Salinas Valley Groundwater Basin
Langley Area Subbasin
Groundwater Sustainability Plan

Salinas Valley Basin Groundwater Sustainability Agency

(Approved by Salinas Valley Basin Groundwater Sustainability Agency Board of Directors on January 13, 2022)

Prepared by:

MONTGOMERY & ASSOCIATES
Water Resource Consultants

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SVBGSA Member Agencies

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Monterey County Water Resources Agency
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Castroville Community Services District
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Langley Area Subbasin Planning Committee

Tom Adcock
Jenny Balmagia
Caroline Chapin, Chair
Elaheh Esfahanian
Grant Leonard
Colby Pereira
Brett Melone
Shawn Nelson
Paul Robins
Max Storms

SVBGSA Staff

Donna Meyers, *General Manager*
Emily Gardner, *Deputy General Manager*
Gary Petersen, *Senior Advisor*
Les Girard, *General Counsel*
Merida Alvarez, *Administrative Assistant*
Ann Camel, *Administrative Support*
Harrison Tregenza, *Clerk of the Board*

Technical Consultants

Montgomery & Associates (M&A)

Derrik Williams, P.G., C.Hg., *Principal Hydrogeologist*
Abby Ostovar, Ph.D., *Water Policy Specialist*
Tiffani Cañez, *Hydrogeologist*
Joseph Oliver, *Senior Hydrogeologist*
Staffan Schorr, *Principal Hydrogeologist*
Greg Nelson, P.G., *Senior Hydrogeologist*
Victoria Hermosilla, *Hydrogeologist*
Michael Levengood, *GIS and Data Coordinator*
Trevor Pontifex, *Hydrogeologist*
Jon Reeves, *Hydrogeologist*

Wallace Group

Kari Wagner, P.E., *Principal/Director of Water Resources*
Greg Hulburd, P.E., *Senior Civil Engineer*

Wood Group

Matt Baillie, P.G., C.Hg., *Senior Hydrogeologist*

Paris Kincaid Wasiewski

Valerie Kincaid, *Principal*

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

$/AF .... dollar per acre-foot
AF .... acre-foot or acre-feet
AF/yr. .... acre-feet per year
Basin .... Salinas Valley Groundwater Basin
BLM .... U.S. Bureau of Land Management
BMPs .... Best Management Practices
CASGEM .... California Statewide Groundwater Elevation Monitoring
CCGC .... Central Coast Groundwater Coalition
CCRWQCB .... Central Coast Regional Water Quality Control Board
CCWG .... Central Coast Wetlands Group
CDFW .... California Department of Fish and Wildlife
CEQA .... California Environmental Quality Act
cfs .... cubic feet per second
COC .... constituents of concern
CPE Actions .... Communication and Public Engagement Actions
CSD .... Castroville Community Services District
CSIP .... Castroville Seawater Intrusion Project
DACs .... Disadvantage Communities
DDW .... Division of Drinking Water
DEM .... Digital Elevation Model
DMS .... Data Management System
DTSC .... California Department of Toxic Substances Control
DWR .... California Department of Water Resources
EDF .... Environmental Defense Fund
EIR .... Environmental Impact Report

EPA................Environmental Protection Agency
ET...................evapotranspiration
eWRIMS ....Electronic Water Rights Information Management System
GAMA ....Groundwater Ambient Monitoring and Assessment Program
GDE ....groundwater-dependent ecosystem
GEMS ....Monterey County Groundwater Extraction Monitoring System
GIS ....Geographic Information System
GMP...............Groundwater Management Plan
GSA................Groundwater Sustainability Agency/Agencies
GSP or Plan....Groundwater Sustainability Plan
HCM ....hydrogeologic conceptual model
HCP................Habitat Conservation Plan
ILRP...............Irrigated Lands Regulatory Program
InSAR ....Interferometric Synthetic Aperture Radar
IRWMP..........Integrated Regional Water Management Plan
ISW ....interconnected surface water
JPA.................Joint Powers Authority
LID.................low impact development
MAR ....managed aquifer recharge
MCLs ....Maximum Contaminant Levels
MCPWD ....Monterey County Public Works Department
MCWRA........Monterey County Water Resources Agency
MTBE ....methyl-tertiary-butyl ether
NAVD88........North American Vertical Datum of 1988
NCCAG..........Natural Communities Commonly Associated with Groundwater
NEPA ....National Environmental Policy Act
NMFS.............National Marine Fisheries Service
O&M..............Operations and maintenance fees
OSWCR ....Online System for Well Completion Report
RMS ....Representative Monitoring Sites
ROW ....Right of Way
RWMG...........Greater Monterey County Regional Water Management Group
SAGBI............Soil Agricultural Groundwater Banking Index
SDACs ....Severely Disadvantaged Communities
SGMA............Sustainable Groundwater Management Act
SMC ....Sustainable Management Criteria
SMCLs...........Secondary Maximum Contaminant Levels
SRDF.............Salinas River Diversion Facility

Subbasin.........Langley Area Subbasin
SVBGSA........Salinas Valley Basin Groundwater Sustainability Agency
SVIHM...........Salinas Valley Integrated Hydrologic Model
SVOM............Salinas Valley Operational Model
SVRP..............Salinas Valley Reclamation Plant
SWIG ....Seawater Intrusion Working Group
SWRCB..........State Water Resources Control Board
URCs..............Underrepresented Communities
USACE ..........U.S. Army Corps of Engineers
USFWS ..........U.S. Fish and Wildlife Service
USGS .............U.S. Geological Survey

EXECUTIVE SUMMARY
INTRODUCTION (GSP CHAPTER 1)

The 2014 California Sustainable Groundwater Management Act (SGMA) requires that medium- and high-priority groundwater basins and subbasins develop Groundwater Sustainability Plans (GSPs) that outline how groundwater sustainably will be achieved in 20 years, and then maintained for an additional 30 years. This GSP fulfills that requirement for the Salinas Valley—Langley Area Subbasin (Subbasin), which is designated by the DWR as a medium priority groundwater subbasin.

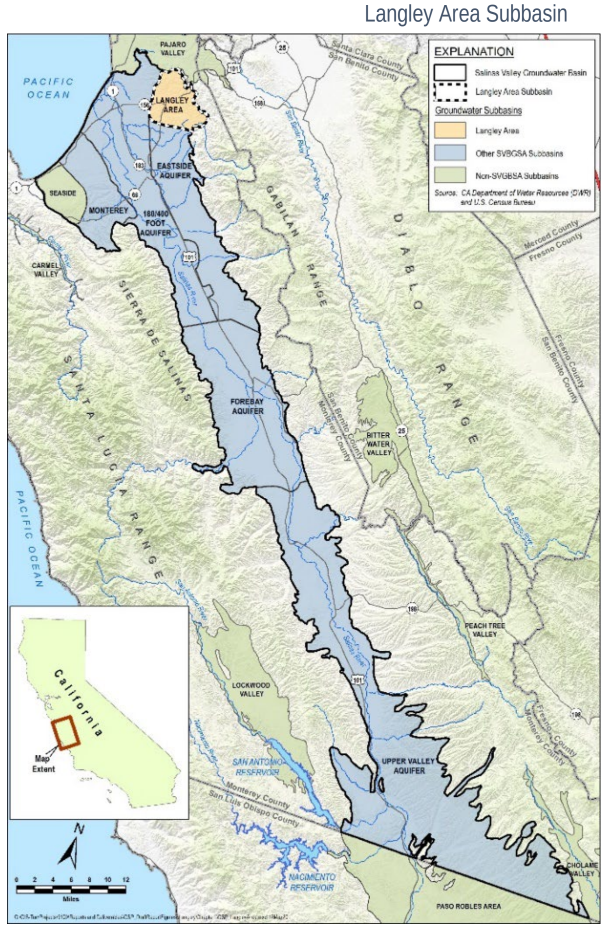
In 2017, local GSA-eligible entities formed the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) to develop and implement the GSPs for the Salinas Valley. The SVBGSA is a Joint Powers Authority (JPA) with membership comprising the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King, Castroville Community Services District, and Monterey One Water. The SVBGSA is governed by an eleven-member Board of Directors, representing public and private groundwater interests throughout the Salinas Valley Groundwater Basin. In addition, an Advisory Committee ensures participation by, and input to, the Board by constituencies whose interests are not directly represented on the Board.

The Salinas Valley Groundwater Basin consists of 9 subbasins, of which 6 are entirely or partially under the SVBGSA's jurisdiction. One of the 9 subbasins, the Seaside Subbasin, is adjudicated and not managed by the SVBGSA. Another 2 subbasins, the Paso Robles and Atascadero Subbasins, lie completely in San Luis Obispo County and are managed by other groundwater sustainability agencies.

The SVBGSA developed this GSP for the Langley Subbasin (DWR subbasin number 3-004.09) in concert with the GSPs for its 5 other Salinas Valley Subbasins: the 180/400-Foot Aquifer Subbasin (DWR subbasin number 3-004.01), the Eastside Aquifer Subbasin (DWR subbasin number 3-004.02), the Forebay Aquifer Subbasin (DWR subbasin number 3-004.04), the Upper Valley Aquifer Subbasin (DWR subbasin number 3-004.05), and the Monterey Subbasin (DWR subbasin number 3-004.10). Having a single GSA prepare all or part of the six plans promotes coordination and cooperation across subbasin boundaries.

This GSP covers the entire 17,600 acres of the Langley Subbasin, as shown on the figure below. The GSP describes current groundwater conditions, develops a hydrogeologic conceptual model, establishes the water budget, outlines locally defined sustainable management criteria, and provides projects and management actions that can be used to reach sustainability by 2042.

Langley Area Subbasin



COMMUNICATIONS AND PUBLIC ENGAGEMENT (GSP Chapter 2)

The SVBGSA designed all phases of SGMA implementation to be open collaborative processes with active stakeholder engagement that allows stakeholders and public participants opportunities to provide input and to influence the planning and development process and subsequently GSP implementation. The communications and public engagement process included the following:

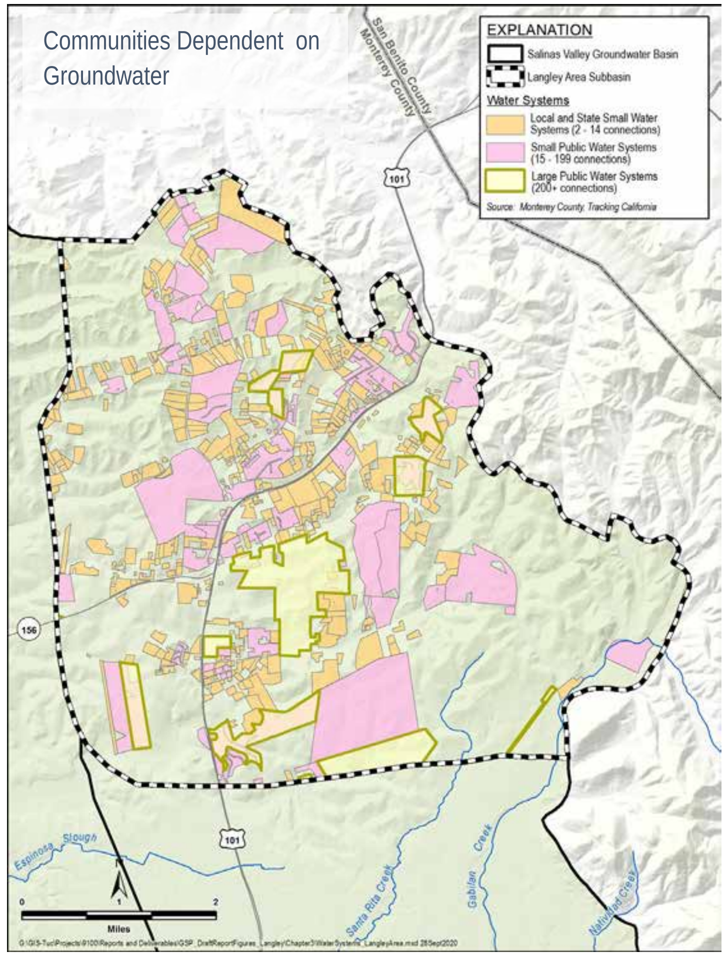
- **GSA formation and coordination.** SVBGSA formation and coordination took place from 2015 through 2017 and included completing a Salinas Valley Groundwater Stakeholder Issues Assessment, which resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and formation of the SVBGSA.
- **GSP preparation.** Given the importance of the Subbasin and the development of the GSP to the communities, residents, landowners, farmers, ranchers, businesses, and others, it is essential that inclusive stakeholder input is a primary component of the GSP process. A rigorous review process for each chapter in this GSP and for the final plan ensured that stakeholders had multiple opportunities to review and comment on the draft GSP.
- **Subbasin Planning Committee.** The Langley Subbasin Planning Committee provides overall direction for GSP development. It comprises local stakeholders and a Board of Directors member, all of whom were appointed by the following a publicly noticed application process by the GSA. This Committee represents constituencies that are considered important stakeholders in the Langley Subbasin, and who may not be represented on the Board of Directors. During the planning process, the SVBGSA held more than 32 Langley Area planning meetings including 11 workshops.
- **Communication and public engagement actions (CPE Actions).** CPE Actions provide the SVBGSA Board and staff a guide to ensure consistent messaging about SVBGSA requirements and other related information. CPE Actions provide ways that beneficial users and other stakeholders can provide timely and meaningful input into the GSA decision-making process, are informed of milestones, and offered opportunities to participate in GSP implementation and plan updates.
- **Underrepresented communities (URCs) and disadvantaged communities (DACs).** During development of the 2022 GSPs SVBGSA assessed how URCs and DACs may be engaged with the GSA and how to develop GSA materials that are accessible and culturally responsive (visual and in Spanish). These materials will communicate impacts of groundwater management on local water conditions to engage URCs and DACs into GSA plan reviews and develop pathways for future involvement.

SVBGSA supports public participation by the development of an interactive website that allows access to all planning and meeting materials, data sets, and meeting notifications. The website can be accessed at: https://svbgsa.org.

DESCRIPTION OF PLAN AREA (GSP Chapter 3)

The Langley Subbasin is located in northeastern Monterey County, east of the Gabilan Range and south of the Elkhorn Slough. The figure below shows that the Langley Subbasin primarily contains small communities, but no incorporated communities; Prunedale is the largest community in the Subbasin. The primary water use sector is rural residential. There is also some agriculture along the southern boundary of the Subbasin. Groundwater is the main water source in the Subbasin. Surface water diversions provide a minimal amount of water in the Subbasin.

The Langley Subbasin is entirely within the jurisdiction of the SVBGSA. This GSP takes into consideration and incorporates existing water resource management, monitoring, and regulatory programs. The sustainability goal, sustainable management criteria, and projects and management actions in this GSP reflect and build on existing local plans and programs. Any potential limits to operational flexibility have already been incorporated into this GSP. Implementation of this GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon. The GSA does not have authority over land use planning. However, the GSA will coordinate with the County on General Plans and land use planning/zoning as needed when implementing the GSP.



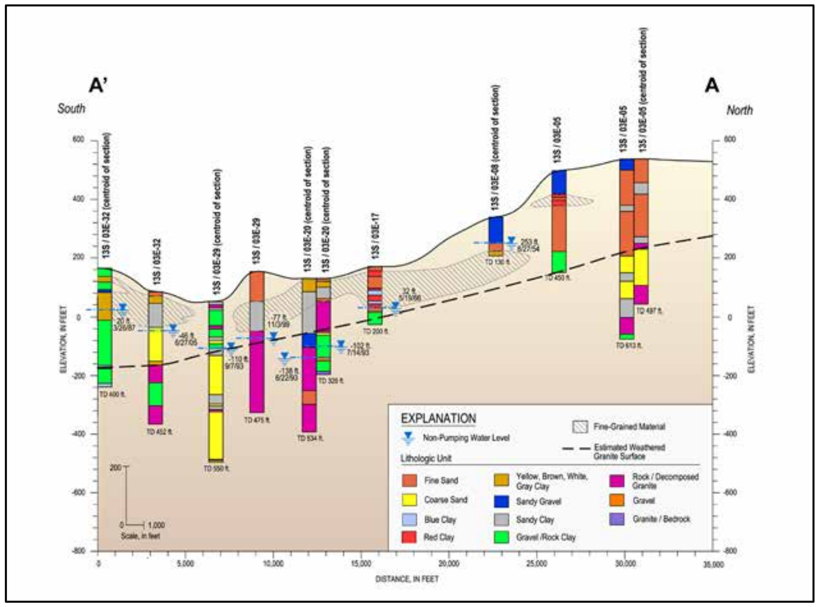
HYDROGEOLOGIC CONCEPTUAL MODEL (GSP Chapter 4)

The geology of the Langley Subbasin is dominated by alluvial fans and sedimentary deposits that form low hills. Surface-water drainages deposited a series of small, interconnected alluvial fans that extend from the Gabilan Range in the northeast to the fluvial deposits that define the boundary with the 180/400-Foot Aquifer Subbasin to the west. The southern boundary with the Eastside Subbasin generally coincides with the boundary of the Aromas Red Sands, which are indicative of the Langley Subbasin (DWR, 2004). Although the Langley Subbasin is not on the valley floor, there are no reported hydraulic barriers separating it from the 180/400-Foot and Eastside Aquifer Subbasins. The eastern boundary of the Subbasin is the contact between the unconsolidated sediments and the Gabilan Range that consists mostly of granitic rocks. To the north, the Langley Subbasin is bounded by the drainage divide with the Pajaro

Valley Groundwater Basin that follows the course of a Salinas River paleo-drainage. This abandoned river valley cuts through the Aromas Red Sands and is filled in with fine sediments that may act as a barrier to flow between the two groundwater basins (Schwartz, 1983).

The unconfined sands and gravels of the Aromas Red Sands are the primary water-bearing geologic formation in the Subbasin's sole principal aquifer. Near the Gabilan Range, some wells are completed in the weathered surface of the granite, fresh granite, or other consolidated formations (Fugro West, Inc., 1995). However, the granite is not a principal aquifer because it does not convey significant and economic quantities of water and the water encountered in the fractured granite is not consistent or reliable since it is drawn from fractures. The figure to the right shows a geologic cross section of the Subbasin.

Cross Section A-A'



This GSP adopts the base of the Subbasin defined by the U.S. Geological Survey (USGS) (Durbin, *et al.*, 1978). The base of the Subbasin is defined by the sharp interface between both the Aromas Red Sands and the alluvium with the underlying granitic rocks that exists near the Gabilan Range. However, away from the Gabilan Range the Subbasin does not have a well-defined base because the sedimentary layers thicken, and with depth the viability of the sediments as productive freshwater principal aquifer becomes increasingly limited.

Detailed aquifer property values (storativity, conductivity, and transmissivity) for the principal aquifer were not available at the time of GSP development. The SVBGSA will fill this data gap during GSP implementation. Specific capacity data is used as a proxy for transmissivity data and indicate that the principal aquifer is relatively transmissive with moderate well yields.

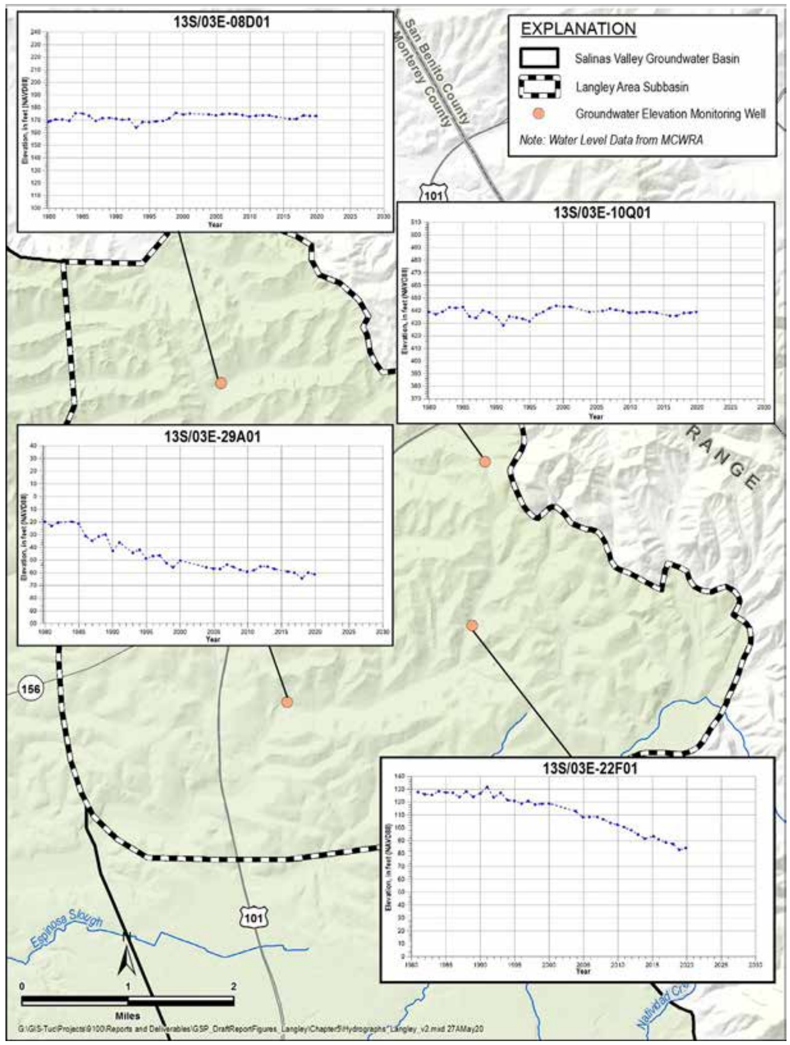
Natural groundwater recharge occurs through infiltration of surface water from streams and deep percolation of infiltrating precipitation. The area with the highest potential for surficial recharge is along Gabilan Creek in the southeast corner of the Subbasin, but most soils in the Subbasin are classified as very poor for recharge potential. There is no known subsurface recharge since this Subbasin is against the Gabilan Range and Elkhorn Slough and is upgradient to the 180/400-Foot and Eastside Aquifer Subbasins.

Groundwater can leave the aquifers where surface water and groundwater are interconnected. There are potential locations of interconnected surface water and groundwater along the Gabilan Creek and a couple other areas in the Subbasin. In these areas groundwater dependent ecosystems (GDEs) may depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface and may discharge groundwater through evapotranspiration (ET).

GROUNDWATER CONDITIONS (GSP Chapter 5)

Historical groundwater conditions in the Subbasin occurred before January 1, 2015 and current conditions occurred after January 1, 2015. Where possible, 2019 was chosen as the representative current year for groundwater conditions.

Map of Example Hydrographs



- **Groundwater elevations.** Historically, groundwater hydrographs show a decline in groundwater elevations near the southcentral areas of the Langley Subbasin. Other areas of the Subbasin have shown generally stable groundwater elevations. The figure to the right shows example hydrographs for the Subbasin.
- **Change in groundwater storage.** The historical average annual loss of storage based on groundwater elevation change between 1944 and 2019 is approximately 290 acre-feet per year (AF/yr.) in the Langley Subbasin, defined as the average change in groundwater that can be safely used for domestic, industrial, or agricultural purposes.
- **Seawater intrusion.** There is no seawater intrusion in the Langley Subbasin. However, the neighboring 180/400-Foot Aquifer Subbasin has been subject to seawater intrusion for more than 70 years.
- **Groundwater quality.** In 2018, nitrate levels exceeded the drinking water MCL in 9% of irrigation supply wells in the Subbasin (CCRWQCB, 2018). Other constituents found at levels of concern for either potable or irrigation uses include 1,2 dibromo-3-chloropropane, iron, manganese, and vinyl chloride.
- **Subsidence.** No measurable subsidence has been recorded anywhere in the Subbasin between June 2015 and June 2019.
- **Interconnected surface water.** Provisional model results show that depletion of interconnected surface water due to groundwater pumping averages about 800 AF/yr. in the Subbasin.

WATER BUDGETS (GSP Chapter 6)

Water budgets provide an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the Subbasin. This GSP presents water budgets for three time periods – historical (1980 to 2016), current (2016), and projected with estimated 2030 and 2070 climate change factors. Water Year 2016 was the last year included in the models that could be used to develop water budgets for the GSP. Water Year 2016 meets the definition of current year found in the SGMA regulations (23 California Code of Regulations §354.18 (c)(1)); however, Water Year 2016 was preceded by multiple dry or dry-normal years and may not necessarily represent average current conditions. This chapter presents the surface water budget and groundwater budget for each time period. The groundwater budget contains aggregate numbers for the Subbasin and is not differentiated spatially.

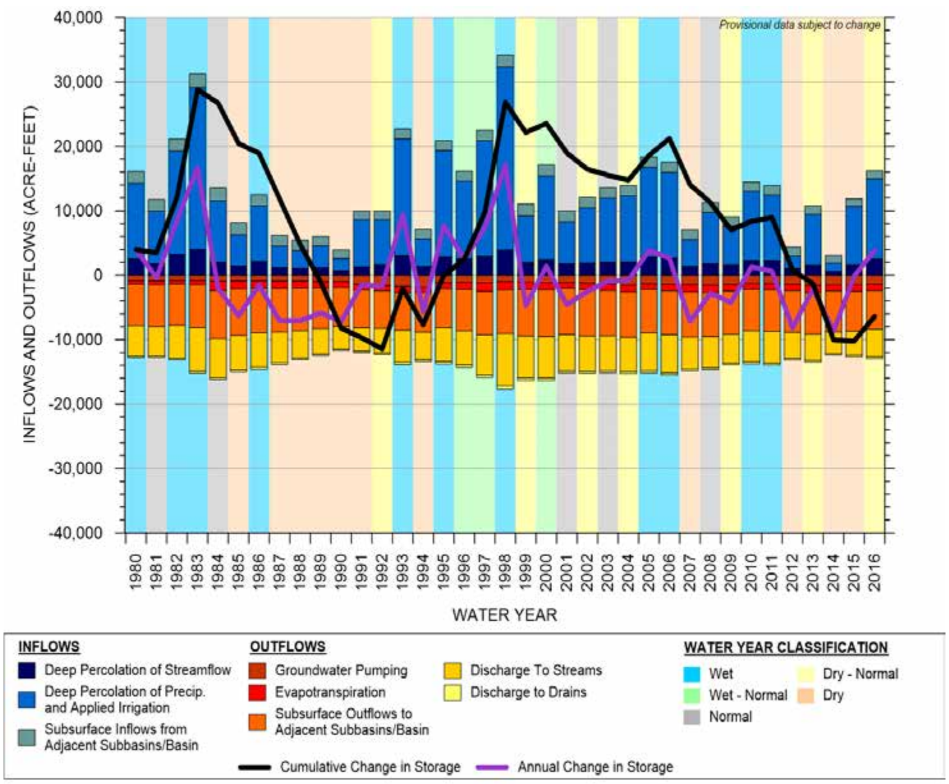
The water budgets are developed using the historical Salinas Valley Integrated Hydrologic Model (SVIHM) and the predictive Salinas Valley Operational Model (SVOM), both developed by the USGS. The models are representations of natural conditions and are limited by assumptions and uncertainty associated with the data upon which they are based. The water budgets produced by the models are adjusted with reported extraction data and extraction estimations for domestic use to ensure the water budgets are based on the best available science and data.

Historical and Current Water Budgets and Historical Sustainable Yield. The groundwater budget accounts for the inflows and outflows to and from the Subbasin's groundwater system. This includes subsurface inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net streambed exchange.

The historical and current groundwater budget figure on the next page shows the annual groundwater inflows and outflows, annual change in groundwater storage, and cumulative change in storage. Changes in groundwater storage generally occur when there are changes in deep percolation of precipitation and excess streamflow, increasing during wet periods and declining during dry periods. However, historical decline in groundwater levels varies across the Subbasin. On average, historical outflows from the groundwater system have been greater than inflows, resulting in a decrease in groundwater storage. Through analysis and comparison of groundwater level changes over time and model results, it is estimated that the Subbasin has historically been in overdraft on the order of 300 AF/yr. When this change in storage is subtracted from a range of the historical pumping, the estimated historical sustainable yield ranges from 500 to 1,100 AF/yr. The sustainable yield of the Subbasin is an estimate of the quantity of groundwater that can be pumped on a long-term average annual basis without causing any of the 6 undesirable results defined in ES-8. The current sustainable yield represents a snapshot in time and is not used for groundwater management planning. These results are provisional and are subject to change in future GSP updates after the SVIHM and SVOM are released by the USGS.

Projected Water Budgets and Projected Sustainable Yield. Projected water budgets for 2030 and 2070 are extracted from the SVOM, which simulates future hydrologic conditions with assumed climate change based on the climate change factors recommended by DWR. Results are then adjusted based on extraction data and estimated domestic use to produce the water budget based on best available data. The projected water budget includes a surface water budget and groundwater budget, each quantifying all inflows and outflows. Subtracting the average change in storage of 300 AF/yr. from the projected pumping, results in a projected sustainable yield of 800 AF/yr. for both 2030 and 2070.

SVIHM Simulated Historical and Current Groundwater Budget



This data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

The projected sustainable yield is the long-term estimate of the quantity of groundwater that can be pumped once all 6 undesirable results have been addressed; however, it does not include projects, management actions, or pumping reductions needed to avoid undesirable results and reach sustainability according to the 6 sustainability indicators. Although the sustainable yield values provide guidance for achieving sustainability, simply increasing groundwater recharge or reducing pumping to within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through avoiding all 6 undesirable results. The projected water budgets are based on a provisional version of the SVOM and are subject to change. Model information and assumptions are based on provisional documentation on the model.

The sustainable yield value will be updated in future GSP updates as more data are collected and additional analyses are conducted. The table below summarizes the historical and projected sustainable yields for the Subbasin.

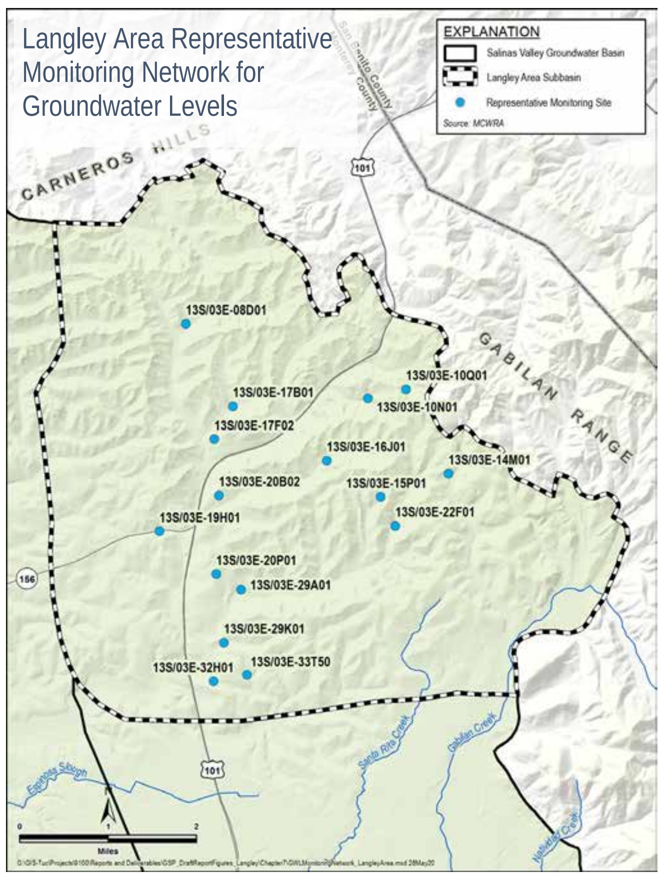
Summary of Historical and Projected 2070 Sustainable Yields in AF/yr.

	Historical Sustainable Yield Range	2070 Projected Sustainable Yield
Groundwater Pumping	800 to 1,400	1,100
Change in Storage	-300	-300
Sustainable Yield	500 to 1,100	800

MONITORING NETWORKS (GSP Chapter 7)

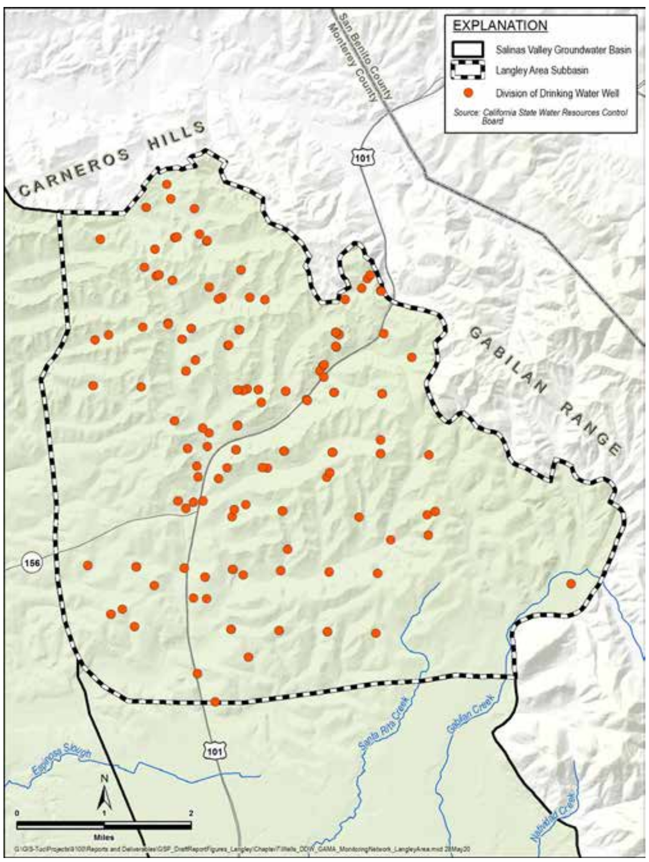
Monitoring networks are developed for data collection of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin and to evaluate changing conditions that occur as the Plan is implemented. The SVBGSA developed monitoring networks for each of the 6 sustainability indicators, based on existing monitoring sites to the extent possible. Where needed, monitoring networks will be expanded and data gaps filled to improve the SVBGSA's ability to demonstrate sustainability and refine the hydrogeologic conceptual model.

- **Groundwater levels** are measured in 16 designated representative monitoring wells that form a network sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients. The figure to the right shows the existing monitoring network, all monitoring is conducted by MCWRA.
- **Groundwater storage** is measured by groundwater elevations; thus the groundwater storage and groundwater level monitoring networks are identical.
- **Seawater intrusion** is evaluated based on a 500 mg/L chloride concentration isocontour derived from measurements at a specific network of monitoring wells in the adjacent 180/400-Foot and Eastside Subbasins. Monitoring and development of the chloride isocontour maps are done by MCWRA.
- **Groundwater quality** is evaluated by monitoring groundwater quality at a network of existing water supply wells. Drinking water constituents of concern will be assessed at public water system supply wells through the Division of Drinking Water (DDW) program and at on-farm domestic wells through the Irrigated Lands Regulatory Program (IRLP), shown on the figures on the following page, respectively. Agricultural constituents of concern will be assessed at irrigation supply wells that are also monitored through the ILRP.
- **Land subsidence** is assessed based on the land subsidence data DWR has collected with InSAR satellite data.
- **Interconnected surface water** will be assessed through monitoring shallow groundwater elevations near locations of interconnection. Given the lack of shallow monitoring wells near locations of interconnection, a new well will be installed along Gabilan Creek.

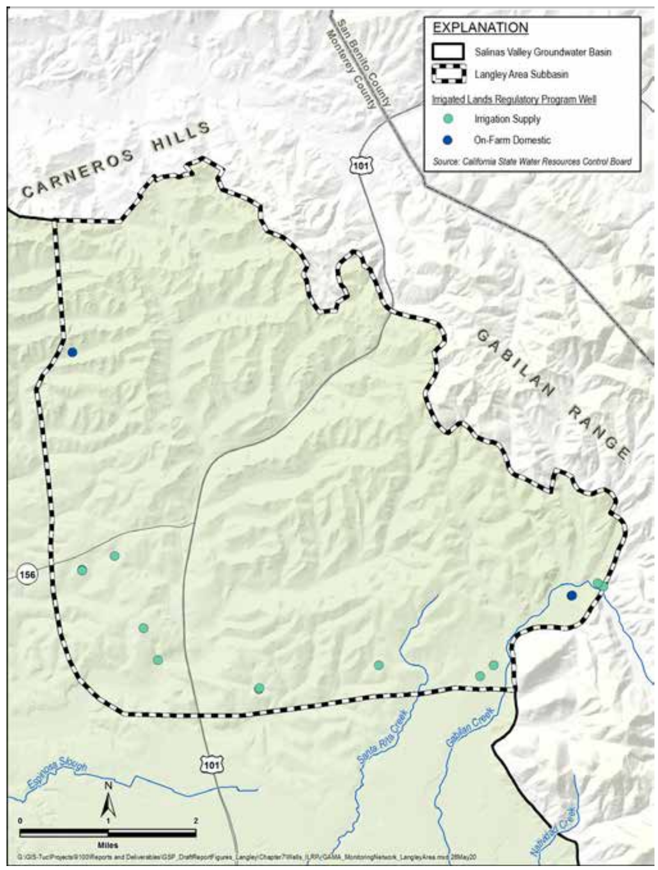


- **Other monitoring networks** are not necessary to monitor the 6 sustainability indicators; however, DWR requires annual reporting of pumping and surface water use.
    - **Groundwater extraction** monitoring includes municipal groundwater users and small water system pumping available from the State Water Resources Control Board (SWRCB), agricultural pumping reported to the MCWRA and estimated using Monterey County crop data, and domestic pumping estimated based on number of domestic users.
    - **Salinas River Watershed Diversion** data from the Electronic Water Rights Information Management System (eWRIMS) is used to monitor the surface water diversions in the Subbasin.
- The SVBGSA has developed a Data Management System (DMS) to store, review, and upload data collected as part of GSP development and implementation. The DMS includes a publicly accessible web-map hosted on the SVBGSA website; accessed at https://svbgsa.org/gsp-web-map-and-data/.

DDW Public Water System Supply Wells in the Groundwater Quality Monitoring Network



ILRP On-Farm Domestic and IrrigationSupply Wells in the Groundwater Quality Monitoring Network



SUSTAINABLE MANAGEMENT CRITERIA (GSP Chapter 8)

The sustainability goal of the Langley Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

Sustainable Management Criteria (SMC) define the conditions that constitute sustainable groundwater management. The following table provides a summary of the SMC for each of the 6 sustainability indicators. Measurable objectives reflect the subbasin's goal for desired groundwater conditions for each sustainability indicator. These provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. The undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin. This GSP is designed avoid undesirable results, and achieve the sustainability goal within 20 years, along with interim milestones every 5 years to show progress. The management actions and projects provide sufficient options for reaching the measurable objectives within 20 years and maintaining those conditions for 30 years for all 6 sustainability indicators.

Summary of Sustainable Management Criteria for Sustainability Indicators

Sustainability Indicator	Minimum Thresholds	Measurable Objectives	Undesirable Result
Chronic lowering of groundwater levels	Minimum thresholds are set to 2019 groundwater elevations, adjusted based on well-specific elevation assessments.	Measurable objectives are set to 2010 groundwater elevations adjusted based on well-specific elevation assessments.	More than 15% of groundwater elevation minimum thresholds are exceeded. Allows two exceedances in the Langley Subbasin.
Reduction in groundwater storage	Minimum thresholds are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.	Measurable objectives are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives are identical to the chronic lowering of groundwater levels measurable objectives.	More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.
Seawater intrusion	Minimum threshold is the 500 mg/L chloride isocontour at the Subbasin boundary.	Measurable objective is identical to the minimum threshold, resulting in no seawater intrusion in the Langley Subbasin.	Any exceedance of the minimum threshold, resulting in mapped seawater intrusion within the Subbasin boundary.
Degraded groundwater quality	Minimum thresholds are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or the Basin Plan objectives (irrigation supply wells) beyond those observed in 2019 for groundwater quality COC. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells.	Measurable objectives are identical to the minimum thresholds.	Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.
Land subsidence	Minimum threshold is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors.	Measurable objective is identical to the minimum threshold, resulting in zero net long-term subsidence.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations.
Depletion of interconnected surface water	Minimum thresholds are established by proxy using shallow groundwater elevations observed in 2019 near locations of ISW, adjusted based on well-specific elevation assessments.	Measurable objectives are established by proxy using shallow groundwater elevations observed in 2010 near locations of ISW, adjusted based on well-specific elevation assessments.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

PROJECTS AND MANAGEMENT ACTIONS (GSP Chapter 9)

This GSP identifies projects and management actions that provide stakeholders with options to reach sustainability. The set of projects and actions achieve the following objectives:

- Attaining groundwater sustainability by 2042 by meeting Subbasin-specific SMC
- Providing equity between who benefits from projects and who pays for projects
- Providing incentives to constrain groundwater pumping within the sustainable yield

The projects and management actions included in this GSP outline a framework for reaching sustainability; however, many details must be negotiated before any of the projects and management actions can be implemented. The set of projects and management actions provide sufficient options for reaching and maintaining sustainability throughout the planning horizon, but they do not all need to be implemented.

This GSP is developed as part of an integrated effort by the SVBGSA to achieve groundwater sustainability in all 6 subbasins of the Salinas Valley under its authority. Therefore, the projects and actions included in this GSP are part of a larger set of integrated projects and actions for the entire Valley.

This GSP focuses on the projects that directly help the Langley Subbasin reach its sustainability goals, but also includes multi-subbasin projects outside the Subbasin that will likely benefit the Subbasin and reduce the need for additional projects and management actions. In addition, the chapter includes implementation actions that contribute to groundwater management and GSP implementation but do not directly help the Subbasin reach or maintain sustainability. The projects, management actions, and implementation actions for this GSP are listed in the table on the next page.

Mitigation of Overdraft. The Langley Subbasin has historically been in overdraft at the rate of approximately 300 AF/yr., and it is projected to still be in overdraft throughout the GSP planning horizon unless projects and management actions bring extraction in line with the sustainable yield. The overdraft can be mitigated by reducing pumping or recharging the subbasin, either through direct or in-lieu means. The potential projects and management actions in this chapter are sufficient to mitigate existing overdraft. These include potential demand management through pumping allocations to be used if other projects and management actions do not reach sustainability goals and mitigate overdraft.

Projects and Management Actions

Project / Mgmt Action #	Name	Description	Project Benefits
A	RECHARGE PROJECTS		
A1	Decentralized Residential In-Lieu Recharge Projects	Small-scale projects initiated by homeowners and business owners, including rooftop rainwater harvesting, rain gardens, and graywater systems	Less domestic groundwater use
A2	Decentralized Stormwater Recharge	Medium scale bioswales and recharge basins on non-agricultural land	Groundwater recharge, less flooding,
A3	MAR with Overland Flow	Construct four recharge basins for MAR of overland flow before it reaches streams	Groundwater recharge, less stormwater and erosion, more regular surface temperature
A4	Surface Water Diversion from Gabilan Creek	Build a new facility on Gabilan Creek that would be allowed to divert water when streamflow is high	Collects streamflow that would otherwise be lost to the ocean
B	DEMAND MANAGEMENT		
B1	Pumping Allocations and Controls	Proactively determines how extraction should be fairly divided and controlled if needed	Decreases extraction if needed
B2	Fallowing, Fallow Bank, and Agricultural Land Retirement	Includes voluntary fallowing, a fallow bank whereby anybody fallowing land could draw against the bank to offset lost profit from fallowing, and retirement of agricultural land	Decreased groundwater extraction for irrigated agriculture
C	CROSS BOUNDARY PROJECTS		
C1	Floodplain Enhancement and Recharge	Restore creeks and floodplains to slow the flow of water	Groundwater recharge, less erosion, less flooding
C2	Castroville Seawater Intrusion Project (CSIP) Expansion	Expand CSIP into the southwest corner of the Langley Subbasin	Less groundwater pumping
D	IMPLEMENTATION ACTIONS		
D1	Well Registration	Register all production wells, including domestic wells.	Better informed decisions, more management options
D2	Groundwater Extraction Management System (GEMS) Expansion and Enhancement	Update current GEMS program, by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection	Better informed decisions
D3	Dry Well Notification System	Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.	Support affected well owners with analysis of groundwater elevation decline
D4	Water Quality Partnership	Form a working group for agencies and organizations to collaborate on addressing water quality concerns.	Better access to quality drinking water
D5	Land Use Jurisdiction Coordination Program	Coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.	Better aligned land use and water use planning

IMPLEMENTATION (GSP Chapter 10)

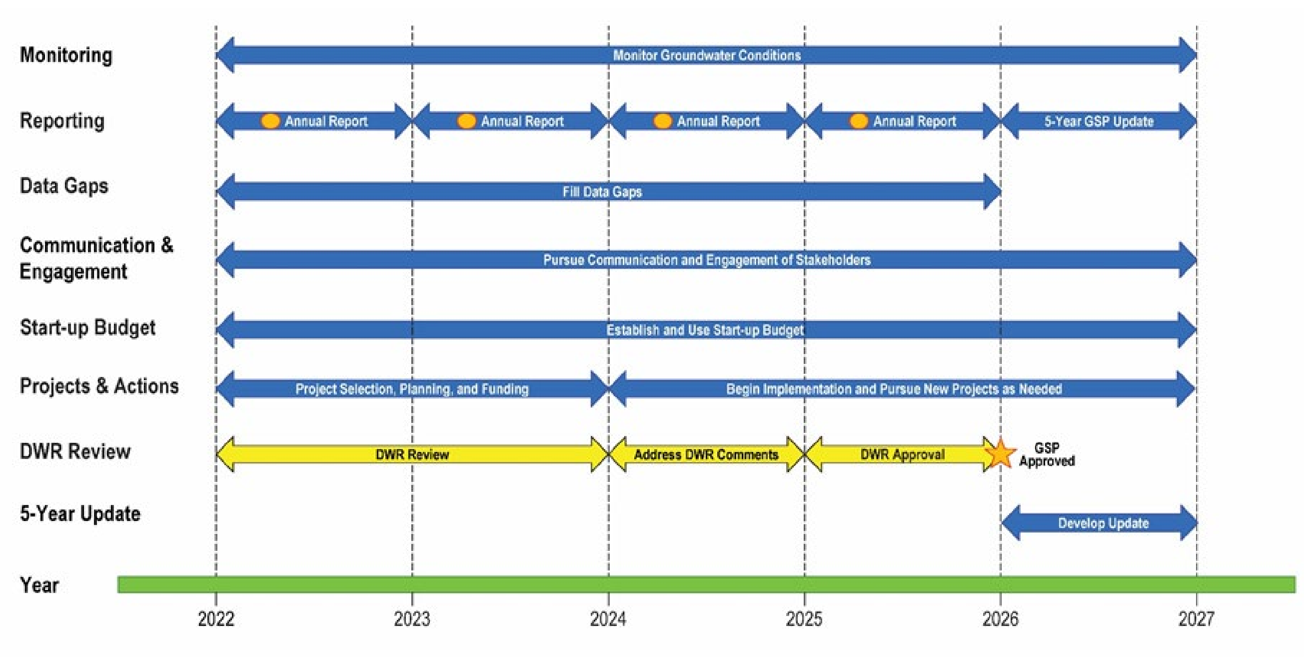
This GSP lays out a roadmap for addressing all of the activities needed for GSP implementation between 2022 and 2042, focusing mainly on the activities between 2022 and 2027. Implementing this GSP requires the following formative activities:

Data, monitoring, and reporting. SGMA requires submittal of annual monitoring data and development of an annual report to track groundwater conditions with respect to the SMC. Monitoring will mostly rely on existing monitoring programs, and expansion of those programs. The groundwater level and groundwater extraction monitoring networks will be improved to provide sufficient temporal and spatial coverage of the Subbasin. Only ISW needs the establishment of a new monitoring network, which will be installed just over the boundary with the Eastside Subbasin. Data from the monitoring programs will be maintained in the DMS and evaluated annually. SVBGSA also plans to fill the aquifer properties and lithologic and hydrostratigraphic data gaps in the HCM to gain a better understanding of the principal aquifer.

Continuing communication and stakeholder engagement. The SVBGSA website will be maintained as a communication tool for posting data, reports, and meeting information. Additionally, the SVBGSA will routinely report information to the public about GSP implementation, progress towards sustainability, and the need to use groundwater efficiently.

Refining and implementing projects and management actions. The projects and management actions in this GSP have been identified as beneficial and sufficient for reaching and maintaining sustainability in the Langley Subbasin. During GSP implementation, they will be refined and prioritized, and impacts of projects and management actions on adjacent subbasins will be analyzed as part of the project selection process. The SVBGSA Board of Directors will approve projects and management actions that are selected for funding.

General Schedule of 5-Year Start-Up Plan



Adapting management with the 5-year update. SGMA requires assessment reports every 5 years to assess progress towards sustainability, a description of significant new information or data, and whether the GSP needs to be adapted. The 5-year update will include updating the SVIHM and SVOM with newly collected data and updating model scenarios to reflect both the additional data and refinements in project design or assumptions.

Developing a funding strategy. SVBGSA established a valley-wide Operational Fee to fund the typical annual operational costs of its regulatory program authorized by SGMA, including regulatory activities of management groundwater to sustainability (such as GSP development), day-to-day administrative operations costs, and prudent reserves. The cost is relatively low because SVBGSA can spread its administrative costs over the 6 subbasins it manages. In addition, this GSP provides an estimate of the start-up budget needed to implement this GSP within the Langley Subbasin. The SVBGSA estimates that these planned activities will cost $938,000 over the first 5 years of implementation in the Langley Subbasin. The start-up budget does not include funding for implementing specific projects and management actions. For projects funded by SVBGSA or funding SVBGSA raises to contribute to the implementation of projects, this GSP includes a list of potential funding mechanisms, and SVBGSA will evaluate the most appropriate mechanism for each project.

Schedule. Implementation of the Langley Subbasin GSP must be integrated with that of the 5 other GSPs in the Salinas Valley to ensure all subbasins can reach and maintain sustainability. The general implementation schedule for the first 5 years of GSP implementation, provided in the figure above, includes 6 main tasks and DWR's review and approval process. For projects and management actions, implementation will begin with implementation actions, recharge projects, and pumping allocations and controls. Throughout GSP implementation, projects and management actions will be continually updated as new data and analyses are available. The GSP is intended to include adaptive management that will refine the implementation and direction of this GSP over time.

1 INTRODUCTION TO THE LANGLEY AREA SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

1.1 Introduction and Purpose

The 2014 Sustainable Groundwater Management Act (SGMA) requires groundwater basins or subbasins that are designated as medium or high priority to be managed sustainably. In general, satisfying the requirements of SGMA requires 4 activities:

1. Forming one or more Groundwater Sustainability Agencies (GSAs) in the basin
2. Developing a Groundwater Sustainability Plan (GSP, or Plan)
3. Implementing the GSP and managing to measurable, quantifiable objectives
4. Providing regular reports to the California Department of Water Resources (DWR)

DWR has designated the Salinas Valley – Langley Area Subbasin (Subbasin, on Langley Subbasin) as a high priority basin. The Langley Subbasin is 1 of 9 subbasins in the Salinas Valley, and it is located along the northern edge of the Salinas Valley (Figure 1-1). This document satisfies the GSP requirement for the Langley Subbasin and meets all of the regulatory standards.

Recharge within the Langley Subbasin primarily occurs from percolation of precipitation along the small drainages within the area. However, groundwater extraction from numerous small water systems and domestic wells, as well as agriculture in the southern part of the Subbasin, puts pressure on maintaining groundwater elevations. This is compounded by the limited aquifer space due to the shallow granite bedrock of the Gabilan Range, which prompted a moratorium on development several years ago. The purpose of this GSP is to outline how the Salinas Valley Basin GSA (SVBGSA) will address the declining groundwater conditions and achieve groundwater sustainability in the Subbasin. Sustainability is the absence of undesirable results for any of the 6 sustainability indicators applicable in the Subbasin: chronic lowering of groundwater levels, groundwater storage reductions, seawater intrusion, groundwater quality degradation, land subsidence, and interconnected surface water (ISW) depletion. Sustainability must by achieved in 20 years and maintained for an additional 30 years.

This GSP first presents the stakeholders, plan area, geologic and hydrogeologic data, groundwater conditions, and water budget necessary to develop an informed and robust plan. This GSP is based on best available data and analyses. As additional data are collected and analyses are refined, the GSP will be modified to reflect changes in the local understanding.

Following the foundational information, the GSP introduces the current agreed-to sustainability goal for the Subbasin. It also locally defines significant and unreasonable conditions, which underpin the quantifiable minimum thresholds, measurable objectives, and interim milestones for each of the corresponding sustainability indicators. The final chapters detail projects and actions that should be implemented to achieve sustainability and provide an implementation plan for achieving sustainability. The GSP is intended to include adaptive management that will refine the implementation and direction of this GSP over time.

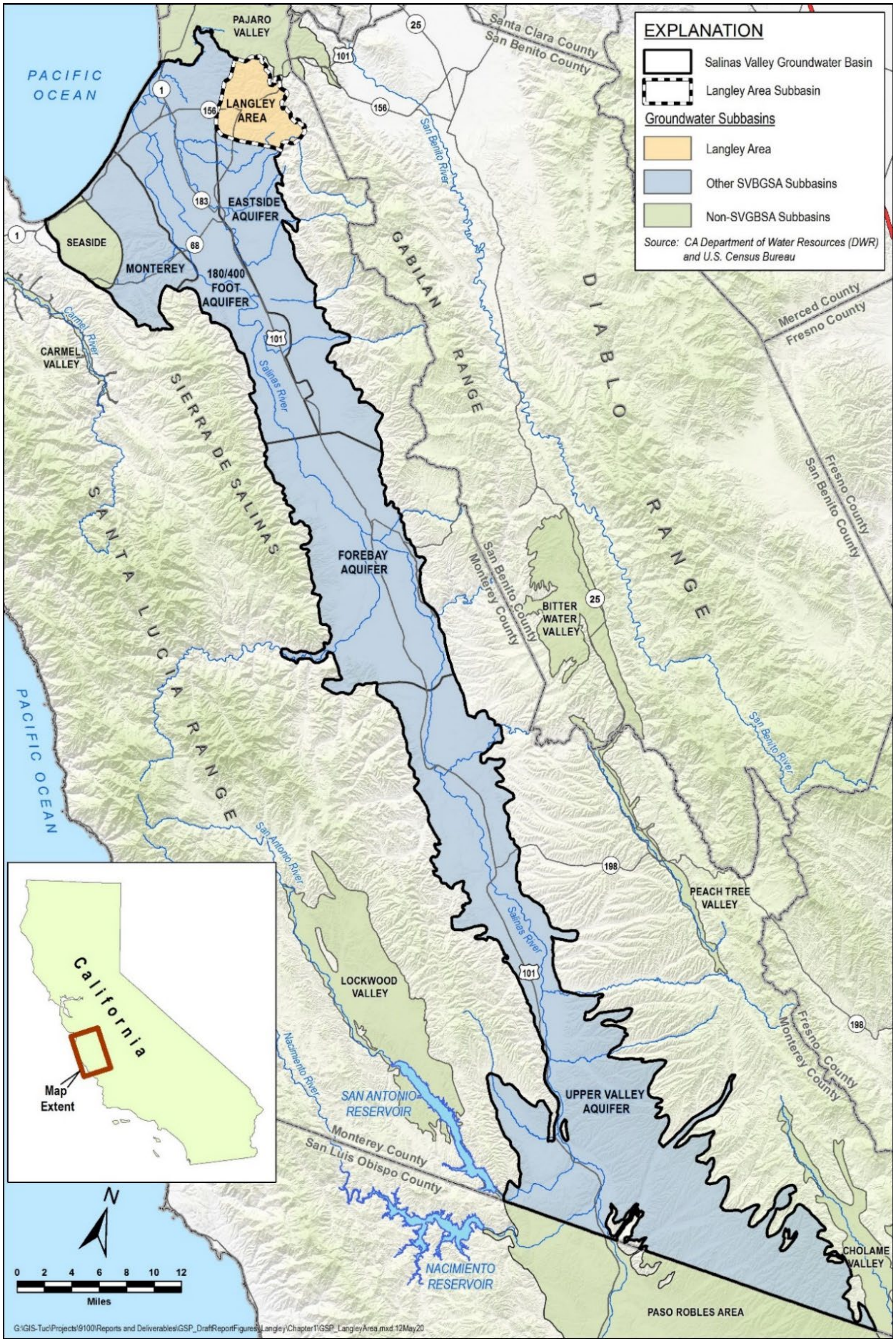


Figure 1-1. Langley Area Subbasin Location

1.2 Agency Information

The Langley Area Subbasin falls entirely within the jurisdiction of the SVBGSA. The Subbasin boundary is shown on Figure 1-2.

1.2.1 Agency Name, Mailing Address, and Plan Manager

Pursuant to California Water Code § 10723.8, the name and contact information for the SVBGSA are:

Salinas Valley Basin Groundwater Sustainability Agency
Attn.: Donna Meyers, General Manager
1441 Schilling Place
Salinas, CA 93901
https://svbgsa.org

The Plan Manager and her contact information are:

Ms. Donna Meyers, General Manager
Salinas Valley Basin Groundwater Sustainability Agency
1441 Schilling Place
Salinas, CA 93901 | (831) 682-2592
meyersd@svbgsa.org
https://svbgsa.org

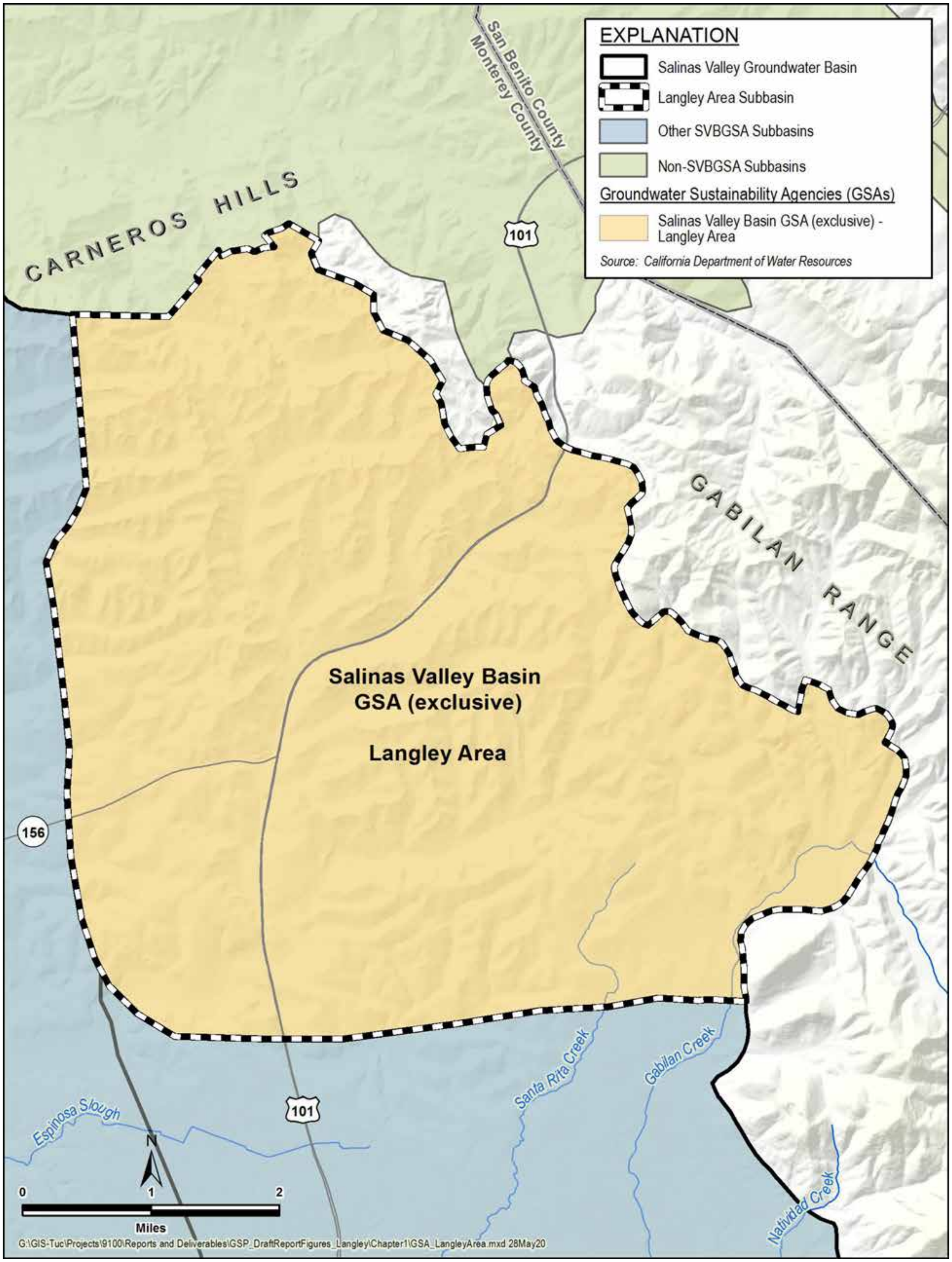


Figure 1-2. Map of Area Covered by the SVBGSA in the Langley Area Subbasin

1.2.2 SVBGSA Organization and Management Structure

Local GSA-eligible entities formed the SVBGSA in 2017. The SVBGSA represents agriculture, public utility, municipal, county, and environmental stakeholders, and is partially or entirely responsible for developing GSPs in 6 of the Salinas Valley Groundwater Subbasins.

The SVBGSA is a Joint Powers Authority (JPA), and its membership includes the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King (King City), the Castroville Community Services District (CSD), and Monterey One Water (formerly the Monterey Regional Water Pollution Control Agency). The SVBGSA is governed and administered by an 11-member Board of Directors (Board), representing public and private groundwater interests throughout the Valley. When a quorum is present, a majority vote is required to conduct business. Some business items require a super majority vote or a super majority plus vote. A super majority requires an affirmative vote by 8 of the 11 Board members. A super majority vote is required for:

- Approval of a GSP
- Amendment of budget and transfer of appropriations
- Withdrawal or termination of Agency members

A super majority plus requires an affirmative vote by 8 of the 11 Board members, including an affirmative vote by 3 of the 4 agricultural representatives. A super majority plus vote is required for:

- Decisions to impose fees not requiring a vote of the electorate or property owners
- Proposals to submit to the electorate or property owners (as required by law) decisions to impose fees or taxes
- Limitations on well extractions (pumping limits)

In addition to the Board of Directors, SVBGSA includes a Budget and Finance Committee consisting of 5 Directors, an Executive Committee consisting of 5 Directors, and an Advisory Committee consisting of Directors and non-directors. The Advisory Committee is designed to ensure participation by constituencies whose interests are not directly represented on the Board. The SVBGSA's activities are coordinated by a general manager. The SVBGSA established individual subbasin planning committees to advise the Board on each of the subbasins under its jurisdiction for which it is developing a 2022 GSP. This GSP has been guided and reviewed by the Langley Area Subbasin Planning Committee, which consists of local representatives from the Subbasin. Once all GSPs are adopted, the subbasin planning committees will transition to implementation committees to advise on the implementation of the GSPs.

1.2.3 Authority of Agency

The SVBGSA was formed in accordance with the requirements of California Water Code § 10723 *et seq*. This section lists its specific authorities for GSA formation and groundwater management.

SVBGSA is a JPA that was formed for the Salinas Valley Groundwater Basin (Basin) in accordance with the requirements of California Government Code § 6500 *et seq*. The JPA agreement is included in Appendix 1A. In accordance with California Water Code § 10723 *et seq.*, the JPA signatories are all local agencies under California Water Code § 10721 with water or land use authority that are independently eligible to serve as GSAs:

- The County of Monterey has land use authority over the unincorporated areas of the County, including areas overlying the Langley Area Subbasin.
- The MCWRA is a California Special Act District with broad water management authority in Monterey County.
- The City of Salinas is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Soledad is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Gonzales is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- King City is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The Castroville CSD is a local public agency of the State of California, organized and operating under the Community Services District Law, Government Code § 6100 *et seq*. Castroville CSD provides water services to its residents.
- Monterey One Water is itself a JPA whose members include many members of the SVBGSA.

Upon establishing itself as a GSA, the SVBGSA retains all the rights and authorities provided to GSAs under California Water Code § 10725 *et seq*. as well as the powers held in common by the members.

1.2.3.1 Coordination Agreement

No coordination agreement is needed for the Langley Area Subbasin, because the SVBGSA is the only GSA with authority in the Subbasin.

1.3 Overview of this GSP

The SVBGSA developed this GSP for the entire Langley Area Subbasin. This GSP is developed in concert with GSPs for 5 other Salinas Valley Groundwater Subbasins under SVBGSA jurisdiction: the 180/400-Foot Aquifer Subbasin, the Forebay Aquifer Subbasin, the Upper Valley Aquifer Subbasin, the Eastside Aquifer Subbasin, and the Monterey Subbasin. While this GSP is focused on the Forebay Subbasin, the GSP will be implemented in accordance with SVBGSA's role in maintaining and achieving sustainability for all subbasins within the Salinas Valley Groundwater Basin. The Langley Area Subbasin is referred to as the Subbasin throughout this GSP, and the collection of Salinas Valley Groundwater Subbasins that fall partially or entirely under SVBGSA jurisdiction are collectively referred to as the Basin or the Valley.

The SVBGSA used a collaborative process to develop this GSP. Chapter 2 details the stakeholders who participated and the process followed to develop this GSP. Stakeholders worked together to gather existing information, define sustainable management criteria (SMC) for the Subbasin, and develop a list of projects and management actions.

This GSP describes the basin setting, presents the hydrogeologic conceptual model, and describes historical and current groundwater conditions. It further establishes estimates of the historical, current, and future water budgets based on the best available information. This GSP defines local SMC, details required monitoring networks, and outlines projects and management actions for reaching sustainability in the Subbasin by 2042.

The SVBGSA developed this GSP as part of an adaptive management process. This GSP will be updated and adapted as new information and more refined models become available. This includes updating SMC and projects and management actions to reflect updates and future conditions. Adaptive management will be reflected in the required 5-year assessment to GSPs and annual reports.

2 COMMUNICATIONS AND PUBLIC ENGAGEMENT

2.1 Introduction

The SVBGSA was formed in 2017 to implement SGMA locally within the Salinas Valley Groundwater Basin. GSA formation and coordination took place from 2015 through 2017 and included completing a Salinas Valley Groundwater Stakeholder Issues Assessment which resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and the formation of the SVBGSA. Through the development and implementation of the GSPs SVBGSA is committed to following the requirements for stakeholder engagement as defined by SGMA:

- Consider the interests of all beneficial uses of water and users of groundwater (§ 10723.2)
- Encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin (§ 10727.8)
- 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 (§ 10723.4)
- Make available to the public and DWR a written statement describing the manner in which interested parties may participate in the development and implementation of the GSP (§ 10723.2)

2.2 Defining and Describing Stakeholders for Public Engagement

The SVBGSA stakeholders are highly diverse. Groundwater supports economic activities from small domestic scale to large industrial scale. Groundwater is an important supply for over 400,000 people living within the Salinas Valley Groundwater Basin. Beneficial users in the Basin are the key stakeholders targeted for robust public engagement for GSP development and implementation. Beneficial users in the Basin are listed below:

Agriculture. Includes row crops, field crops, vineyards, orchards, cannabis, and rangeland. The Salinas Valley agricultural region supports a $4.25 billion dollar production value and produces a large percentage of the nation's produce and healthy foods including 61% of the leaf lettuce, 57% of celery, 56% of head lettuce, 40% of broccoli, and 38% of spinach. Agriculture is the largest user of groundwater in the Basin accounting for approximately 250,000 irrigated acres and 94% of pumping in the Basin.

Domestic Water Users. Includes urban water use assigned to non-agricultural water uses in the cities and census-designated places and rural residential wells used for drinking water. Urban water use includes small local water systems, small state water systems, and small and large public water systems.

Industrial Users. Includes industrial water users, such as quarries and oil production. There is little industrial use within the Basin.

Environmental Users. Environmental users include the habitats and associated species maintained by conditions related to surface water flows such as steelhead trout and groundwater dependent ecosystems (GDEs) including brackish and freshwater marsh and riparian habitats. Environmental users include native vegetation and managed wetlands.

Stakeholders associated with these beneficial users and uses include the following. These users are also represented on the SVBGSA Board and Advisory Committees as described in the next section.

- **Environmental organizations.** Environmental organizations that are stakeholders include Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough, California Native Plant Society Monterey Chapter, Trout Unlimited, Surfriders, the Nature Conservancy (TNC) and the Carmel River Steelhead
- **Underrepresented communities (URCs) and Disadvantaged Communities (DACs).** URCs and DACs include the City of Greenfield, the City of Salinas, the community of Chualar, CSD, San Jerardo Cooperative, San Ardo Water District, San Vicente Mutual Water Company, Environmental Justice Coalition for Water
- **City and county government.** Cities of Gonzales, Soledad, Greenfield, King City, Marina, and Salinas, Monterey County, Monterey County Environmental Health Department
- **Land use nonprofits.** Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough
- **Residential well owners.** Represented by public members and members of mutual water companies and local small or state small water systems
- **Water agencies.** Monterey County Water Resources Agency, Marina Coast Water District, Arroyo Seco Groundwater Sustainability Agency, Castroville Community Services District, Monterey One Water, Monterey Peninsula Water Management District, Aromas Water District, Pajaro/Sunny Mesa Community Services District
- **CPUC-regulated water companies.** Alco Water Corporation, California Water Service

Company, California American Water.

2.3 SVBGSA Governance Structure

SVBGSA is governed by a local and diverse 11-member Board and relies on robust science and public involvement for decision-making. The Board meets monthly, and all meetings are open to the public. The Board is the final decision-making body for adoption of GSPs completed by the GSA.

The SVBGSA Advisory Committee advises the SVBGSA Board. The Advisory Committee is comprised of 25 members. The Advisory Committee strives to include a range of interests in groundwater in the Salinas Valley and outlined in SGMA. Advisory Committee members live in the Salinas Valley or represent organizations with a presence or agencies with jurisdiction in the Basin including:

- All groundwater users
- Municipal well operators, Public-Utilities Commission-Regulated water companies, and private and public water systems
- County and city governments
- Planning departments/land use
- Local landowners
- URCs
- Business and agriculture
- Rural residential well owners
- Environmental uses

The Advisory Committee, at this time, does not include representation from:

- Tribes
- Federal government

The Advisory Committee will review its charter following GSP completion for additional members if identified as necessary by the Board. The Advisory Committee provides input and recommendations to the Board and uses consensus to make recommendations to the Board. The Advisory Committee was established by Board action and operates according to a Committee Charter which serve as the bylaws of the Advisory Committee. The Advisory Committee reviews and provides recommendations to the Board on groundwater-related issues that may include:

- Development, adoption, or amendment of the GSP
- Sustainability goals
- Monitoring programs
- Annual work plans and reports
- Modeling scenarios
- Inter-basin coordination activities
- Projects and management actions to achieve sustainability
- Community outreach
- Local regulations to implement SGMA
- Fee proposals
- General advisory

Subbasin planning committees were established in May 2020 by the Board of Directors to inform and guide planning for the 5 GSPs due in January 2022. Membership is 7-12 people per subbasin planning committee and all meetings are Brown Act meetings.

Together the Board, Advisory Committee, and subbasin planning committees are working to complete the 6 GSPs required within the SVBGSA jurisdiction. Subsequent to that SVBGSA, will complete a Salinas Valley Basin-wide Integrated Implementation Plan that will detail project portfolios and groundwater sustainability programs to meet SGMA compliance for subbasins by 2040 and maintain sustainability through 2050. Once all the GSPs are filed, the subbasin planning committees will transition to implementation committees.

The following graphic captures the phases of GSA development and GSP planning and implementation intended by the SVBGSA through 2050.

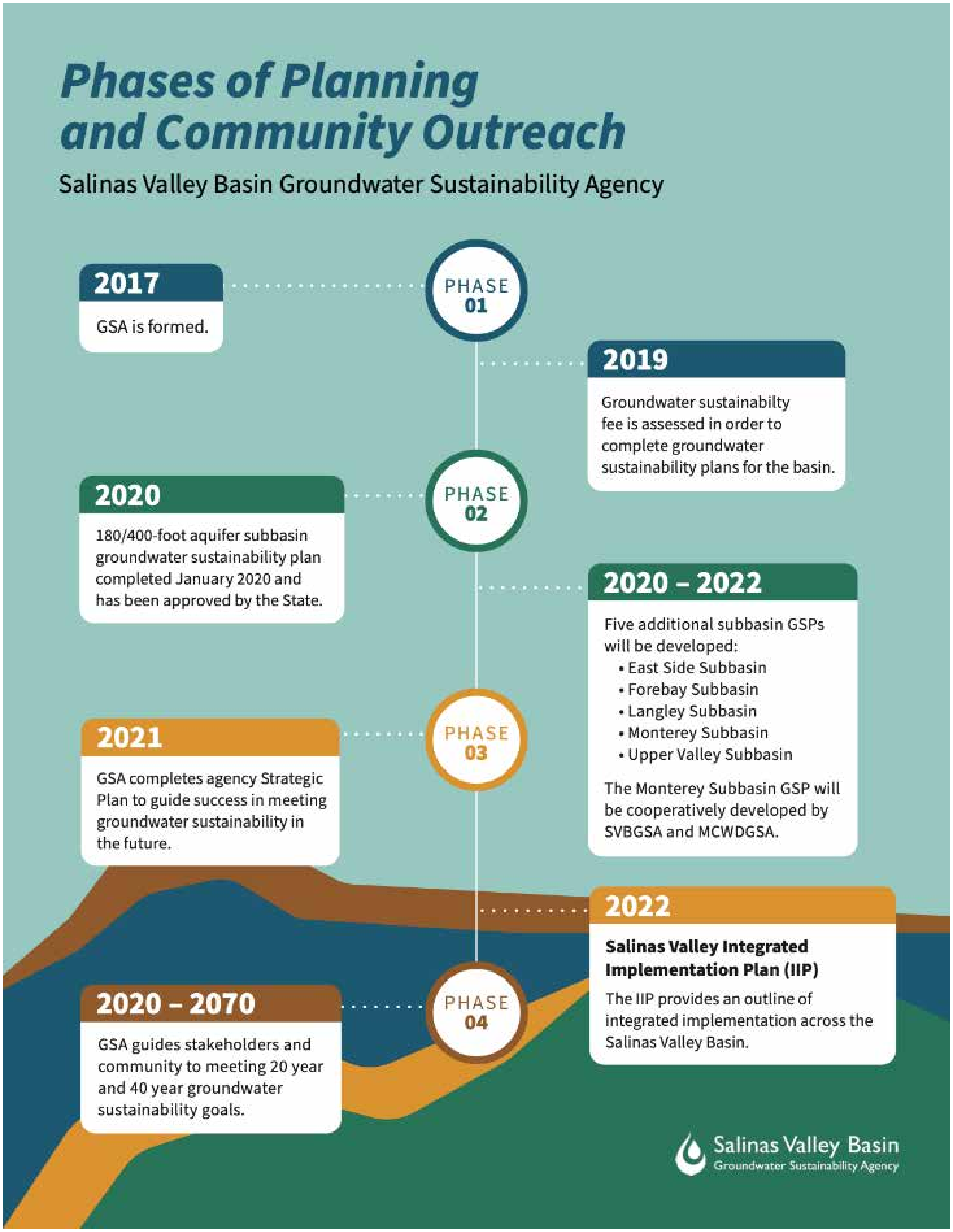


Figure 2-1. Phases of Planning and Community Outreach

2.4 Langley Subbasin GSP Preparation

Given the importance of the Basin and the development of the Langley GSP to the communities, residents, landowners, farmers, ranchers, businesses, and others, inclusive stakeholder input was a primary component of the Langley GSP process. In order to encourage ongoing stakeholder engagement SVBGSA deployed the following strategies in the preparation of the Langley Subbasin GSP:

- An inclusive outreach and education process conducted that best supports the success of a well-prepared GSP that meets SGMA requirements.
- Kept the public informed by distributing accurate, objective, and timely information.
- Invited input and feedback from the public at every step in the decision-making process.
- Established a Subbasin Planning Committee for the Subbasin and completed a comprehensive planning process with this Committee, including engagement on key items with the Board and Advisory Committee.
- Publicly noticed drafts of the Langley Subbasin GSP and allowed for required public comment periods as required by SGMA. Comments received and responses are included in Appendix 2A.

Additionally, a rigorous review process for each chapter in the Langley GSP and for the final plan was completed. This process ensured that stakeholders had multiple opportunities to review and comment on the development of the chapters. A graphical presentation of the planning process is presented below.

Figure 2-2. GSP Development Process

2.5 Langley Subbasin Planning Committee

Subbasin planning committees are comprised of local stakeholders and Board members and were appointed by the Board of Directors following a publicly noticed application process by the GSA. Subbasin planning committees were convened in June and July 2020. Subbasin planning committees do the comprehensive work of plan development, review, and recommendations, with assistance provided by SVBGSA staff and technical consultants.

These committees represent constituencies that are considered important stakeholders to developing comprehensive subbasin plans for the Salinas Valley or are not represented on the Board. A list of the Langley Subbasin Planning Committee is included in the Acknowledgements section of this GSP.

Subbasin planning committee meetings are subject to the Brown Act and noticed publicly on the SVBGSA website. Public comment is taken on all posted agenda items. Subbasin planning committees have been engaged in an iterative planning process that combines education of pertinent technical topics through presentations and data packets and receiving GSPs chapters for review and comment. A live GSP comment form is available on the SVBGSA website for ongoing comment submission on all GSP chapters. All GSP chapters were posted for public review and comment.

GSP chapters that have been taken to the Subbasin Planning Committee were also taken to the Advisory Committee for further review and comments. Community engagement and public transparency on SVBGSA decisions is paramount to building a sustainable and productive solution to groundwater sustainability in the Basin. At the conclusion of the planning process in August 2021 for the Langley GSP the SVBGSA will have held more than 32 planning meetings and technical workshops on each aspect of the Langley Subbasin GSP.

In addition to regularly scheduled committee meetings, a series of workshops were held for the Langley Subbasin Planning Committee as detailed below. These workshops are informational for committee members, stakeholders, and the general public and cover pertinent topics to be included in the GSPs. Workshops were timed to specific chapter development for the GSP. Subject matter experts were brought in as necessary to provide the best available information to Subbasin Planning Committee members.

Table 2-1. Subject Matter Workshops Held During GSP Preparation

Topic	Date
Brown Act and Conflict of Interest	July 22, 2020
Sustainable Management Criteria	July 28, 2020
Water Law	August 10, 2020
Salinas Valley Watershed Overview	August 26, 2020
Web Map Workshop	September 30, 2020
Town Hall – Domestic Wells & Drinking Water	October 28, 2020
Pumping Allocations	November 18, 2020
Funding Mechanisms	January 27, 2021
Water Budgets	February 24, 2021
Communications and Implementation	March 31, 2021
Technical Modeling Workshop – SVIHM & SVOM	June 30, 2021

2.6 Communication and Public Engagement Actions

SVBGSA is focused on communication and public engagement targeted at the public, including beneficial users, regarding the development of the SVBGSA's GSP for the Langley Subbasin. Communication and public engagement actions (CPE Actions) that have taken place during GSP development will continue during implementation of all SVBGSA GSPs. CPE Actions provide the SVBGSA Board and staff a guide to ensure consistent messaging about SVBGSA requirements and other related information. CPE Actions provide ways that beneficial users and other stakeholders can provide timely and meaningful input into the GSA decision-making process. CPE Actions also ensure beneficial users and other stakeholders in the Basin are informed of milestones and offered opportunities to participate in GSP implementation and plan updates. Appendix 2B includes the SVBGSA's marketing and communications plan.

Notice and communication, as required by GSP Regulation § 354.10, was focused on providing the following activities during the development of the Langley Subbasin GSP**:**

- Clear decision-making process on GSP approvals and outcomes
- Robust public engagement opportunities
- Encouragement of active involvement in GSP development

2.6.1 Goals for Communication and Public Engagement

Ultimately, the success of the Langley Subbasin GSP will be determined by the collective action of every groundwater user. In order to meet ongoing water supply needs, both for drinking water and for economic livelihoods, the Subbasin must achieve and maintain sustainability into the future. This outreach strategy engages the public early and frequently, and keeps the internal information flow seamless among staff, consultants, committee members and the SVBGSA

Board regarding the goals and objectives of the Langley Subbasin GSP and associated monitoring and implementation activities.

Critical to the success of the Langley GSP implementation will be public understanding of the projects and management actions planned for sustainability, as well as sustainability implementation actions and other groundwater management activities. These important actions are identified below (not in order of priority) and specifically described in Chapter 9 of the Langley GSP.

Decentralized Projects

- Decentralized Residential In-Lieu Recharge Projects
- Decentralized Stormwater Recharge
- Managed Aquifer Recharge (MAR) with Overland Flow
- Surface Water Diversion from Gabilan Creek

Demand Management

- Pumping Allocations and Control
- Fallowing, Fallow Bank, and Agricultural Land Retirement

Cross-Boundary Projects

- Floodplain Enhancement and Recharge
- Castroville Seawater Intrusion Project (CSIP) Expansion

Implementation Actions

- GEMS Expansion
- Well Registration
- Dry Well Notification System
- Water Quality Coordination Group
- Land Use Jurisdiction Coordination Program

Additional important actions of GSP implementation will be the production of the required Annual Report by April 1 each year for the Langley Subbasin. The Annual Report covers annual data collected each water year from October 1 through September 30. The Annual Report provides an annual benchmark for SVBGSA to provide to the public and stakeholders to assess progress towards sustainability. The Annual Report also includes assessment of the 6 SMC for the subbasin. The Annual Report provides an important opportunity to reengage the Langley Subbasin Committee in its review and to discuss sustainability status and goals.

CPE Actions provide outreach during the Subbasin planning efforts and assists SVBGSA in being receptive to stakeholder needs through communication tools. The CPE Actions also forecast how SVBGSA will communicate during GSP implementation.

The goals of the CPE Actions are:

1. To keep stakeholders informed through the distribution of accurate, objective, and timely information while adhering to SGMA requirements for engagement (noted above).
2. To articulate strategies and communications channels that will foster an open dialogue and increase stakeholder engagement during the planning process.
3. To invite input from the public at every step in the decision-making process and provide transparency in outcomes and recommendations.
4. To ensure that the Board, staff, consultants, and committee members have up-to-date information and understand their roles and responsibilities.
5. To engage the public on GSP Implementation progress especially for project and management actions and Annual Reports.

2.6.2 Communication and Outreach Objectives

The following are the communications and outreach objectives of the CPE Actions:

- Expand Audience Reach
    - Maintain a robust stakeholder list of interested individuals, groups and/or organizations.
    - Secure a balanced level of participants who represent the interests of beneficial uses and users of groundwater.
- Increase Engagement
    - Keep interested stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred method of communications.
    - Publish meeting agendas, minutes, and summaries on the SVBGSA website: www.svbgsa.org.
    - Inform and obtain comments from the general public through GSP online comment form and public meetings held on a monthly basis.

- Facilitate productive dialogues among participants throughout the GSP planning process.
- Seek the input of interest groups during the planning and implementation of the GSP and any future planning efforts.

- Increase GSP Awareness
  - Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the SVBGSA website for the GSP.
  - Secure quality media coverage that is accurate, complete, and fair.
  - Utilize social media to engage with and educate the general public.
- Track Efforts
  - Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities.

2.6.3 Target Audiences and Stakeholders

SVBGSA stakeholders consist of other agencies and interested parties including all beneficial users of groundwater or representatives of someone who is. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population.

There are a variety of audiences targeted within the Basin whose SGMA knowledge varies from high to little or none. Given this variance, SVBGSA efforts are broad and all-inclusive. Target audiences include:

- SVBGSA Board of Directors, Advisory Committee, and Subbasin Planning Committees
- SVBGSA Groundwater Sustainability Fee Payers
- Partner agencies including Monterey County Environmental Health Department, County of Monterey, MCWRA, and the Greater Monterey County Integrated Regional Water Management Group (RWMG)
- Municipal and public water service providers
- Private and local small or state small water system providers
- Local municipalities and communities
- Elected officials within the Basin

- Beneficial uses and users of groundwater including, agriculture, domestic wells and local small or state small water systems, and environmental uses such as wetlands
- Diverse social, cultural, and economic segments of the population within the Basin including URCs
- The general public

Stakeholder involvement and public outreach is critical to the GSP development because it helps promote the plan based on input and broad support. The following activities summarize involvement opportunities and outreach methods to inform target audiences and stakeholders. It is important to note that levels of interest will evolve and shift according to the GSP's implementation opportunities and priorities.

2.6.4 Stakeholder Database

A stakeholder database of persons and organizations of interest will be created and maintained. The database will include stakeholders that represent the region's broad interests, perspectives, and geography. It will be developed by leveraging existing stakeholder lists and databases and by conducting research of potential stakeholders that may be interested in one or all of the following categories: municipal users and groundwater users including agricultural, urban, industrial, commercial, institutional, rural, environmental, URCs, state lands and agencies, and integrated water management.

2.6.5 Key Messages and Talking Points

SVBGSA developed key messages focused on getting to know your GSA, an overview of groundwater sustainability planning for our community, and how we intend to continue outreach through implementation. These messages were guided by the underlying statements:

- The GSP process, both planning and implementation, is transparent and direct about how the GSP will impact groundwater users.
- SVBGSA represents the groundwater interests of all beneficial uses/users of the basin equitably and transparently to ensure that the basin achieves and maintains sustainable groundwater conditions.
- SVBGSA is committed to working with stakeholders using an open and transparent communication and engagement process.
- As the overall GSP will be more comprehensive with an engaged group of stakeholders providing useful information, SVBGSA will create as many opportunities as possible to educate stakeholders and obtain their feedback on the GSP implementation and plan updates.

These messages are being used as the basis for specific talking points/Q&A to support effective engagement with audiences. The SVBGSA Key Messages are also used to support communication with audiences (Appendix 2C).

2.6.6 Engagement Strategies

SVBGSA utilizes a variety of tactics to achieve broad, enduring, and productive involvement with stakeholders during the development and implementation of the GSPs. Below are activities that SVBGSA uses to engage the public currently and anticipated activities for GSP implementation:

- Develop and maintain a list of interested parties
- Offer public informational sessions and subject-matter workshops and provide online access via Facebook Live or via Zoom
- Basin tours (currently on hold due to COVID restrictions)
- SVBGSA Web Map
- Annual Report presentations
- FAQS – Offer FAQs on several topics including SGMA, SVBGSA, GSP, projects, Monitoring Program, Annual Report, Programs and Groundwater Sustainability Fee
- Science of Groundwater – new examples (studies, etc.)
- Board, Advisory Committee, and other Committee Meetings
    - Regular public notices and updates; Brown Act compliance
    - Develop talking points for various topics and evolve as necessary
- Subbasin Implementation Committees
    - Each subbasin's planning committee for GSP development will transition to a subbasin implementation committee to be convened for GSP updates and annual report reviews.
- Integrated Implementation Committee
    - The Integrated Implementation Committee will be convened to discuss Basin wide aspects to the 6 GSPs in the Basin including public outreach.
- Online communications
    - SVBGSA website: maintain with current information
    - SVBGSA Facebook page: maintain and grow social media presence
    - Direct email via Mailchimp newsletter

- Mailings to most-impacted water users and residents – topics to include: Annual Report dashboard, What does your GSA do with the Sustainability Fee?, newsletter that accompanies each tax bill.
- Media coverage. Appendix 2D includes SVBGSA's media policy.
    - Op-eds in the local newspapers
    - Press releases
    - Radio interviews
- Promote/Celebrate National Groundwater Week (held in December)
- Co-promotional opportunities and existing channels with agencies, committees, and organizations including email newsletters, social media, board meetings and mailings to customers.
- Talks and presentations to various stakeholder groups, associations, community organizations, and educational institutions.
- Educational materials

2.6.7 CPE Actions Timeline and Tactics

CPE Actions and GSP milestone requirements by phase include:

- Prior to initiating plan development: Share how interested parties may contact the GSA and participate in development and implementation of the plan submitted to DWR. (23 California Code of Regulations § 353.6)
- Prior to GSP development: Establish and maintain an interested persons list. (California Water Code § 10723.4)
- Prior to and with GSP submission:
    - Record statements of issues and interests of beneficial users of basin groundwater including types of parties representing the interests and consultation process
    - Lists of public meetings
    - Inventory of comments and summary of responses
    - Communication section in GSP (23 California Code of Regulations § 354.10) that includes: agency decision-making process, identification of public engagement opportunities and response process, description of process for inclusion, and method for public information related to progress in implementing the plan (status, projects, actions)
- Supporting tactics to be used to communicate messages and supporting resources

available through GSP development and GSP implementation:

- SVBGSA website, updated regularly to reflect meetings and workshop offerings
- Direct email via Mailchimp sent approximately monthly to announce board meetings, special workshop offerings and other opportunities for engagement
- Outreach to local media to secure coverage of announcements and events, radio interviews, op-ed placement
- Workshops, information sessions and other community meetings
- Social media, specifically Facebook, updated regularly to share information and support other outreach efforts

2.6.8 CPE Actions – Annual Evaluation and Assessment

The annual evaluation and assessment of CPE Actions will include:

- What worked well?
- What didn't go as planned?
- Are stakeholders educated about the GSP development process and their own role?
- Is the timeline for implementation of the GSP clear?
- Has the GSA received positive press coverage?
- Do diverse stakeholders feel included?
- Has there been behavior changes related to the program goals? Or improved trust/relationships among participants?
- Community meeting recaps and next steps
- Lessons learned
- Budget analysis

2.7 Underrepresented Communities and Disadvantaged Communities Strategic Engagement and Communications

During development of the 2022 GSPs SVBGSA conducted the scoping of an engagement strategy for URCs and DACs that would provide both an assessment of how URCs and DACs may be engaged with the GSA and to develop GSA materials that are accessible and culturally responsive (visual and in Spanish). These materials will communicate impacts of groundwater management on local water conditions in order to engage URCs and DACs into GSA plan reviews and develop pathways for future involvement.

2.7.1 Underrepresented Communities and Disadvantaged Communities in the Salinas Valley

In this GSP, URCs and DACs are considered communities that currently have little or no representation in water management, or who historically have had disproportionately less representation in public policy decision making. URCs and DACs are inclusive of Severely Disadvantaged Communities (SDACs), Economically Distressed Areas (EDAs) and other communities that are traditionally underrepresented.

The basin wide SVBGSA program area also has well documented DAC designation including 7 Census Designated Places, 60 Block Groups and 20 Tracts. Additionally, work conducted by the Greater Monterey County Integrated Regional Water Management Program (IRWMP) identified 25 small DACs, SDACs, and suspected DACs in unincorporated areas of Figure 2-3 shows where DACs, SDACs, and EDAs are located within the Salinas Valley Groundwater Basin, and Appendix 2E further describes DACs.

SVBGSA seeks to engage more constructively with URCs and DACs moving forward in subbasin planning processes and ultimately GSP implementation. In August 2019, SVBGSA hired the Consensus Building Institute (CBI) to conduct an assessment with URC and DAC community leaders via formal interviews. The purpose of the assessment was to capture insights and recommendations to inform an engagement strategy for URCs and DACs. CBI conducted 14 interviews and summarized findings from the assessment to identify initial strategic steps for work with URCs and DACs for GSP planning and implementation. Based on this work, an initial set of short and middle term actions to complete from January 2021-August 2021 was identified and work has begun on these items during the GSP development period and will be operational for implementation in Fall 2021 and are intended for focus during implementation of the GSP. The Board of Directors affirmed these short and middle term actions on February 11, 2021. Middle and long-term actions with URCs were identified for 2022. The *Spectrum of Community to Ownership* will be utilized as a guide in further shaping SVBGSA work with URCs and DACs communities in the Basin in consultation with community leaders.

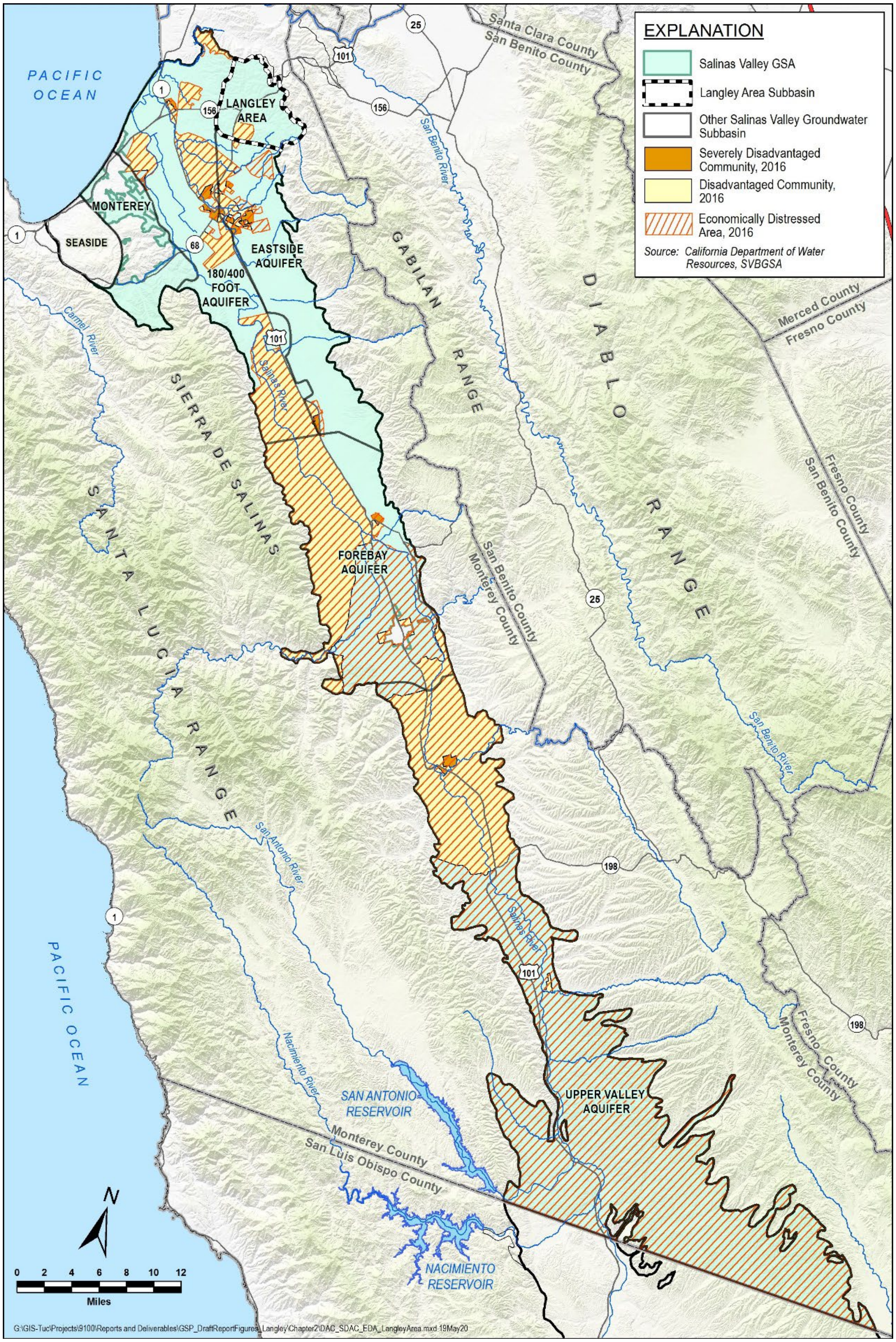


Figure 2-3. Disadvantaged Communities in the Salinas Valley Groundwater Basin

2.7.2 Additional activities scoped for engagement of Underrepresented Communities and Disadvantaged Communities

Additional activities scoped for engagement of URCs and DACs include:

- Conduct workshops with partners on importance of water and groundwater sustainability
- Identify URC and DAC concerns and needs for engagement
- Plan listening sessions around GSA milestones
- Coordinate with partner organizations to develop a “resource hub” where people can go for support
- Identify community allies in groundwater engagement work and bring down barriers for participation
- Consider particular URC and DAC impacts during routine GSA proceedings
- Convene a working group on domestic water, including URCs and DACs

3 DESCRIPTION OF PLAN AREA

This GSP covers the entire Langley Subbasin, as shown on Figure 3-1. The Langley Subbasin lies in the northeastern corner of Monterey County and the Salinas Valley Groundwater Basin. The Subbasin covers an area of approximately 17,600 acres, or 27.5 square miles (DWR, 2004). It is bounded by the Gabilan Range to the east, Pajaro Groundwater Basin to the north, the 180/400-Foot Aquifer Subbasin (DWR subbasin number 3-004.01) to the west, and the Eastside Aquifer Subbasin (DWR subbasin number 3-004.02) to the south. Although under MCWRA's jurisdiction, groundwater extraction monitoring in the Langley Subbasin falls mostly outside MCWRA's management subareas, aside from a small portion of the MCWRA's Eastside Subarea.

The Langley Subbasin has 2 named intermittent streams that drain from the western slopes of the Gabilan Range and flow across the Subbasin and into the Eastside Aquifer Subbasin. The Subbasin contains small communities, but no incorporated communities; Prunedale is the largest community in the Subbasin. Streams and major roads are shown on Figure 3-1.

This description of the plan area has been prepared in accordance with the GSP Regulations § 354.8. Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP through the development of the sustainability goal, SMC, and projects and management actions. This GSP has been developed to reflect the principles outlined in existing local plans, programs, and policies, and will build off them during GSP implementation.

3.1 Summary of Adjudicated and Jurisdictional Areas

3.1.1 Adjudicated Areas, Other GSAs, and Alternatives

The Langley Subbasin is not adjudicated. The only adjudicated area in the Salinas Valley Groundwater Basin is the Seaside Subbasin (DWR subbasin number 3-004.08), which is not adjacent to the Langley Subbasin.

No alternative plans have been submitted for any part of the Subbasin, or for any other Salinas Valley Groundwater Subbasins.

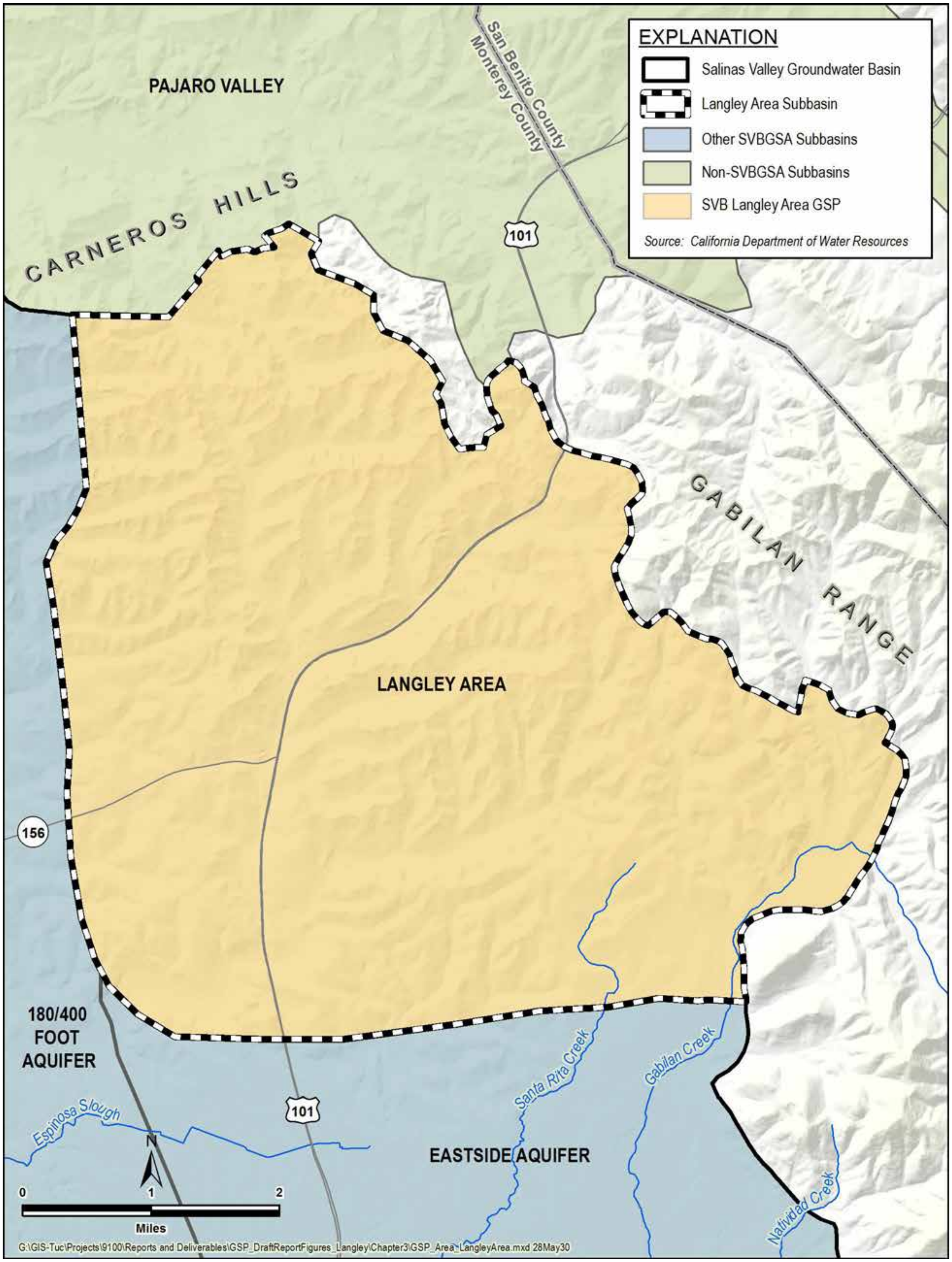


Figure 3-1. Langley Area Subbasin Area Covered by GSP

3.1.2 Jurisdictional Areas

3.1.2.1 Federal and State Jurisdictional Areas

Maps of federal and state jurisdictional areas are based on data from the U.S. Bureau of Land Management National Surface Management Agency National Geospatial Data Asset (BLM, 2020). There are no areas where federal or state agencies have jurisdiction over water management authority in the Subbasin. The Subbasin also does not contain any tribal lands (RWMG, 2018).

3.1.2.2 County Jurisdiction

The entire Subbasin is unincorporated and under the jurisdiction of the County of Monterey. Figure 3-2 shows 2 County conservation areas or parks within the Subbasin: Royal Oaks Park and Manzanita Regional Park (BLM, 2020).

MCWRA has broad water management authority in Monterey County, with its jurisdiction covering the entire Langley Subbasin, as shown on Figure 3-2. MCWRA manages, protects, stores, and conserves water resources in the Monterey County for beneficial and environmental use. Originally formed under a different name for flood control and management, it also has jurisdiction over water conservation, purveying water, and preventing extractions that are harmful to the groundwater basin. Key assessment zones for various projects and programs administered by MCWRA are shown in Figure 3-3. MCWRA is governed by a 9-member Board of Directors who are appointed by the 5-member MCWRA Board of Supervisors. The Board of Supervisors of the County is the *ex officio* Board of Supervisors of MCWRA (Monterey County Water Resources Agency Act, Sec. 15).

3.1.2.3 City and Local Jurisdiction

The jurisdictional boundaries of cities and local jurisdictions are shown on Figure 3-2(U.S. Census Bureau, 2018). Pajaro/Sunny Mesa Community Services District and Aromas Water District provide water to parts of the Subbasin.

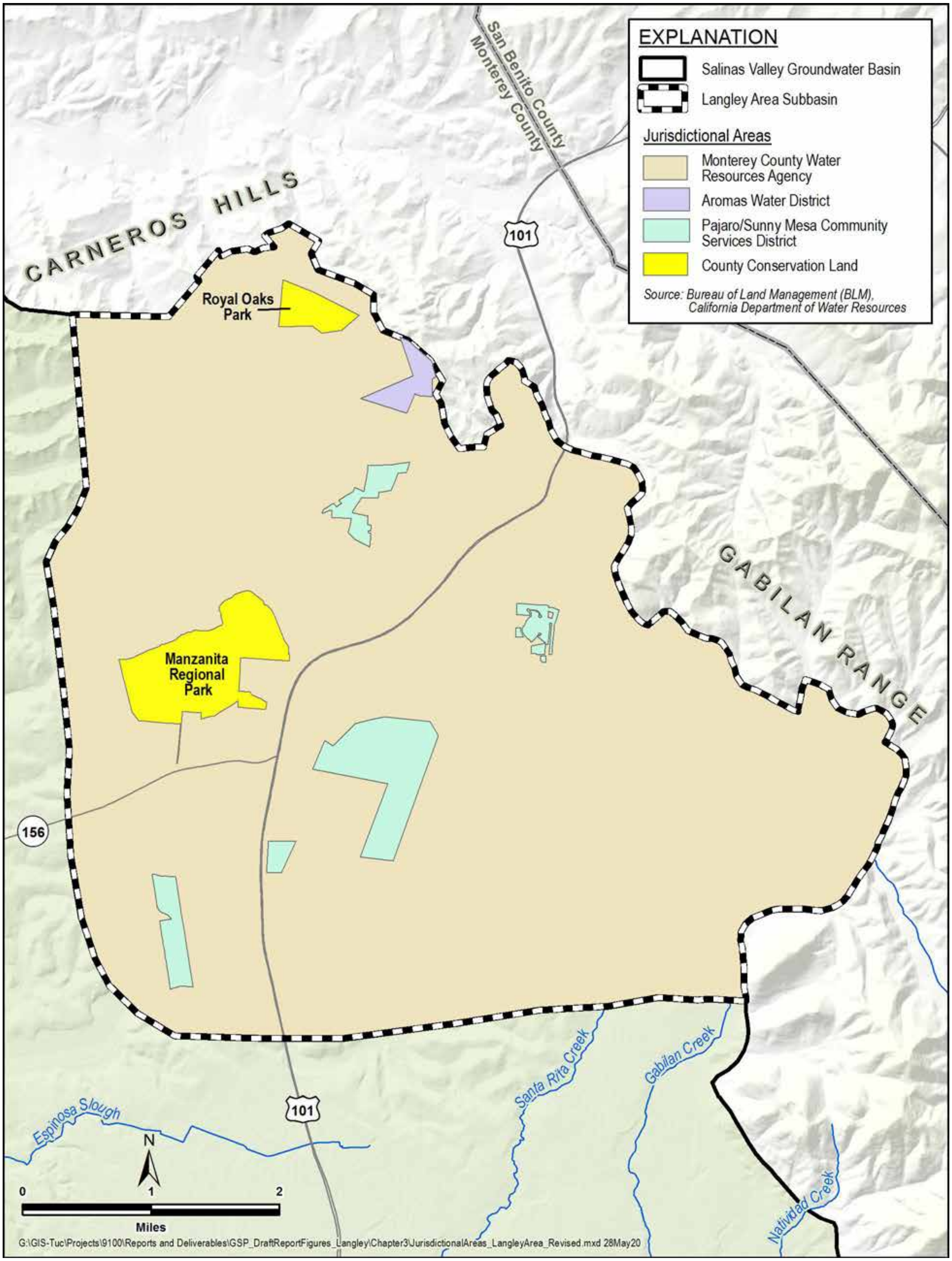


Figure 3-2. Federal, State, County, City, Local, and Water District Jurisdictional Areas

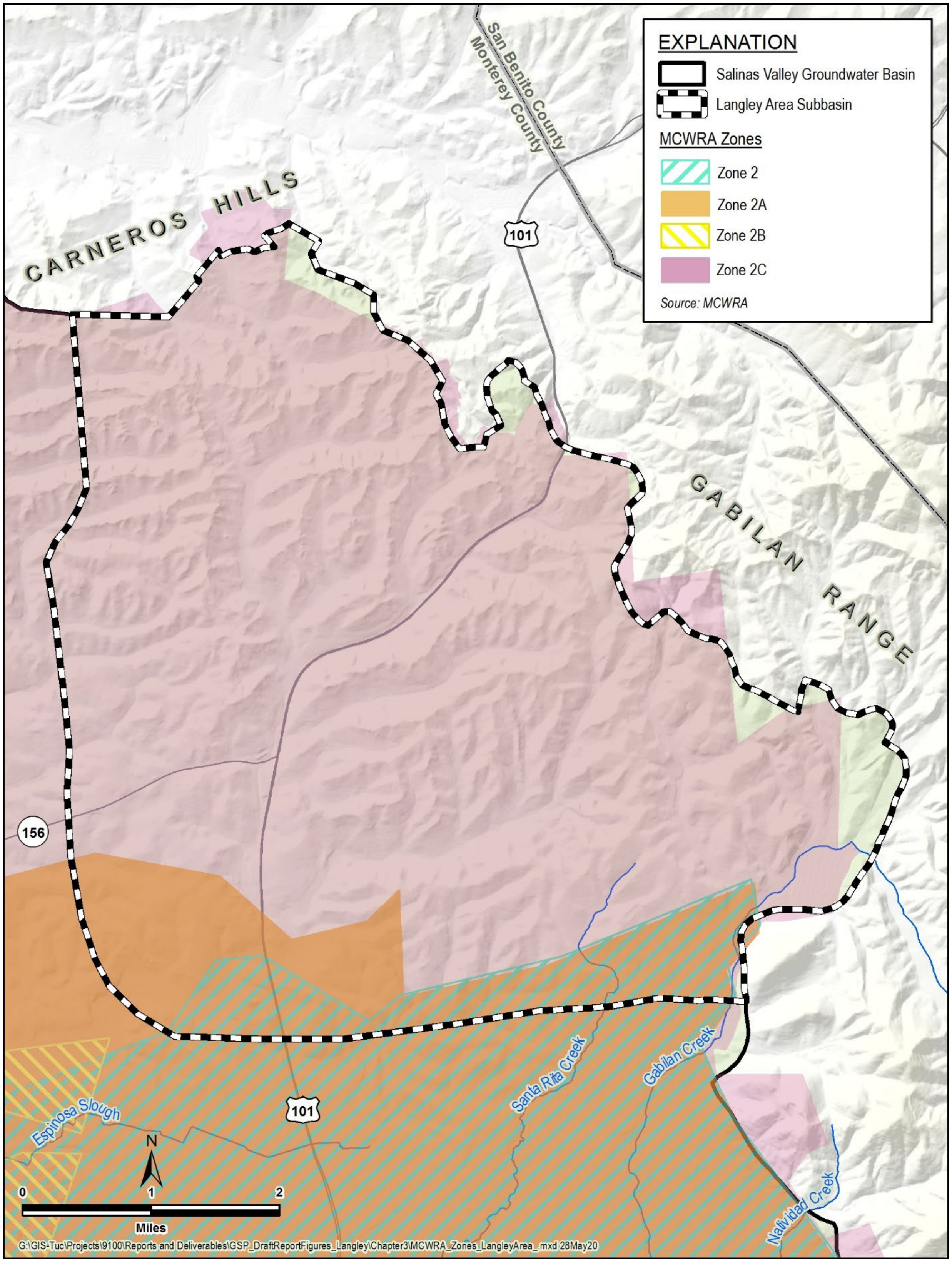


Figure 3-3. MCWRA Zones in the Langley Area Subbasin

3.2 Land Use

The Monterey County Assessor's office maintains a Geographic Information System (GIS) database of land use at the parcel level. Current (2019) land use categories in the Langley Subbasin are shown on Figure 3-4 and summarized by major category in Table 3-1. The difference between the land use area in Table 3-1 and the total Subbasin area of 17,600 acres is the result of 1) some parcels having null land use values and 2) small gaps between parcels that are not counted.

Table 3-1. Land Use Summary

Category	Area in Subbasin (acres)
Agriculture (Irrigated)	2,691
Agriculture (Dry)	2,576
Commercial	157
Industrial	35
Institutional	1,073
Miscellaneous	144
Multi-Family	165
Residential (Urban)	917
Rural	8,976
Not Classified	260
Total	**16,994**

Source: Monterey County Assessor's Office parcel data

Most of the Subbasin comprises undeveloped land and rural homes, although there is some agriculture, mainly in the south and southeast where the land is flatter.

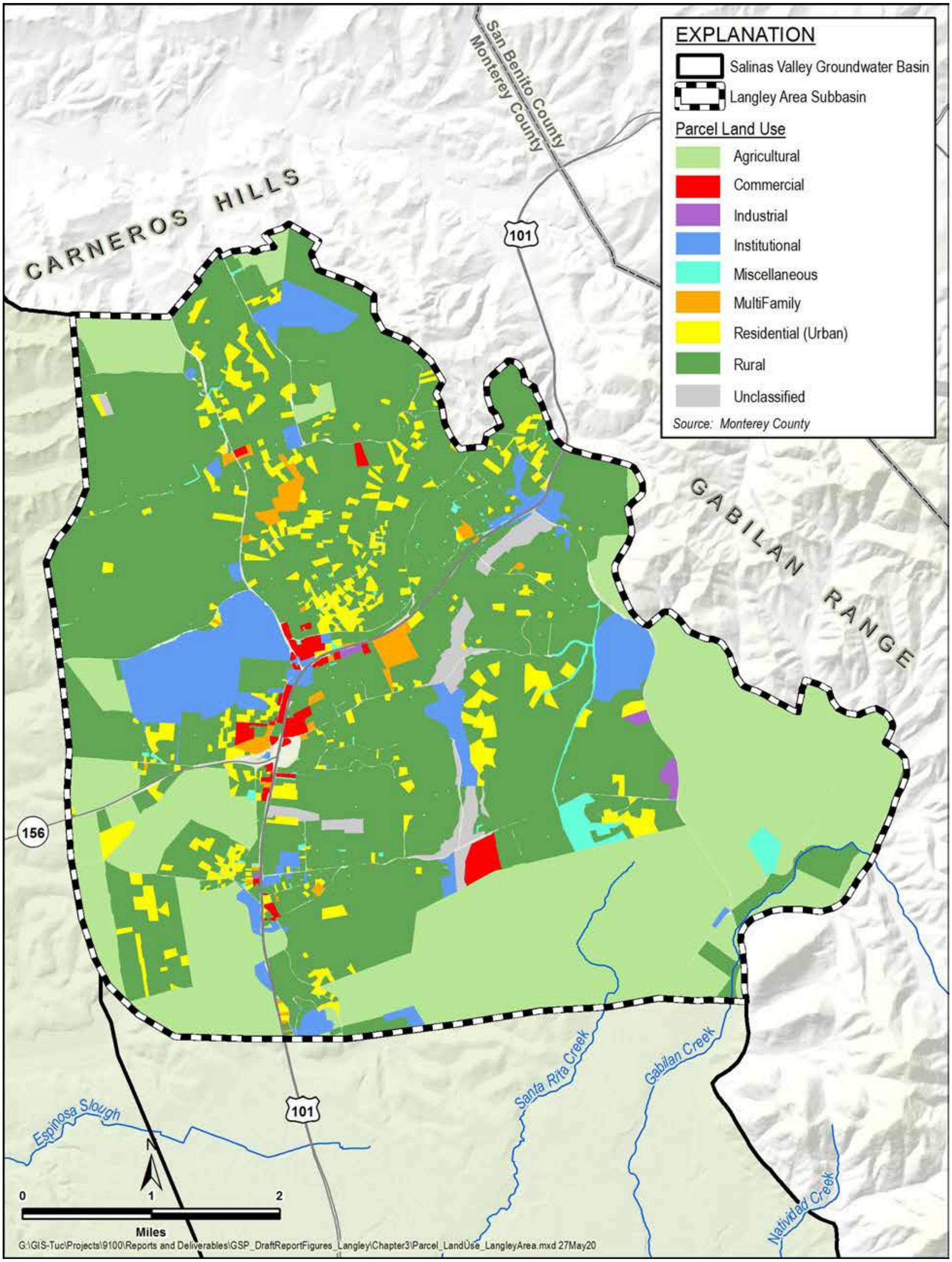


Figure 3-4. Existing Land Use

3.2.1 Water Source Types

No recycled water is used within the Subbasin. Surface water diversions within the Salinas River watershed are reported to the State Water Resources Control Board (SWRCB) under Electronic Water Rights Information Management System (eWRIMS). The locations of reported surface water diversions are shown on Figure 3-5. This figure does not show land that is dependent on the reported diversions, but rather infers areas through locations of diversion permits. Elsewhere in the Salinas Valley Groundwater Basin some surface water diversions are also reported as groundwater extractions, but there is no double counting of that kind in Langley Subbasin. Groundwater is the primary water source for all water use sectors in the Subbasin.

Communities that depend on groundwater are shown on Figure 3-6. The large public water systems shown on this figure are derived from data provided by Tracking California (Tracking California, 2020). These boundaries were confirmed by the large water systems in the Langley Subbasin. Monterey County provided the boundaries for the small public water systems and the local small or state small water systems shown on Figure 3-6. More information on these water systems can be found on SVBGSA's Web Map, accessible at: https://portal.elmontgomery.com. Groundwater is also used for rural residential areas, small community systems, and small commercial operations such as wineries and schools. The complete list of water systems and their number of connections, if available, are listed in Appendix 3A.

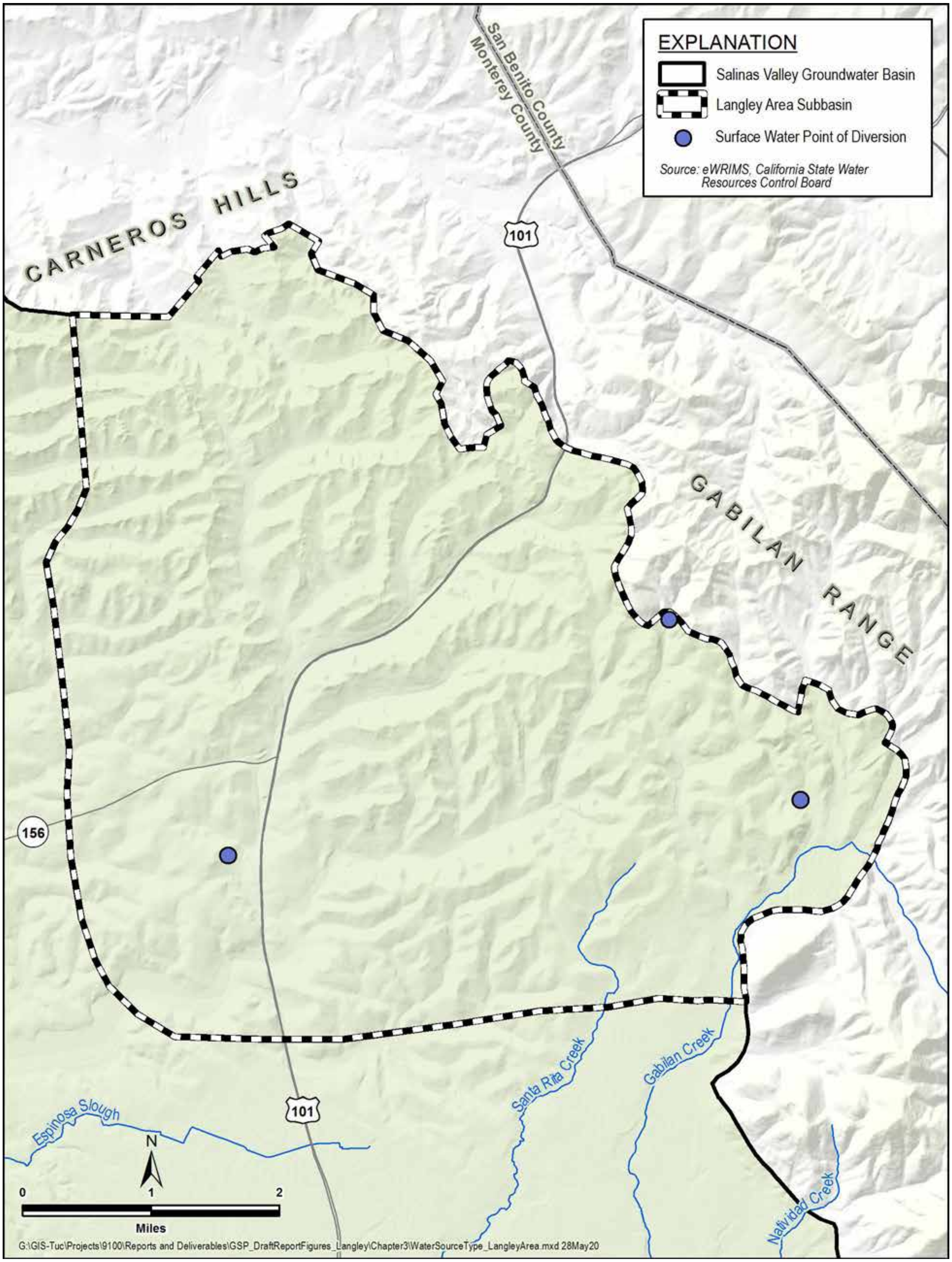


Figure 3-5. Salinas River Watershed Surface Water Points of Diversion in the Langley Area Subbasin

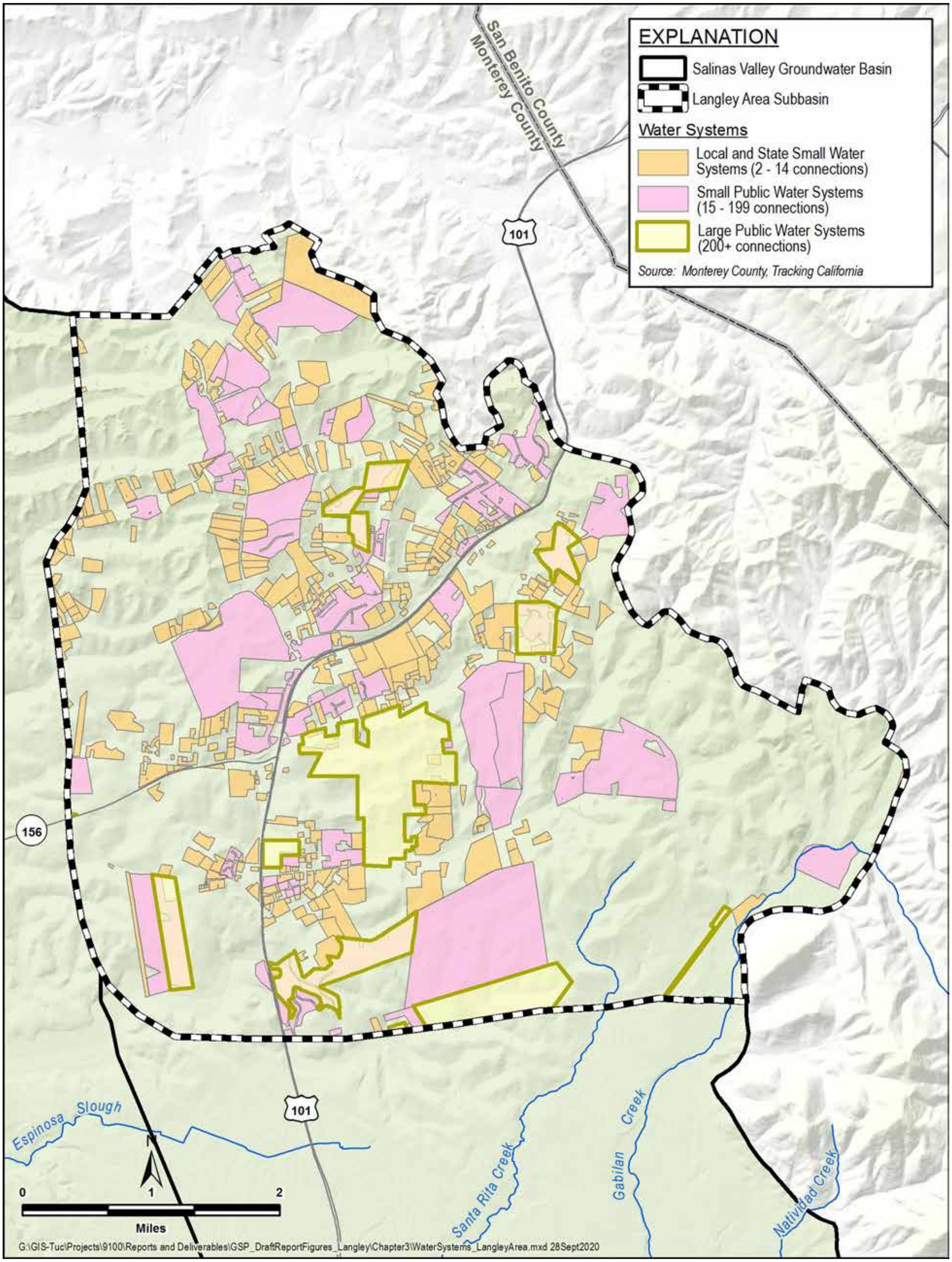


Figure 3-6. Communities Dependent on Groundwater

3.2.2 Water Use Sectors

Groundwater demands in the Subbasin are classified into the 6 water use sectors identified in the GSP Regulations. The water use sectors are shown on Figure 3-7. Groundwater demand categories include:

- **Urban**. Urban water use is assigned to non-agricultural water uses in the cities and census-designated places. Domestic use outside of census-designated places is not considered urban use.
- **Industrial**. There is limited industrial use in the Subbasin.
- **Agricultural**. Agricultural use is mainly limited to the southern edges of the Langley Subbasin.
- **Managed wetlands**. DWR land use records indicate that there are no managed wetlands in the Langley Subbasin.
- **Managed recharge**. There is no managed recharge in the Subbasin.
- **Native vegetation**. Groundwater use by native vegetation has not been estimated for this subbasin. Although not a native species, water use by *Arundo donax* is estimated at between 32,000 and 64,000 acre-feet per year (AF/yr.) in the entire Salinas Valley Groundwater Basin (Cal-IPC, 2011); an unknown quantity occurs within the Langley Subbasin.
- **Other**. This includes rural residential water use and any water use not captured in the other water use sectors.

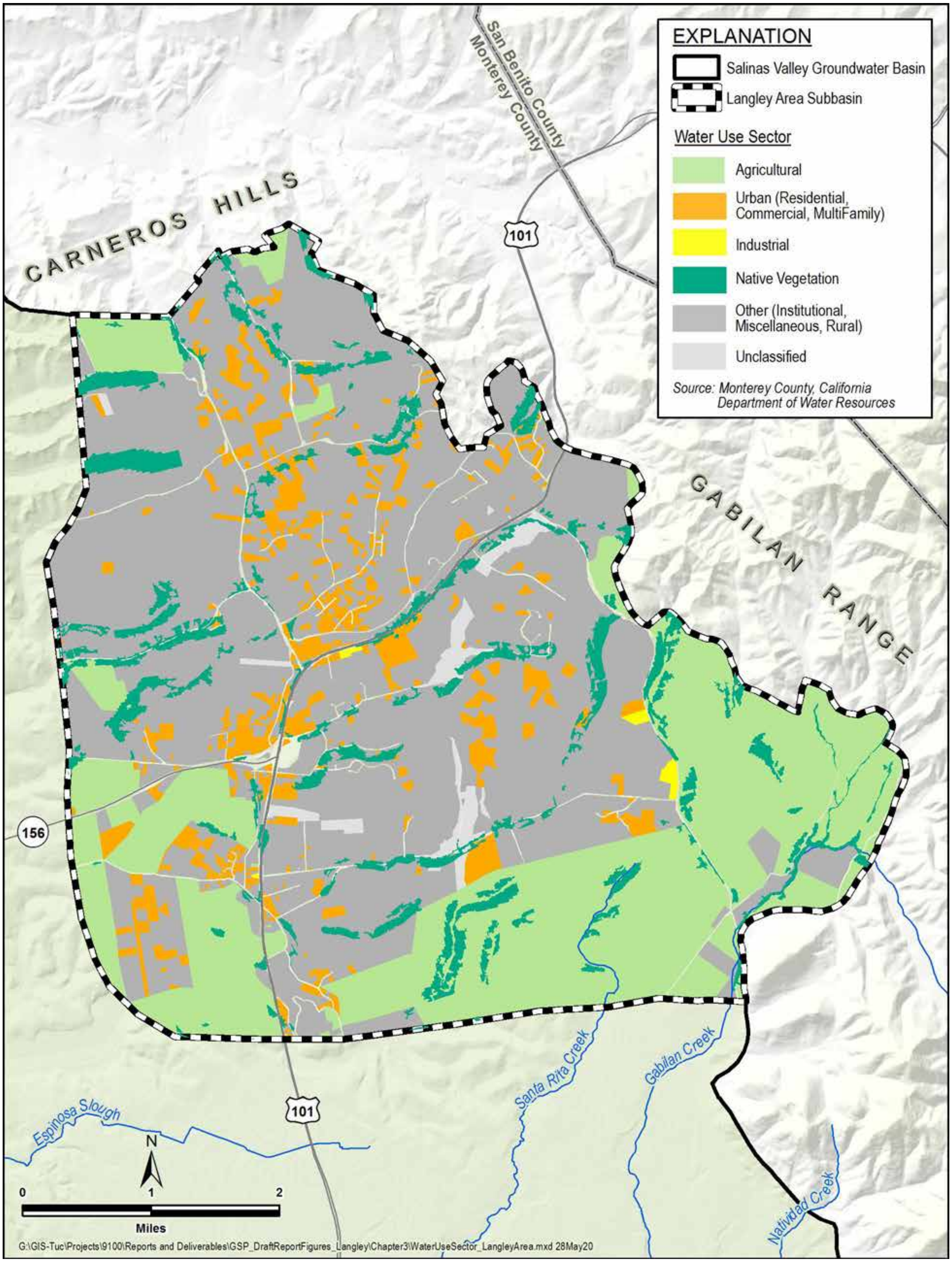


Figure 3-7. Map of Water Use Sectors

3.3 Existing Well Types, Numbers, and Density

Well density data were derived from DWR's Online System for Well Completion Report (OSWCR) Map Application (DWR, 2020a). Other data sources are available from MCWRA or other sources, and they may result in different well densities that are not reflected in DWR's OSWCR database. However, the DWR data were used for simplicity and consistency with other DWR data used in this GSP.

DWR's OSWCR Map Application classifies wells as domestic, production, and public supply; production wells include wells that are designated as irrigation, municipal, public, or industrial, and only exclude those designated as domestic. Less than 2% of wells in the Subbasin are classified as public supply wells, even though groundwater is the primary water source for urban and rural communities in the Subbasin. Domestic wells account for most of the remaining wells and have an average depth of approximately 307 feet. Some of the domestic wells identified by DWR may be classified as *de minimis* extractors, defined as pumping less than 2 AF/yr. for domestic purposes. Well counts in the Subbasin are summarized in Table 3-2, with public supply wells subtracted from the production category to avoid double counting. DWR provides well counts by Public Land Survey System sections; well counts for sections that are only partially in the Subbasin use the proportion of the section in the subbasin to proportion the well count. These well counts may not be reflective of active wells in the Subbasin, as some wells may have been abandoned or are inactive.

Figure 3-8, Figure 3-9, and Figure 3-10 show the density of domestic, production, and public supply wells, respectively, in the Subbasin, with the production wells being inclusive of the public supply wells.

Table 3-2. Well Count Summary

Category	Number of Wells
Domestic	916
Production	64
Public Supply	14
Total	1,008

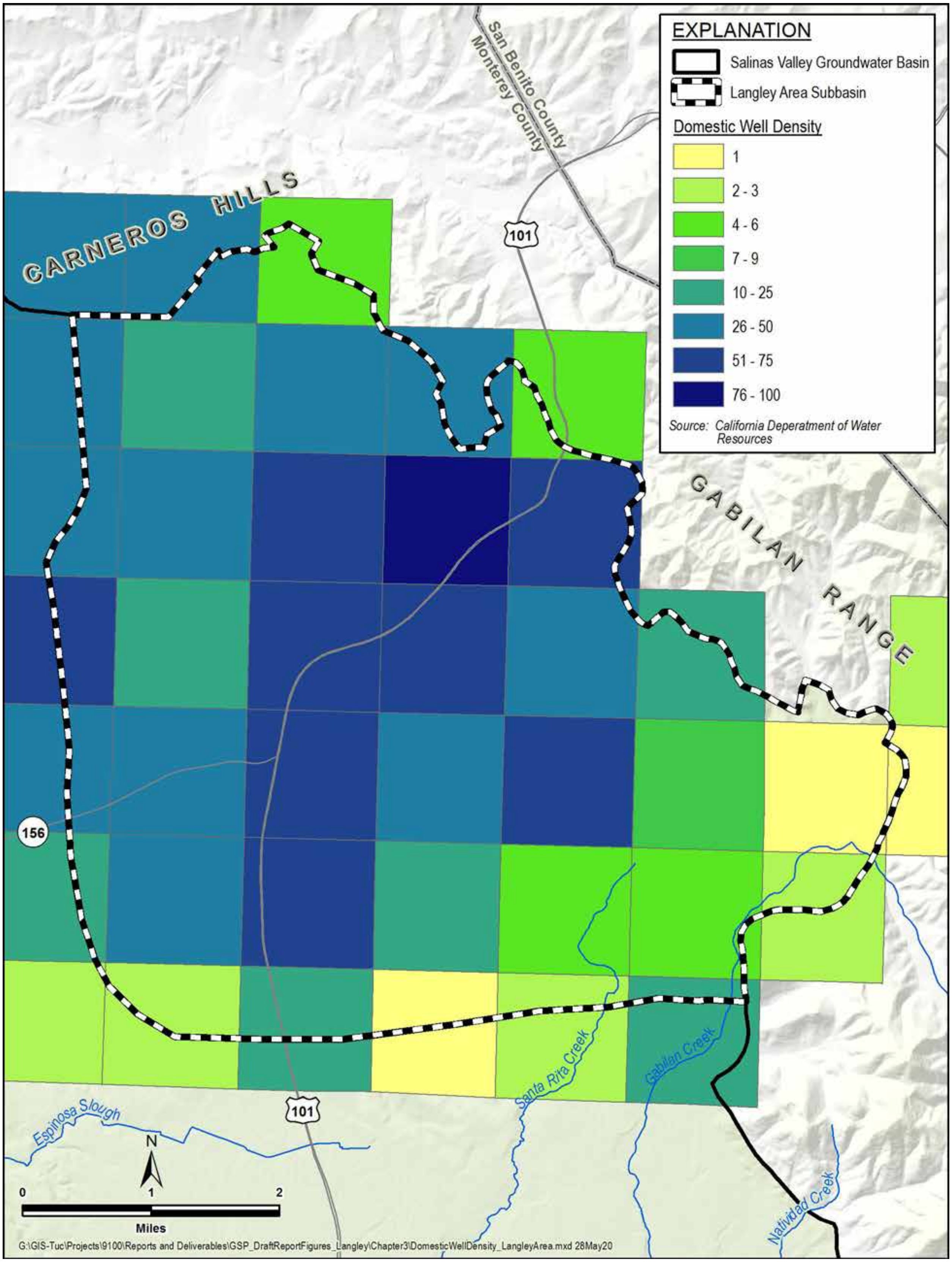


Figure 3-8. Density of Domestic Wells (Number of Wells per Square Mile)

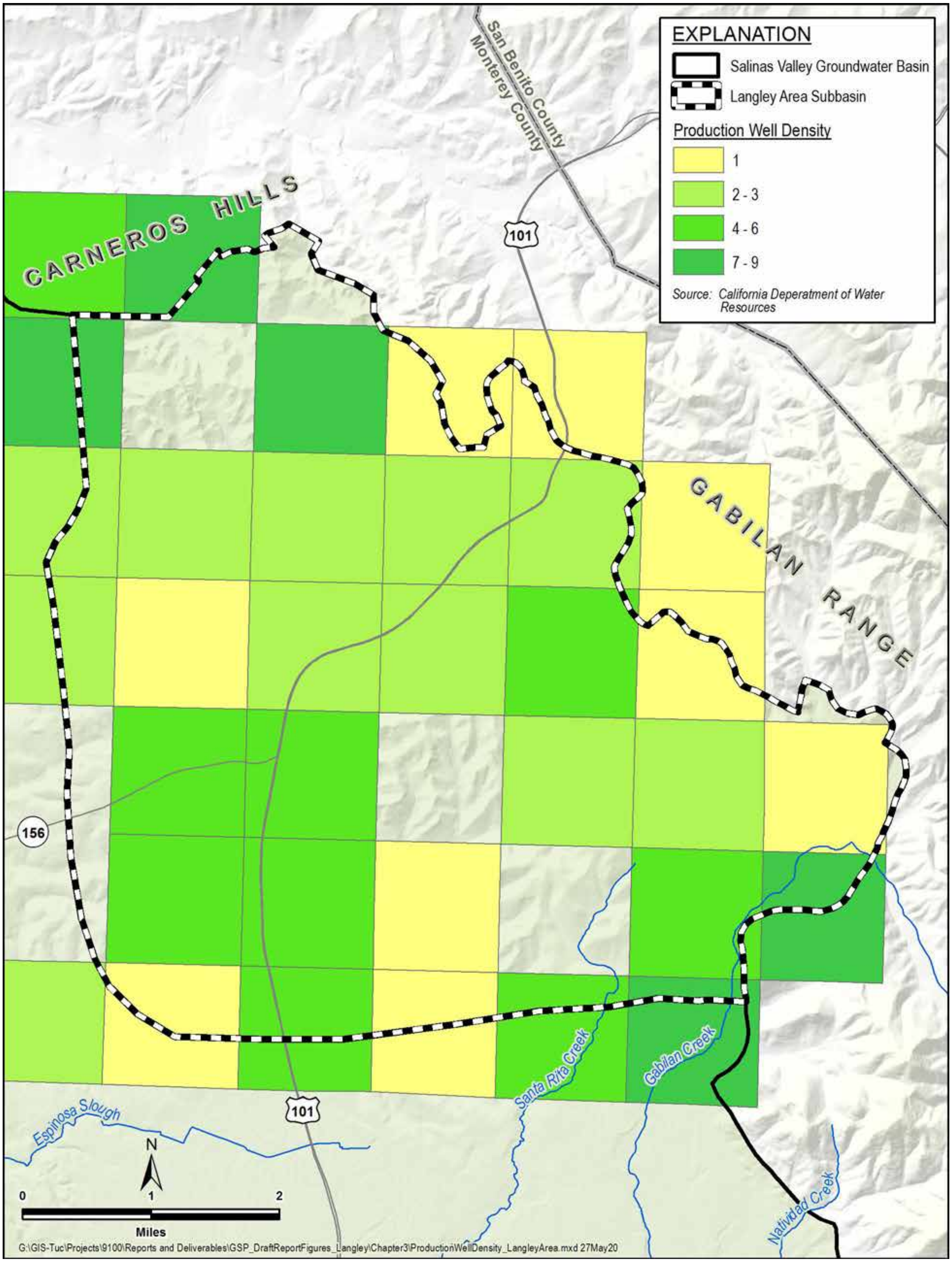


Figure 3-9. Density of Production Wells (Number of Wells per Square Mile)

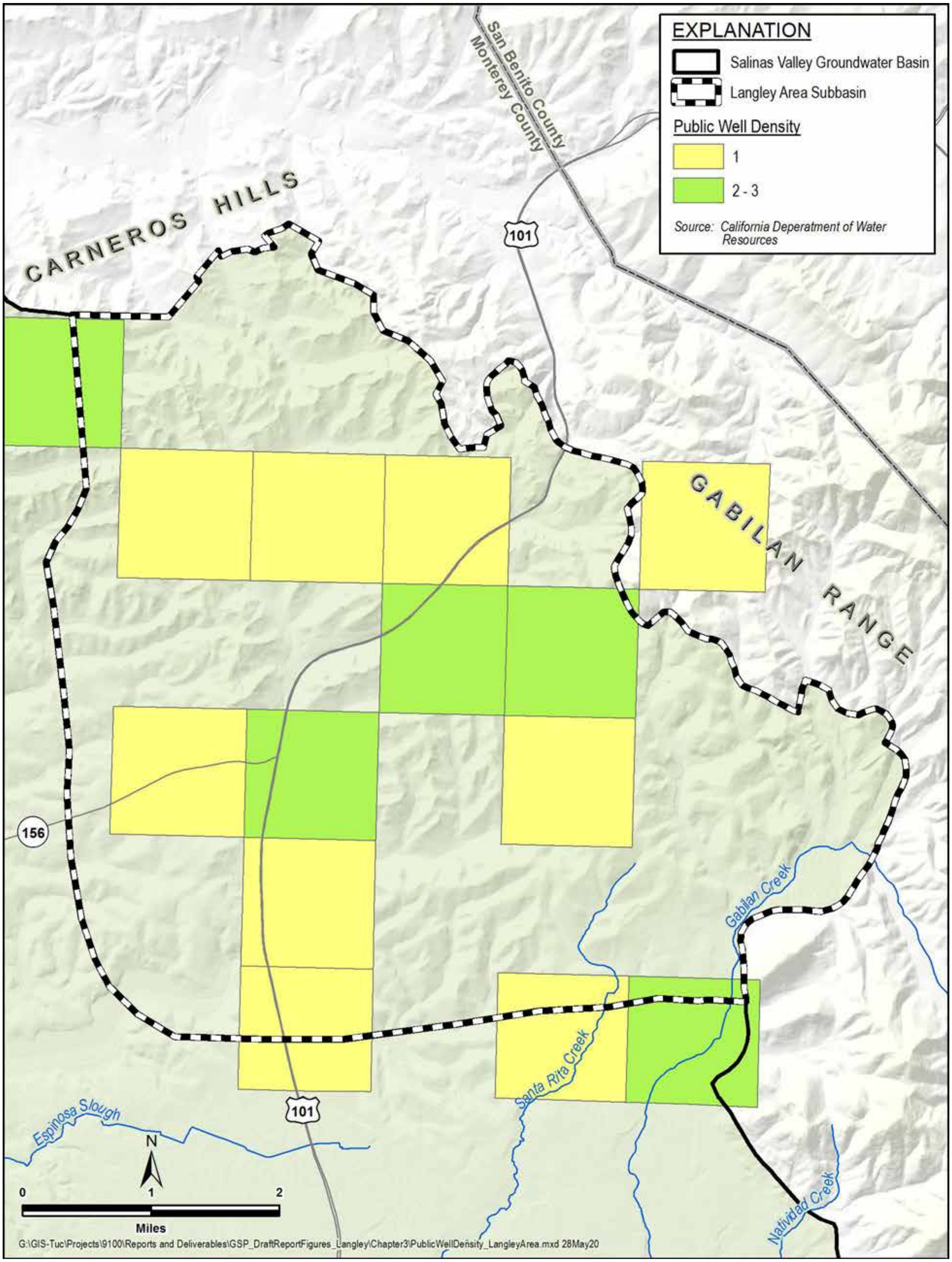


Figure 3-10. Density of Public Wells (Number of Wells per Square Mile)

3.4 Existing Monitoring Programs

3.4.1 Groundwater Elevation Monitoring

MCWRA operates existing groundwater elevation monitoring programs in the Salinas Valley Groundwater Basin, which are incorporated into the monitoring plan of this GSP as appropriate. MCWRA has annual fall, August, and monthly groundwater elevation monitoring programs, and is the responsible agency for the California Statewide Groundwater Elevation Monitoring (CASGEM) program in most areas of Monterey County. The existing groundwater elevation monitoring programs will be updated and improved to document the avoidance of undesirable results in the principal aquifer in the Subbasin.

MCWRA historically has monitored 3 wells within the Langley Subbasin as part of the CASGEM network. All 3 are privately owned domestic wells. MCWRA collects monthly groundwater elevation data from the CASGEM wells and reports the groundwater elevation data to DWR twice per year. The CASGEM wells have been migrated to the SGMA monitoring network and will be supplemented with 13 other wells that are already part of the MCWRA groundwater elevation monitoring networks. Groundwater elevation data from all wells in the monitoring network are publicly available. This network will be used for water elevation monitoring under this GSP, as described further in Chapter 7. It will be updated and improved as needed to monitor groundwater elevations for this Subbasin.

3.4.2 Groundwater Extraction Monitoring

Since 1993, MCWRA has collected groundwater extraction information from all wells within Zones 2, 2A, and 2B that have internal discharge pipes of 3 inches or greater in diameter. These 3 MCWRA zones only cover a small southern portion of the Langley Subbasin, leaving groundwater extraction in the rest of the Subbasin largely unreported, as shown in Figure 3-3. This is a data gap that will be addressed during GSP implementation. This network will be used for groundwater extraction monitoring under this GSP, as described in Chapter 7. SVBGSA will work with MCWRA to update and enhance the program to enable it to sufficiently monitor groundwater extractions for this Subbasin.

SWRCB Division of Drinking Water (DDW) collects annual pumping data from public drinking water systems located within the Subbasin, which include systems with over 15 connections. This data will be used to estimate municipal pumping in the areas of the Subbasin not covered by Zones 2, 2A, and 2B.

3.4.3 Groundwater Quality Monitoring

3.4.3.1 MCWRA Seawater Intrusion Monitoring

Seawater intrusion has been observed in 2 adjacent basins: the Pajaro Valley Basin and the 180/400-Foot Aquifer Subbasin. MCWRA monitors seawater intrusion with a network of 152 monitoring wells, most wells located within the 180/400-Foot Aquifer Subbasin. The seawater intrusion monitoring network comprises a combination of production wells and dedicated monitoring wells. The seawater intrusion front has not reached the Langley Subbasin and MCWRA does not currently monitor seawater intrusion in the Subbasin. However, seawater intrusion could reasonably threaten the Langley Subbasin in the future. Therefore, the existing seawater intrusion monitoring network in the 180/400-Foot Aquifer Subbasin will be examined periodically to assess the potential threat to the Langley Subbasin. This network will be used for seawater intrusion monitoring under this GSP, as described in Chapter 7.

3.4.3.2 Other Groundwater Quality Monitoring

Groundwater quality is monitored under several different programs and by different agencies including the following:

- Municipal and community water purveyors must collect water quality samples on a routine basis for compliance monitoring and reporting to the SWRCB DDW. These purveyors include municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year.
- Local small or state small water system wells are regulated by the Monterey County Department of Public Health. Local small water systems serve 2 to 4 service connections and state small water systems serve 5 to 14 connections.
- To fulfill the groundwater quality regulatory requirements of the Irrigated Lands Regulatory Program (ILRP), the Central Coast Regional Water Quality Control Board (CCRWQCB) requires monitoring of both on-farm domestic wells and agricultural wells for irrigation and livestock supply.
- In addition to the ILRP, the CCRWQCB conducts groundwater quality monitoring at multiple sites as part of investigation or compliance monitoring programs. These sites are discussed further in Chapter 5.

For this GSP, groundwater quality data will be downloaded and reviewed from SWRCB's DDW for municipal public water system supply wells and the ILRP irrigation supply wells and on-farm domestic wells monitored under the CCRWQCB's Agricultural Order, as described in Section 3.6.2.

3.4.4 Surface Water Monitoring

The U.S. Geological Survey (USGS) does not operate any streamflow gauges within the Langley Subbasin.

The SWRCB eWRIMS is used to collect surface water rights data in the Salinas River watershed for the points of diversion in the Subbasin that are shown on Figure 3-5. This includes monthly surface water diversions from the Salinas River and its tributaries.

3.5 Existing Water Management Plans

3.5.1 Monterey County Groundwater Management Plan

MCWRA developed a Groundwater Management Plan (GMP) that is compliant with AB3030 and SB1938 legislation (MCWRA, 2006). This GMP exclusively covered the Salinas Valley Groundwater Basin in Monterey County. This GSP replaces the GMP.

The GMP identified 3 objectives for groundwater management:

Objective 1: Development of Integrated Water Supplies to Meet Existing and Projected Water Requirements

Objective 2: Determination of Sustainable Yield and Avoidance of Overdraft

Objective 3: Preservation of Groundwater Quality for Beneficial Use

To meet these 3 objectives, the GMP identified 14 elements that should be implemented by MCWRA:

Plan Element 1: Monitoring of Groundwater Elevations, Quality, Production, and Subsidence

Plan Element 2: Monitoring of Surface Water Storage, Flow, and Quality

Plan Element 3: Determination of Basin Yield and Avoidance of Overdraft

Plan Element 4: Development of Regular and Dry Year Water Supply

Plan Element 5: Continuation of Conjunctive Use Operations

Plan Element 6: Short-Term and Long-Term Water Quality Management

Plan Element 7: Continued Integration of Recycled Water

Plan Element 8: Identification and Mitigation of Groundwater Contamination

Plan Element 9: Identification and Management of Recharge Areas and Wellhead Protection Areas

Plan Element 10: Identification of Well Construction, Abandonment, and Destruction Policies

Plan Element 11: Continuation of Local, State, and Federal Agency Relationships

Plan Element 12: Continuation of Public Education and Water Conservation Programs

Plan Element 13: Groundwater Management Reports

Plan Element 14: Provisions to Update the GMP

3.5.2 Integrated Regional Water Management Plan

The Integrated Regional Water Management (IRWM) Plan for the Greater Monterey County Region was developed by the Greater Monterey County Regional Water Management Group (RWMG), which consists of government agencies, nonprofit organizations, educational organizations, water service districts, private water companies, and organizations representing agricultural, environmental, and community interests.

The Langley Subbasin falls within the IRWM Plan area. The IRWM Plan consists of a set of goals and objectives that were identified by the RWMG as being critical to address water resource issues within the planning area in the areas of:

- Water Supply
- Water Quality
- Flood Protection and Floodplain Management
- Environment
- Regional Communication and Cooperation
- DACs
- Climate Change

The IRWM Plan includes more than 25 projects that could assist regional groundwater management (RWMG, 2018).

3.6 Existing Water Regulatory Programs

3.6.1 Groundwater Export Prohibition

The MCWRA Act, § 52.21 prohibits the export of groundwater for uses outside the Salinas Valley Groundwater Basin from any part of the Basin, including the Langley Subbasin. In particular, the Act states:

> *For the purpose of preserving [the balance between extraction and recharge], no groundwater from that basin may be exported for any use outside the basin, except that use of water from the basin on any part of Fort Ord shall not be deemed such an export. If any export of water from the basin is attempted, the Agency may obtain from the superior court, and the court shall grant, injunctive relief prohibiting that exportation of groundwater.*

3.6.2 Agricultural Order

In 2021 the CCRWQCB issued Agricultural Order No. R3-2021-0040, the Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands (CCRWQCB, 2021). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve receiving water quality. Specific requirements for individual growers are structured into 3 phases based on the relative risk their operations pose to water quality. Each of the 3 phases encompass a different area of the Central Coast Basin. Monitoring results from this new Agricultural Order (Ag Order 4.0) will be incorporated into this GSP's groundwater quality network.

3.6.3 Water Quality Control Plan for the Central Coast Basins

The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) was most recently updated in June 2019 (CCRWQCB, 2019). The objective of the Basin Plan is to outline how the quality of the surface water and groundwater in the Central Coast Region should be managed to provide the highest water quality reasonably possible. Water quality objectives for both groundwater and surface water are provided in the Basin Plan.

The Basin Plan lists beneficial users, describes the water quality that must be maintained to allow those uses, provides an implementation plan, details SWRCB and CCRWQCB plans and policies to protect water quality, and describes statewide and regional surveillance and monitoring programs. Present and potential future beneficial uses for waters in the Basin are municipal supply; agricultural supply; groundwater recharge; recreation; sport fishing; warm freshwater habitat; wildlife habitat; rare, threatened or endangered species habitat; and spawning, reproduction, and/or early development of fish.

3.6.4 Title 22 Drinking Water Program

The SWRCB DDW regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Private domestic wells, wells associated with drinking water systems with fewer than 15 residential service connections, industrial, and irrigation wells are not regulated by the DDW.

The DDW enforces the monitoring requirements established in Title 22 of the California Code of Regulations for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

3.7 County Public Policy of Safe and Clean Water

To recognize the Human Right to Water, in December 2018 the County of Monterey established a public policy that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes and that the human right to water extends to all residents of Monterey County, including disadvantaged individuals and groups and communities in rural and urban areas. The County intended for the policy to inform the County when implementing policies and regulations affecting water supply and usage and to help the County to focus on the issue of drinking water pollution in certain Monterey County domestic wells and water systems as well as potential future threats due to drought and a lack of available drinking water, while not impacting water rights or expanding or creating new County obligations.

3.8 Incorporating Existing Programs into the GSP and Limits on Operational Flexibility

Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP. They are taken into consideration during the preparation of the sustainability goal, when establishing SMC, and when developing projects and management actions. This GSP has been developed to reflect the principles outlined in those existing local plans and builds off existing plans during GSP implementation. Some of the existing management plans and ordinances may limit operational flexibility. These potential limits to operational flexibility have already been incorporated into the projects and management actions included in this GSP. Examples of limits on operational flexibility include:

- The groundwater export prohibition included in the MCWRA Act prevents export of water out of the Salinas Valley Groundwater Basin. This prohibition is not expected to adversely affect SVBGSA's ability to reach sustainability.
- The Basin Plan and the Title 22 Drinking Water Program restrict the quality of water that can be recharged into the Subbasin.
- The Habitat Conservation Plan (HCP) being developed by MCWRA on the Salinas River will limit operational flexibility for Nacimiento and San Antonio reservoir releases for groundwater recharge in the Basin.

The other monitoring, management, and regulatory programs do not limit the operational flexibility in this Subbasin.

3.9 Conjunctive Use Programs

There are currently no conjunctive use programs in the Subbasin.

3.10 Land Use Plans

3.10.1 Land Use Plans in the Subbasin

Land use is an important factor in water management. Monterey County has developed a general plan that guides land use in the Subbasin. General descriptions of this land use plan and how implementation may affect groundwater management in the Subbasin are included in Appendix 3B.

3.10.2 Land Use Plans Outside of Basin

Monterey County's General Plan is applicable throughout the unincorporated area of the County, including the adjoining 180/400-Foot Aquifer Subbasin and the Eastside Aquifer Subbasin. The Cities of Salinas, Marina, and Gonzales have general plans with land use elements in the neighboring 180/400-Foot Aquifer and Eastside Aquifer Subbasins. Because Salinas and Gonzales are members of the SVBGSA, management actions taken by the SVBGSA or the SVBGSA has a cooperation agreement with their water district, will be in alignment with the concerns and plans of the County and those cities. Therefore, it is unlikely that these land use plans will affect the ability of the SVBGSA to achieve sustainable groundwater management.

3.10.3 Well Permitting

The Public Service element of the Monterey County General Plan addresses permitting of individual wells in rural or suburban areas. Table 3-3 summarizes the Monterey County General Plan's water supply guidelines for the creation of new residential or commercial lots (Monterey

County, 2010, Table PS-1). Table 3-4 depicts the decision matrix from the Monterey County General Plan for permitting new residential or commercial wells for existing lots (Monterey County, 2010, Table PS-2).

On August 29, 2018, the State Third Appellate District Court of Appeal published an opinion in *Environmental Law Foundation v. State Water Resources Control Board* (No. C083239), a case that has the potential to impact future permitting of wells near navigable surface waters to which they may be hydrologically connected. The Court of Appeal found that while groundwater itself is not protected by the public trust doctrine, the doctrine does protect navigable waters from harm caused by extraction of groundwater if it adversely affects public trust uses. Further, it found that Siskiyou County, as a subdivision of the State, shares responsibility for administering the public trust. Similarly, Monterey County is responsible for well permitting. Therefore, it has a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting wells near areas where groundwater may be interconnected with navigable surface waters.

Moreover, California Supreme Court's decision in *Protecting Our Water and Environmental Resources v. County of Stanislaus* (2020) held that Stanislaus County could not categorically classify its issuance of groundwater well construction permits as ministerial decisions exempt from environmental review under the California Environmental Quality Act (CEQA). Chapter 15.08 of the Monterey County Code sets forth the application and decision-making process for the County in considering applications for well construction permits. The Chapter sets forth certain technical requirements that appear to be purely ministerial in their application; however, the Chapter also gives the Health Officer discretion to impose unspecified conditions on a permit, grant variances, and deny an application if in his/her judgment it would defeat the purposes of the Chapter. The Monterey County Code has not yet been amended, so permits are currently issued according to Chapter 15.08 and the 2010 General Plan, as applicable. The Monterey County Health Department, Environmental Health Bureau issues well permits and receives input from the County of Monterey Housing and Community Development to determine what, if any, level of CEQA review is necessary.

Table 3-3. Monterey County Water Supply Guidelines for the Creation of New Residential or Commercial Lots

Major Land Groups	Water Well Guidelines
Public Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Agriculture Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Centers	Public System; Individual Wells Allowed in limited situations
Community Areas	Public System

Table 3-4. Monterey County Well Permitting Guidelines for Existing Residential and Commercial Lots

Characteristics of Property	Water Connection Existing or Available from the Water System	Not Within a Water System or a Water Connection Unavailable
Greater than or equal to 2.5 acres connected to a Public Sewage System or an on-site wastewater treatment system	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to a Public Sewage System	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to an on-site wastewater treatment system	Do not Process Water Well Permit	Process Water Well Permit

3.10.4 Effects of Land Use Plan Implementation on Water Demand

The GSA does not have authority over land use planning. However, the GSA will coordinate with the County on general plans and land use planning/zoning as needed when implementing the GSP.

A lawsuit filed against the County of Monterey's 2010 General Plan led to a settlement agreement that could affect water supplies. The settlement agreement requires the County of Monterey to develop a study of the Salinas Valley Groundwater Basin within Zone 2C which largely overlaps the Basin and includes, among other items:

- An assessment of whether the total water demand for all uses designated in the General Plan for the year 2030 are likely to be reached or exceeded
- An evaluation and conclusions regarding future expected trends in groundwater elevations
- An evaluation and conclusions regarding expected future trends in seawater intrusion

Should the study conclude the following, then the study shall make recommendations on how to address these conditions:

- Total water demand for all uses is likely to be exceeded by 2030, or
- Groundwater elevations are likely to decline by 2030, or
- The seawater intrusion boundary is likely to advance inland by 2030

The outcomes from this study may affect the GSP implementation. However, the GSP will consider multiple approaches to keep extraction within the sustainable yield through the measures laid out in Chapter 9. The study and GSP implementation are 2 parallel efforts, and the results of the County's study will be reviewed when finalized and considered during GSP implementation. SGMA may preempt implementation of the County's study if it were to conflict with the purposes of SGMA and the efforts of the SVBGSA to attain sustainability in the Basin.

Monterey County has chosen to retain the USGS to develop the Salinas Valley Integrated Hydrologic Model (SVIHM), which will be used during implementation of this GSP. The USGS is currently planning to publicly release it in 2022.

3.10.5 Effects of GSP Implementation on Water Supply Assumptions

Implementation of this GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon. This GSP includes sufficient projects and management actions to keep extraction within the sustainable yield, should they need to be implemented. Changes in the cost of groundwater may affect whether surface water or groundwater is used. Land use changes may occur as a result of these activities and based on financial decisions by individual growers. However, there is no direct impact from the GSP implementation on land use management.

4 HYDROGEOLOGIC CONCEPTUAL MODEL

The hydrogeologic conceptual model (HCM) characterizes the geologic and hydrologic framework of the Subbasin in accordance with the GSP Regulations § 354.14. It is based on best available data, technical studies, and qualified maps that characterize the physical components and surface water/groundwater interaction in the Subbasin. This HCM provides comprehensive written descriptions and illustrated representations of subsurface conditions. The chapter describes the Subbasin characteristics and processes which govern the flow of water across the Subbasin boundaries, and outlines the general groundwater setting that may be encountered in the subsurface environment. Current and historical groundwater conditions are discussed in greater detail in the subsequent chapter. This current HCM in this GSP will be part of an iterative process where current conditions and data gaps are described, investigated, and then updated accordingly.

4.1 Subbasin Setting and Topography

The Langley Subbasin is an approximately 24-square-mile long hilly area at the northern end of the Salinas Valley. The Subbasin is roughly triangular, with a few stream drainages dissecting lower elevations of the Carneros Hills and the Gabilan Range (Figure 4-1).

The colored bands on Figure 4-1 show the topography of the Subbasin, derived from the USGS Digital Elevation Model (DEM). The Subbasin slopes at an average grade of approximately 125 feet/mile, generally from the northeast to the southwest towards the Salinas River. Land surface elevations in the Subbasin range from approximately 600 feet along its border with the Gabilan Range to approximately 100 feet where it meets the 180/400-Foot and Eastside Aquifer Subbasins.

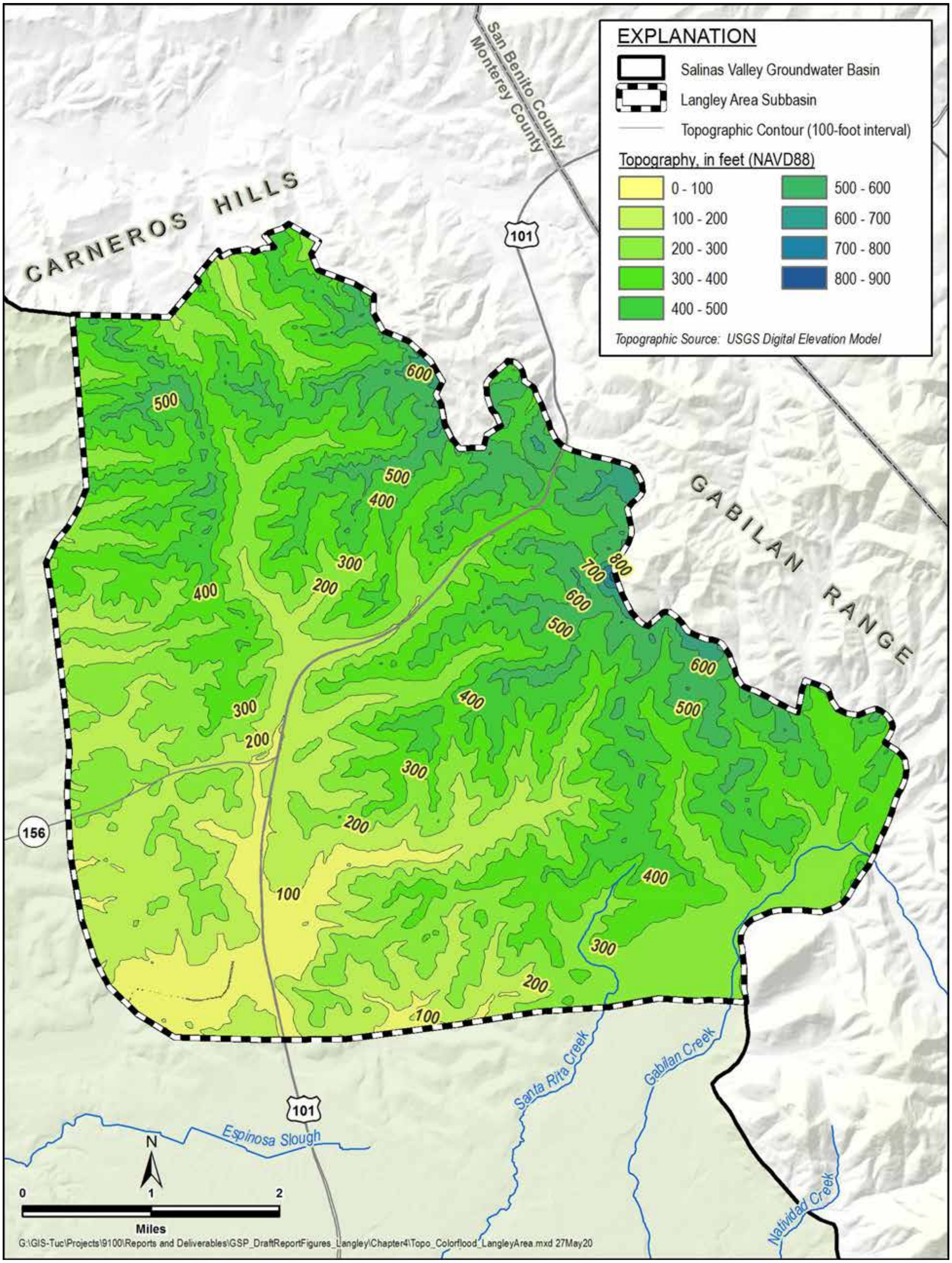


Figure 4-1. Langley Area Subbasin Topography

4.2 Subbasin Geology

The subbasin geology describes the physical framework in which groundwater occurs and moves. The geology of the Subbasin controls the locations and depths of the aquifer and aquitards, as well as the subbasin boundaries. The geologic descriptions provided here are derived from previously published scientific reports, and from investigations conducted by the USGS, State of California, and academic institutions.

The Subbasin was formed through periods of structural deformation and periods of marine and terrestrial sedimentation in a tectonically active area on the eastern edge of the Pacific Plate. Figure 4-2 presents a geologic map of the Subbasin and vicinity. This geologic map was adopted from the 2001 Digital Geologic Map of Monterey County as well as the California Geologic Survey's 2010 statewide geologic map (Rosenberg, 2001; Jennings, *et al.*, 2010). The locations of cross sections used to define the principal aquifer in Section 4.4 are also shown on Figure 4-2. The legend on Figure 4-2 presents the age sequence of the geologic materials from the youngest unconsolidated Quaternary sediments to the oldest pre-Cambrian basement rock.

The geology of the Langley Subbasin is dominated by alluvial fans and sedimentary deposits that form low hills. Surface-water drainages originating in the Gabilan Range deposited a series of small, interconnected alluvial fans that extend from the Gabilan Range in the northeast to the fluvial deposits that define the 180/400-Foot Aquifer Subbasin in the southwest.

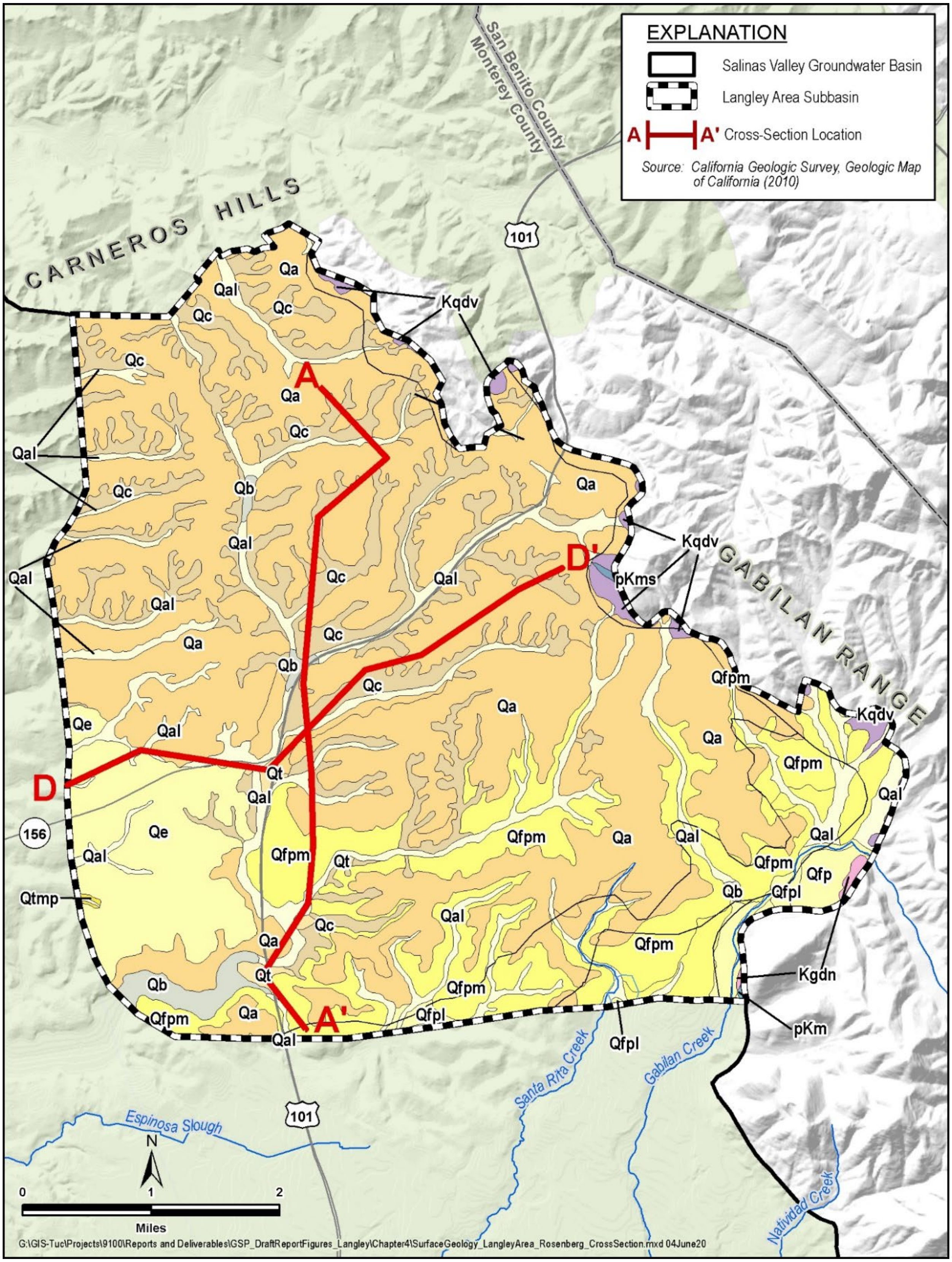


Figure 4-2. Subbasin Geology
(from Rosenberg, 2001; Jennings, *et al*., 2010)

FIGURE 4-2. EXPLANATION

QUATERNARY

Qa	Aromas Sand, undifferentiated
Qal	Alluvial deposits, undifferentiated
Qb	Basin deposits
Qc	Colluvium
Qe	Eolian deposits
Qfp	Flood-plain deposits, undifferentiated?
Qfpl	Alluvial fans, late Pleistocene
Qfpm	Alluvial fans, middle Pleistocene
Qls	Landslide deposits
Qt	Fluvial terrace deposits, undifferentiated
Qtmp	Fluvial terrace deposits, middle Pleistocene

PRE-CRETACEOUS

pKms	Mica schist (Gabilan Range)
pKm	Marble

CRETACEOUS

Kqdv	Quartz Diorite of Vergeles
Kgdn	Granodiorite of Natividad

GEOLOGIC FEATURES

——— fault, certain

4.2.1 Geologic Formations

Major geologic units present in the Langley Subbasin are described below, starting at the surface and moving through the geologic layers from youngest to oldest. Geologic descriptions are derived from a combination of sources (Jennings, *et al.*, 2010; Clark, *et al.*, 2000; Johnson, *et al.*, 1988; DWR, 2004). The corresponding designations on Figure 4-2 are provided in parentheses.

Quaternary Deposits

- *Alluvium in streambeds and small drainages (*Qal, Qb, and Qfp*)* – Streambeds and other drainages are filled with loose, moderately sorted silt and sand with lenses of clay and some areas of gravel (Qal). Clays mixed with silt, sand, and organic material have collected at the bottoms of past and present basins (Qb). A floodplain deposit in the southeast corner of the Subbasin contains loose sand and silt where Gabilan Creek has overflowed its banks (Qfp).
- *Aromas Red Sands and similar (*Qa, Qe, and Qc*)* – The Aromas Red Sands Formation is comprised of lower fluvial sand units and upper aeolian sand units locally separated by interbedded clays and silty clays (DWR, 2004). This complex aggregation of materials has been deposited in varied, localized environments which makes it difficult to correlate significant stratigraphies over distance (Fugro West, Inc., 1995). The Aromas Red Sands include partly consolidated, moderately to poorly sorted, silty clay, sand, and gravel (Qa). Sand matching that of the Aromas Red Sands is also found in windblown deposits (Qe). Some sources refer to the windblown deposits as the Upper Aromas Red Sands.
- *Alluvial fans (*Qfpl and Qfpm*)* – Alluvial fans are sediments deposited in a distributary manner at the base of mountain fronts where streams emerge (Kennedy/Jenks, 2004). Alluvial Fans can be found on either side of drainages in the southern Subbasin. They consist of moderately to poorly sorted sand, silt, and gravel. Middle Pleistocene alluvial fans (Qfpm) tend to be weakly consolidated, whereas late Pleistocene alluvial fans (Qfpl) can be moderately consolidated.
- *Terrace deposits (*Qt and Qtmp*)* – Terrace deposits are the remains of ancient floodplains. The terrace deposits in the southern Subbasin are partially consolidated and consist mostly of sand mixed with silt and gravel. Some are known to be from the middle Pleistocene (Qtmp). Others are of indeterminate age (Qt).

Quaternary-Tertiary Deposits

- *Paso Robles Formation* – Although not shown on Figure 4-2, the Paso Robles Formation underlies the Aromas Red Sands in parts of the Subbasin (DWR, 2004). This Pliocene to lower Pleistocene (1.6 million to 5 million years ago) unit is composed of lenticular beds of sand, gravel, silt, and clay from terrestrial deposition (Thorup, 1976, Durbin et. al., 1978). The depositional environment is largely fluvial but also includes alluvial fan, lake, and floodplain deposition (Durbin, 1974; Harding ESE, 2001; Thorup, 1976; Greene, 1970). The alternating beds of fine and coarse materials typically have bed thicknesses of 20 to 60 feet (Durbin et. al., 1978).

- *Purisima Formation (P)* – Also not shown on Figure 4-2, The Purisima Formation underlies the Aromas Red Sands in parts of the Subbasin (DWR, 2004). This Pliocene unit consists of intercalated siltstone, sandstone, conglomerate (Greene, 1977), clay and shale (Harding ESE, 2001) deposited in a shallow marine environment.

Older Igneous and Metamorphic Rocks

Cretaceous quartz diorite (Kqdv) and granodiorite (Kgdn) form the eastern boundary of the Subbasin. This bedrock angles downward to the northwest, where it underlies the sedimentary deposits above. On the eastern boundary, there is at least one outcropping of pre-Cretaceous mica schist (pKms).

4.2.2 Restrictions to Flow

There are no known structural features, such as geologic folds or faults, that restrict groundwater flow within the Langley Subbasin. However, there are depositional features that have the potential to restrict groundwater flow. There are clay layers between the upper and lower Aromas Red Sands that form confining beds in some places. These barriers to flow appear to be localized. A report by Fugro West, Inc. (1995) acknowledges the clay, but states that there are no major aquitards in the Subbasin.

4.2.3 Soils

The soils of the Subbasin are derived from the underlying geologic formations and influenced by the historical and current patterns of climate and hydrology. Soil types can influence groundwater recharge and the placement of recharge projects. The arable soils of the Subbasin historically are classified into 4 groups (Carpenter and Cosby 1925): residual soils, old valley-filling soils, young valley-filling soils, and recent-alluvial soils.

More recent surveys classify the soils into categories based on detailed soil taxonomy (U.S. Department of Agriculture, 2018). Figure 4-3 is a composite soil map of soils in the Subbasin from the USDA Natural Resources Conservation Service (NRCS) and the Gridded Soil Survey Geographic (gSSURGO) Database that is produced by the National Cooperative Soil Survey (NCSS).

The Subbasin is dominated by 3 major soil orders: entisols, mollisols, and alfisols. Minor soils include vertisols, histosols, and isceptisols. The 3 major soil orders are described below.

- **Entisols** are the predominant soil order in this Subbasin. Entisols are mineral soils without distinct soil horizons because they have not been in place long enough for distinct horizons to develop. These soils are often found in areas of recent deposition such as active flood plains, river basins, and areas prone to landslides.

- **Mollisols** are the second most found soil order in this Subbasin. This soil is more prevalent proximal to the boundary with the Eastside Subbasin and the 180/400-Foot Subbasin. Mollisols are characterized by a dark surface horizon, indicative of high organic content. The organic content often originates from roots of surficial grasses or similar vegetation. They are highly fertile and often alkaline rich (calcium and magnesium). Mollisols can have any moisture regime, but enough available moisture to support perennial grasses is typical.
- **Alfisols** are present along portions of the Subbasin close to the boundary with the Eastside Subbasin. Alfisols are known to have natural fertility both from the tapering of clay in the subsurface horizons and from leaf litter when under forested conditions. This order of soils is commonly associated with high base minerals such as calcium, magnesium, sodium, and potassium.

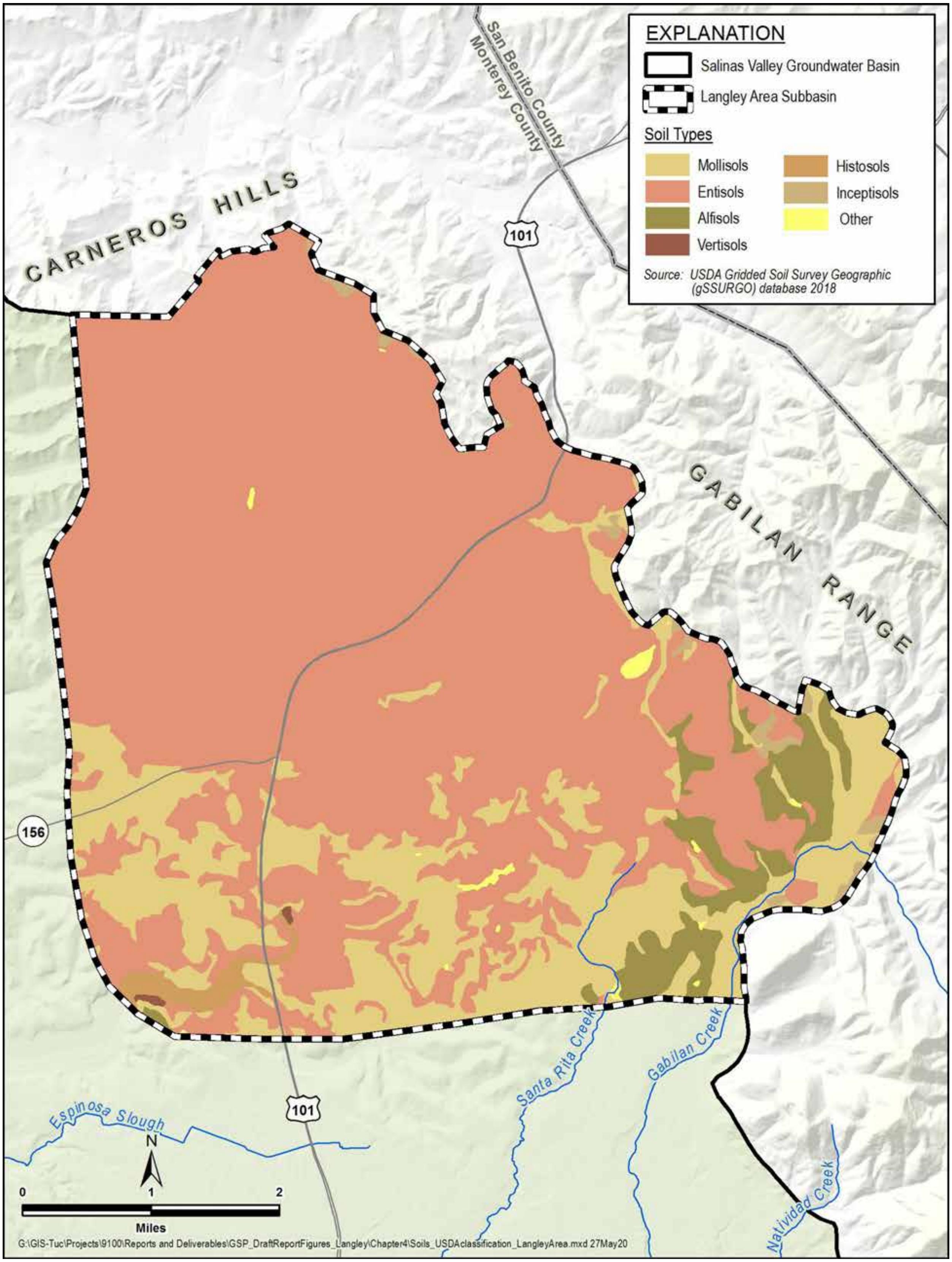


Figure 4-3. Composite Soils Map

4.3 Subbasin Extent

The subbasin extents describe both the lateral and vertical extents of the Subbasin. The Subbasin extents are defined by the DWR and are documented in Bulletin 118, (DWR, 2003; DWR, 2016a). Figure 3-1 illustrates the extent of the Subbasin.

4.3.1 Lateral Subbasin Boundaries

The Langley Subbasin is laterally bounded by a combination of subbasin boundaries and physical boundaries of the Salinas Valley Groundwater Basin, all shown on Figure 1-1.

4.3.1.1 Boundaries with Adjacent Subbasins

The Langley Subbasin is bound by the following subbasins:

- **180/400-Foot Aquifer Subbasin.** The western boundary with the adjacent 180/400-Foot Aquifer Subbasin generally coincides with the 200-foot land surface elevation contour. Although the Langley Subbasin is not on the valley floor, there are no reported hydraulic barriers separating these 2 subbasins; therefore, this GSP needs to consider potential for groundwater flow between these adjacent subbasins.
- **Eastside Subbasin.** The southern boundary with the Eastside Subbasin generally coincides with the presence of Pleistocene Aromas Red Sands indicative of the Langley Subbasin (DWR, 2004). Although the Langley Subbasin is not on the valley floor, there are no reported hydraulic barriers separating these 2 subbasins; therefore, the GSP needs to consider potential for groundwater flow between these adjacent subbasins.

4.3.1.2 Physical Basin Boundaries

The Langley Subbasin is bound by the following physical features:

- **The Gabilan Range.** The eastern boundary of the Subbasin is the contact between the unconsolidated sediments and the Gabilan Range, which consists mostly of granitic rocks. Groundwater flow across this boundary has not been studied extensively, and many reports indicate groundwater recharge for this subbasin is primarily through the stream channels originating in the Gabilan Range. There are no published mapped faults or significant fracture sets that could contribute to mountain block recharge for the Subbasin.
- **Drainage Divide with the Pajaro Valley Groundwater Basin.** This boundary follows the course of a Salinas River paleo-drainage (DWR, 2004). This abandoned river valley cuts through the Aromas Red Sands and is filled in with terrestrial to marine sediments in a fining-up sequence (Schwartz, 1983). The presence of these fine sediments may act as a

barrier to flow between the Salinas River Groundwater Basin and the Pajaro Valley Groundwater Basin.

4.3.2 Vertical Subbasin Boundaries

The base, or bottom, of the Subbasin is not defined by a sharp interface between permeable sediments and lower-permeability basement rock across the entire Subbasin. A sharp interface between both the Aromas Red Sands and the alluvium with the underlying granitic rocks exists near the Gabilan Range. However, away from the Gabilan Range the sedimentary layers thicken, and with increasing depth 3 factors limit the viability of the sediments as a productive, principal aquifer:

1. Contact with the granite basement limits the thickness of saturated sediments, and the decomposed granite lends itself to more clay deposits.
2. Discontinuous alluvial fan deposits interfingered with clay lenses impede vertical and horizontal groundwater flow.
3. Increased consolidation and cementation of the sediments decrease well yields.

Because these factors gradually change with depth, there is not a sharp, well-defined bottom to the aquifer throughout the Subbasin. This GSP adopts the bottom of the aquifer that was defined by the USGS (Durbin, *et al.*, 1978) and extrapolates that surface north to the Subbasin's boundary where it is in contact with the Gabilan Range and the Elkhorn Slough. Figure 4-4 is a map of elevation contours of the bottom of the Subbasin; however, some analyses indicate the bottom of the Subbasin is more vertically varied. Figure 4-5 shows a contour map of the depth to the bottom of the Subbasin from the ground surface, prepared using the extrapolated bottom elevation and ground surface elevation. This interpretation will be refined through further investigation as the Durbin model was extrapolated in this portion of the Salinas Valley Basin.

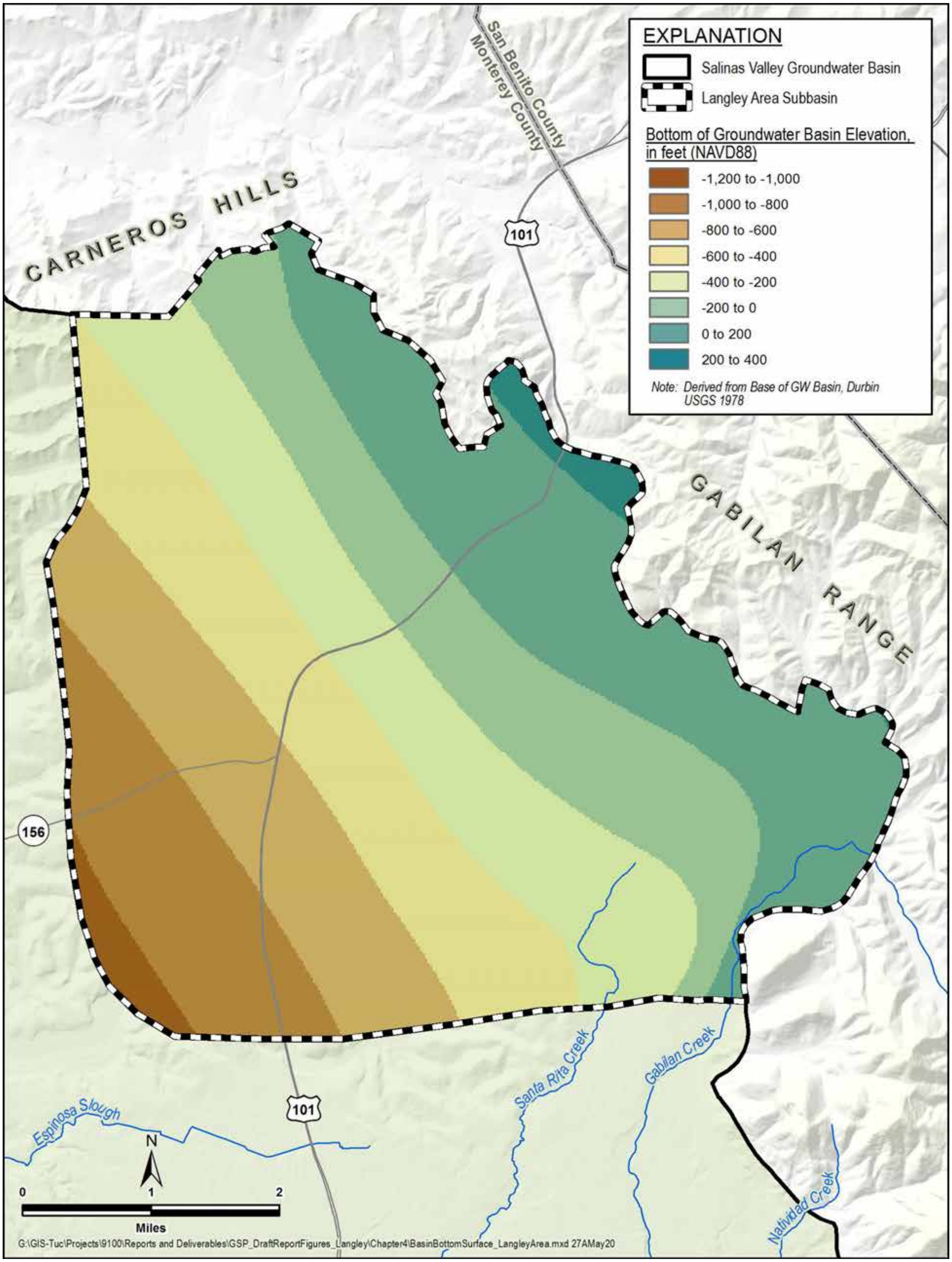


Figure 4-4. Elevation of the Bottom of the Langley Area Subbasin

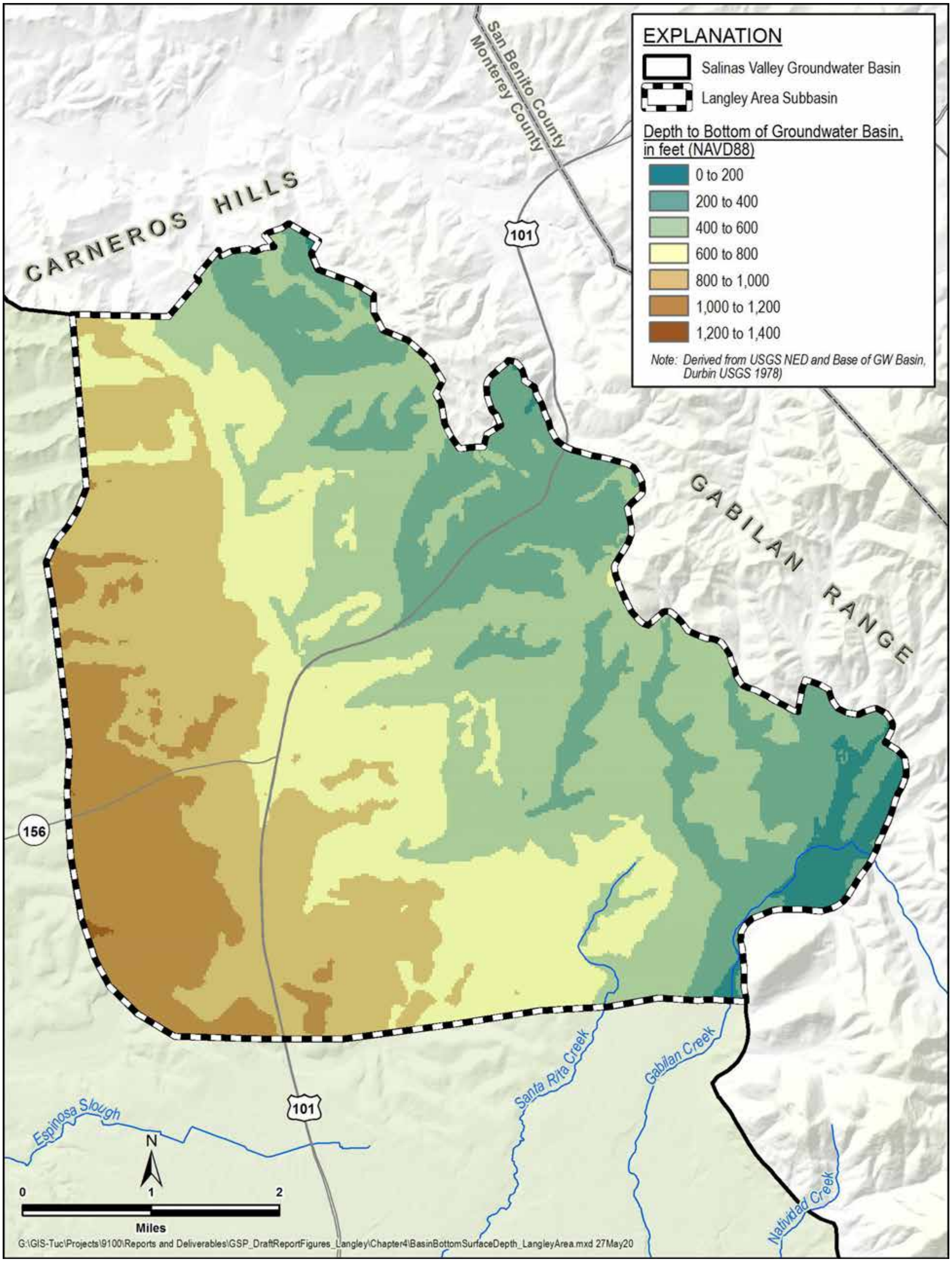


Figure 4-5. Depth to Bottom of the Langley Area Subbasin

4.4 Subbasin Hydrogeology

The Subbasin hydrogeology details the principal aquifer that occurs in the subbasin, inventories known aquifer properties, and identifies naturally occurring groundwater inputs and outputs, which will be incorporated into the groundwater budgets described in Chapter 6. This section also includes cross sections, which give graphical representations of what is described in the following subsections.

Groundwater in the Langley Subbasin is primarily produced from the Aromas Red Sands. Groundwater generally flows from the northwest to the southwest. However, historical pumping created a groundwater depression in the center of the Subbasin in the mid-1990s, which altered groundwater flow direction (DWR, 2004).

4.4.1 Principal Aquifers and Aquitards

Groundwater can be found throughout most of the Quaternary deposits and portions of the Cretaceous, fractured, crystalline rocks, not all groundwater is part of a principal aquifer. SGMA defines a principal aquifer as "…aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems" (23 California Code of Regulations § 351 (aa)). There is only one principal aquifer underlying the Langley Subbasin; a single, unconfined aquifer.

There has been limited hydrogeologic analysis of the Langley Subbasin aquifer. The most recent, detailed hydrostratigraphic analysis of the region that encompasses the Langley Subbasin was published in 1995 with an update on nitrate conditions in 2014 (Fugro West Inc., 1995; HydroFocus, Inc., 2014). The *North Monterey County Hydrogeologic Study, Volume I, Water Resources* report focuses on North Monterey County, and discusses 2 subareas that predated the Langley Subbasin: the South Highlands and Granite Ridge subareas (Fugro West Inc., 1995). These 2 subareas cover approximately 75% of the Langley Subbasin (MCWRA, 2015b).

The Aromas Red Sands are the primary water-bearing formation in the Subbasin's sole principal aquifer. Water is drawn from the unconfined sands and gravels that characterize the formation. The lower portion of the Aromas Red Sands Formation includes blue clays typically found in the Salinas Valley Aquitard (Fugro West, Inc., 1995). However, there is no unified aquitard in the Langley Subbasin despite some suggestions of a laterally continuous clay zone (Fugro West, Inc., 1995). The Aromas Red Sands Formation is also found in the 400-foot Aquifer of the 180/400-Foot Aquifer Subbasin where it interfingers with the upper portion of the Paso Robles Formation (DWR, 2004). Thus, the single aquifer in the Langley Subbasin appears to be hydraulically connected to the 180- and 400-Foot Aquifers in the 180/400-Foot Aquifer Subbasin.

The upper portions of the Paso Robles Formation and Purisima Formation are also included in the Subbasin’s single principal aquifer where they may be in contact with the Aromas Red Sands. There is no significant and laterally extensive aquitard separating the Aromas Red Sands from the underlying formations. Therefore, these formations are hydraulically connected to the Aromas Red Sands and contribute water to the principal aquifer.

Near the Gabilan Range, some wells are completed in the weathered surface of the granite, fresh granite, or other consolidated formations (Fugro West, Inc., 1995). It is difficult to determine exactly where wells are completed as many well completion reports lack the detail necessary to distinguish between granite and gravel derived from granite. Additionally, well yields in either the weathered or fresh granite are variable, with many well yields not going over 5 gallons per minute (Fugro West, Inc., 1995). Consequently, the granite is not a principal aquifer because it does not convey significant and economic quantities of water. Furthermore, the water encountered in the fractured granite is not consistent or reliable since it is drawn from fractures.

Two cross sections along and across the Subbasin are shown on Figure 4-6 and Figure 4-7. The location of these cross sections is depicted on Figure 4-2. Cross section A-A’ extends from north to south, and section D-D’ extends eastward across the Langley Subbasin.

The cross sections are based on geologic logs provided in DWR Water Well Drillers Reports. Cross-section D-D’ was adopted from the North Monterey County Hydrogeologic Study (Fugro, 1995). This cross-section interprets the geologic log descriptions to identify the primary geologic units of granite, weathered granite, Aromas Red Sands, and alluvium. The Purisima Formation is assumed to exist below the Aromas Red Sands. Cross section D-D’ shows weathered granite overlying fresh granite. This is interpreted from the driller’s logs as well as geologic understanding in the area.

Cross-section A-A’ does not differentiate between geologic units. Instead, geologic log descriptions were grouped into hydrologic units as follows:

- Fine-grained sediments such as clay, silt, sandy clay, and gravelly clay are shown as aquitards.
- Coarse-grained sediments such as sand, gravel, and sand-gravel mixtures are shown as aquifers.
- Sediments logged as Gravel/Rock/Clay, Rock/Decomposed Granite, or Granite/Bedrock were interpreted to represent the weathered surface of the Gabilan Range crystalline rocks.

Cross section A-A’ shows an interpreted contact with the weathered surface as well, but no definitive contact with fresh granite. In some cases, the logs may be old, the depth resolution poor, or the lithologic distinction suspect, and therefore the lithology shown on the well logs should not be viewed as precise.

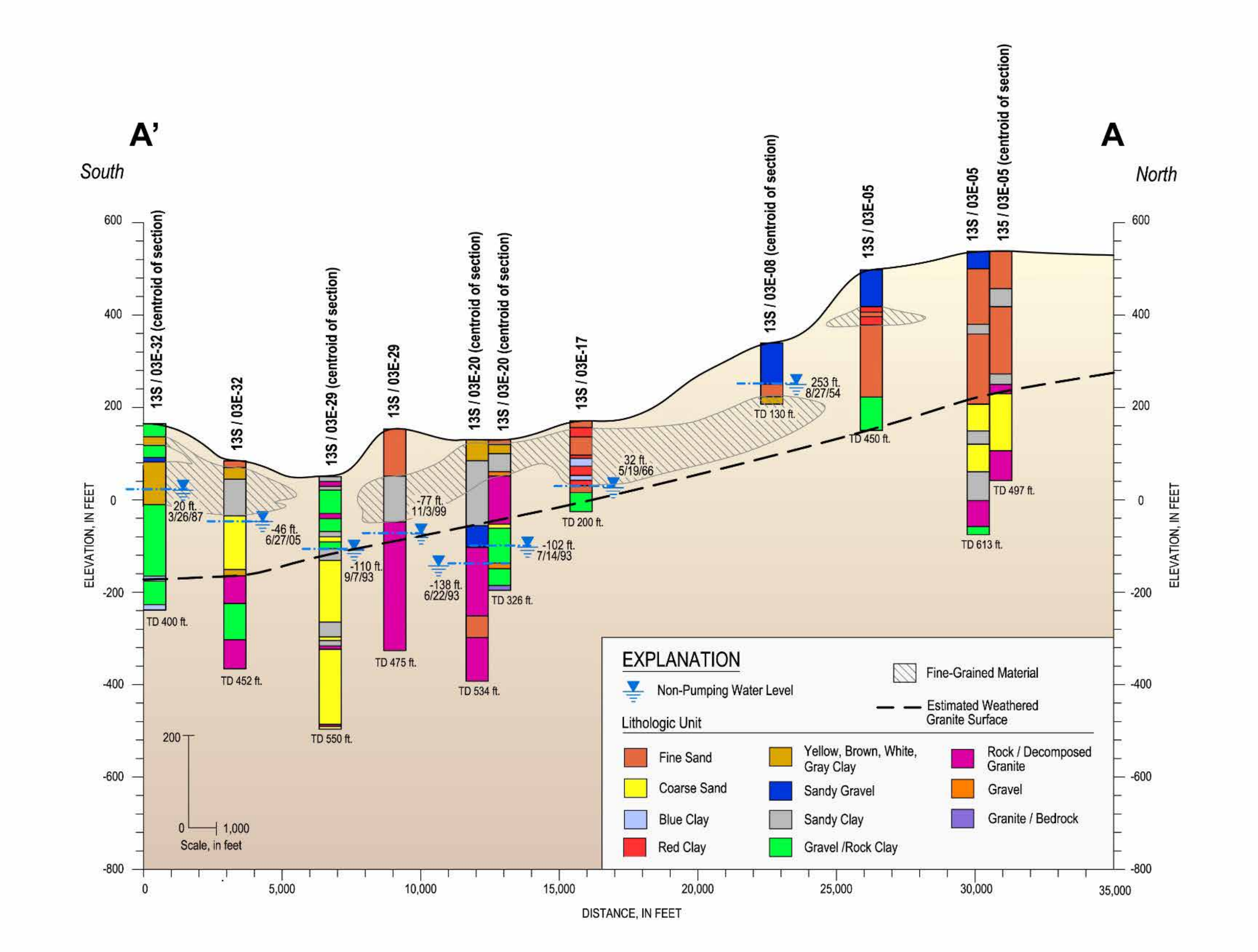


Figure 4-6. Cross Section A-A'

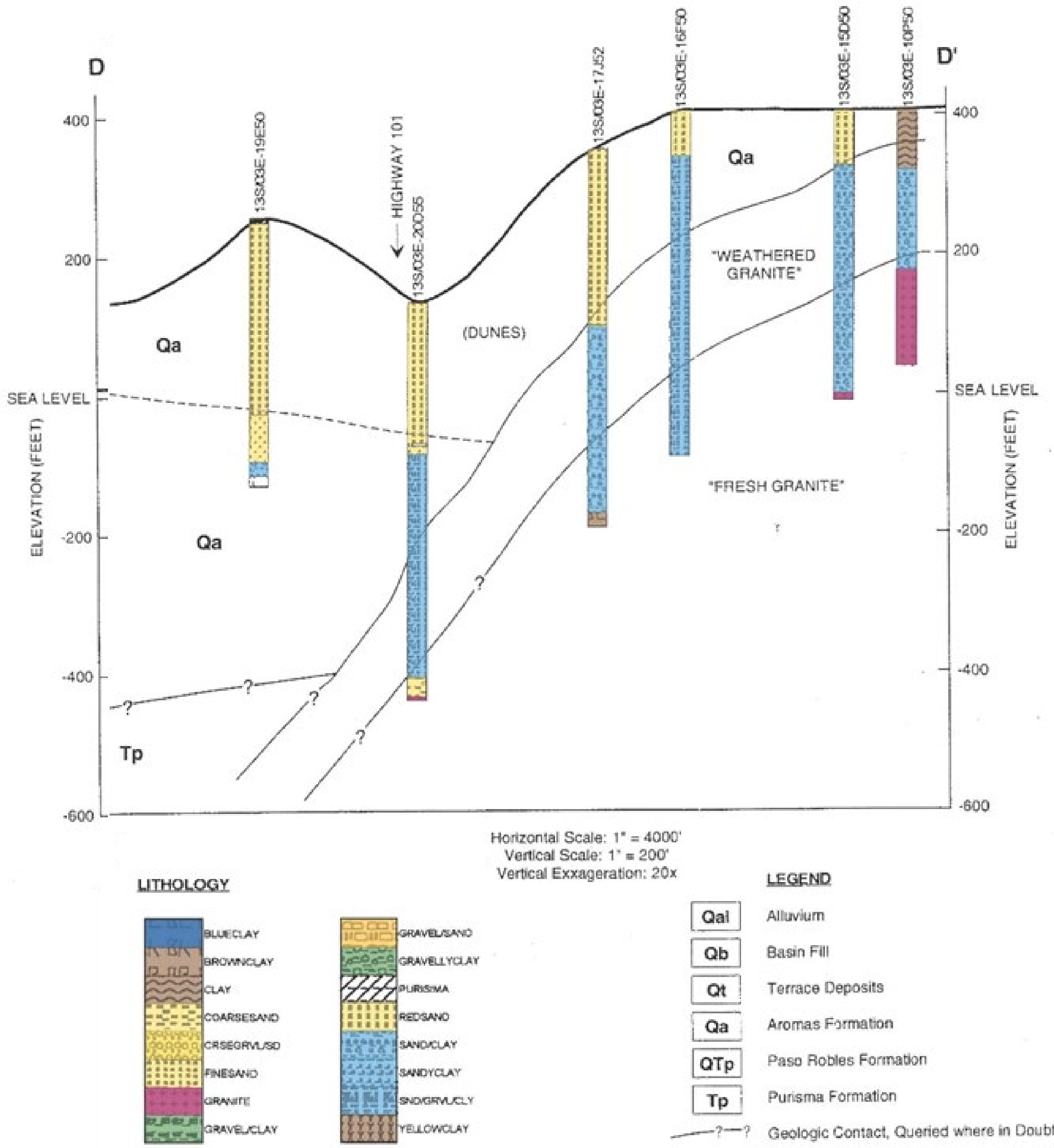


Figure 4-7. Cross Section D-D’
(modified from Fugro West, Inc., 1995)

4.4.2 Aquifer Properties

Aquifer properties define how groundwater is stored and how groundwater moves in the subsurface. This information is needed to understand current groundwater conditions, to predict future groundwater conditions, and to assess strategies for achieving sustainability.

The values and distribution of aquifer properties in the Langley Subbasin have not been well characterized and documented. The relatively sparse amount of measured aquifer properties throughout the Subbasin is considered a data gap that will be addressed during implementation of the GSP.

Aquifer property measurements are limited in the Subbasin. Aquifer properties have been estimated during calibration of regional numerical groundwater flow models for the Salinas Valley basin. Aquifer property calibration has been completed for numerous published modeling studies including studies by Durbin (1974), Yates (1988), WRIME (2003), and the SVIHM that is used to develop this GSP.

There are 2 general types of aquifer properties relevant to groundwater management:

- **Aquifer storage properties.** These properties control the relationship between the volume of groundwater stored in the aquifer and the groundwater elevations measured in the aquifer.
- **Groundwater transmission properties.** These properties control the relationship between hydraulic gradients and the rate of groundwater flow.

4.4.2.1 Aquifer Storage Properties

The aquifer properties that characterize the relation between groundwater elevation and amount of water stored in an aquifer are specific yield for unconfined aquifers and specific storage for confined aquifers. Storativity, or storage coefficient, is equal to specific storage multiplied by the aquifer saturated thickness for confined aquifers. Both specific yield and specific storage are measured in units of cubic feet of water per cubic feet of aquifer material. These ratios are often expressed as a percentage.

- **Specific yield** is the amount of water that drains from pores when an unconfined aquifer is dewatered. Often, specific yield values range from 8% to 20% for alluvium deposits. Estimated Aromas Red Sands specific yields values from the USGS's groundwater model of the adjacent Pajaro Valley range from 4% to 15% (Hanson et al., 2014).
- **Specific storage** is the amount of water derived from a unit volume of a confined aquifer due to a unit decline in pressure change in the aquifer. Specific storage values have units of 1/L and are often on the order of $5x10^{-4}$ to $1x10^{-5}$ for alluvial deposits. There are no

estimated specific storage values published for the principal aquifer in the Langley Area as this aquifer is generally unconfined.

Detailed aquifer property values specific to the Subbasin were not available at the time of this GSP development. This is a data gap that will be filled during implementation.

4.4.2.2 Groundwater Transmission Properties

Hydraulic conductivity measures the ability of an aquifer to transmit water. Hydraulic conductivity is expressed in units of length per unit time, such as feet per day. Materials with higher hydraulic conductivities, such as sands and gravels, transmit groundwater more readily than units with lower hydraulic conductivities, such as clay. Transmissivity is equal to the hydraulic conductivity multiplied by the aquifer saturated thickness. Few estimates of either hydraulic conductivity or transmissivity exist for the Subbasin. Since the aquifer thickness changes dramatically from east to west, transmissivity will be more difficult to estimate for this Subbasin. Estimated hydraulic conductivities for the Aromas Red Sands, derived from the USGS's groundwater model of the adjacent Pajaro Valley, range from 3.2 to 167 feet/day (Hanson et al., 2014). Well yields in the Aromas Red Sands average 450 gallons per minute (gpm) and can be as high at 750 gpm (Johnson, 1983).

Specific capacity of a well is sometimes used as a surrogate for estimating aquifer transmissivity. The specific capacity of a well is the ratio between the well pumping rate in gallons per minute (gpm), and the drawdown in the well during pumping measured in feet. Specific capacity is moderately well correlated, and approximately proportional to, aquifer transmissivity. Wells completed in the Aromas Red Sands in the Pajaro Valley have specific capacities of approximately 20 gpm/ft (Johnson, 1983). Durbin, *et al*. (1978) reported that, the granitic fragments that comprise the alluvial fans along the Gabilan Range weather rapidly, and the pores of the unconsolidated sediments are plugged with clay minerals. This results in a reported specific capacity of 20 gpm/ft in the alluvial fan emanating from Gabilan Creek which flows through the southeastern corner of the Subbasin (Durbin, *et al*, 1978).

4.4.3 Primary Aquifer Uses

The primary uses of groundwater from this single aquifer include domestic, irrigation, and municipal water supply uses (DWR, 2004).

4.4.4 Natural Recharge Areas

Natural recharge areas allow rainfall, local runoff, and streamflow to replenish aquifers by percolating through the subsurface. Identifying areas of potentially significant natural recharge can inform water budgets and help planners promote good groundwater management by incorporating recharge areas into land use plans. This section only identifies areas of natural recharge; quantitative information about all natural and anthropogenic recharge is provided in Chapter 6. There is no known anthropogenic recharge in this subbasin at this time.

Natural groundwater recharge occurs through the following processes:

- Recharge of surface water from the streams originating in the Gabilan Range
- Deep percolation of infiltrating precipitation
- Subsurface inflow from the adjacent subbasins

Recharge of surface water and deep percolation of precipitation are both surficial sources of natural groundwater recharge. An area's capacity for surficial groundwater recharge is dependent on a combination of factors, including steepness of grade, soil surface conditions such as paving or compaction, and ability of soil to transmit water past the root zone. To assist agricultural communities in California assess groundwater recharge potential, a consortium of researchers at University of California Davis developed a Soil Agricultural Groundwater Banking Index (SAGBI) and generated maps of recharge potential in agricultural areas of California (O'Geen, *et al.*, 2015). Figure 4-8 presents the SAGBI index map for the Langley Subbasin. This map ranks soil suitability for groundwater recharge based on 5 major factors including: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. Areas with excellent recharge properties are shown in green. Areas with poor recharge properties are shown in red. Not all land is classified, but this map provides helpful guidance on where natural recharge likely occurs.

The area with the highest potential for recharge is along Gabilan Creek in the southeast corner of the Subbasin. Most soils in the Subbasin are classified as very poor for recharge potential. Although Figure 4-8 shows many areas of very poor recharge potential in the Langley Subbasin, actual recharge to the productive zones of the Subbasin is unknown. This map should not be used exclusively to identify recharge areas that will directly benefit the aquifer in the Langley Subbasin. Rather, it should be used in conjunction with additional research and investigation tools such as test boreholes and downhole geophysics.

There is no known subsurface recharge since this Subbasin is against the Gabilan Range and Elkhorn Slough and is upgradient to the 180/400-Foot Aquifer Subbasin and the Eastside Subbasin. Total natural recharge is estimated to be 4,000 acre-feet per year (DWR, 2004).

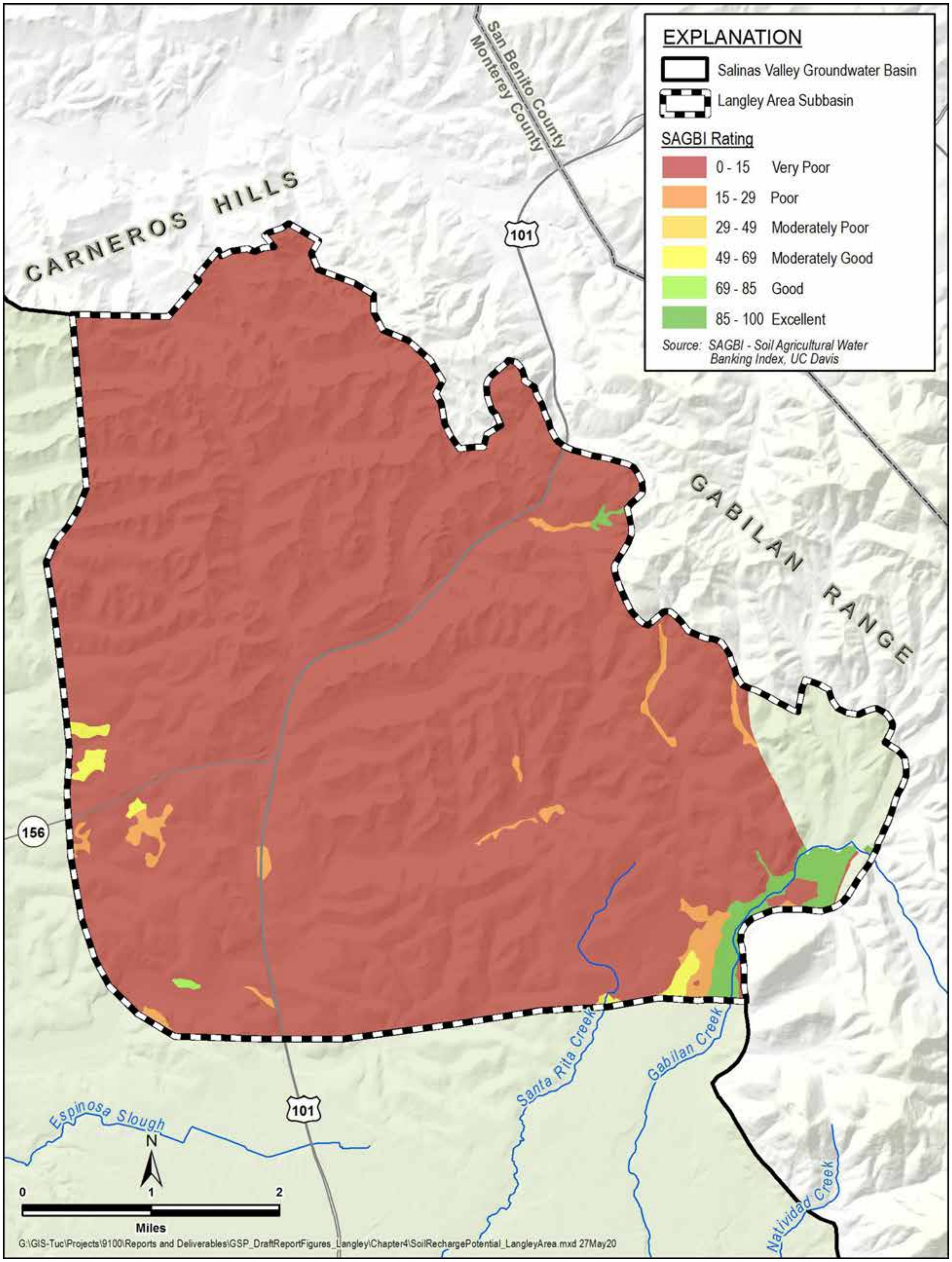


Figure 4-8. SAGBI Soils Map for the Langley Area Subbasin

4.4.5 Natural Discharge Areas

Natural discharge areas are areas where groundwater naturally leaves aquifers through flow to adjoining basins or percolation to the ground surface. Identifying areas of potentially significant natural discharge can inform water budgets and help locate important environmental uses of groundwater. Quantitative information about all natural and anthropogenic discharge is provided in Chapter 6.

Natural groundwater discharge areas within the Subbasin include wetlands and other surface water bodies that receive groundwater discharge to surface water bodies and evapotranspiration (ET) by vegetation types commonly associated with the sub-surface presence of groundwater. There are no springs and seeps in the Subbasin as identified in the National Hydrology Dataset (NHD). Natural groundwater discharge to streams has not been mapped to date.

4.4.5.1 Potential Interconnected Surface Water

Figure 4-9 shows locations of ISW, in the Langley Subbasin evaluated on a monthly basis over the entire SVIHM model period from 1967 to 2017. The blue cells indicate areas where surface water is connected to groundwater for more than 50% of the number of months in the model period and are designated as areas of ISW. The clear cells represent areas that have interconnection less than 50% of the model period and require further evaluation to determine whether the SMC, discussed in Chapter 8, apply. The gray cells show locations of canals, drains, or connectors and were excluded from the analysis. These ISW locations are based on simulated results from the preliminary SVIHM, which is calibrated to measured groundwater levels and streamflows. Although seepage along the ISW reaches is based on assumed channel and aquifer parameters as model inputs, the preliminary SVIHM is the best available tool to estimate ISW locations. The model construction and uncertainty are described in Chapter 6 of this GSP. This map does not show the extent of interconnection which is estimated in Chapter 5. Interconnection between surface water and groundwater can vary both in time and space. A seasonal analysis is included in Appendix 4A. Figure 4-9 is based on provisional version of the SVIHM[1] and is subject to change.

[1] These data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

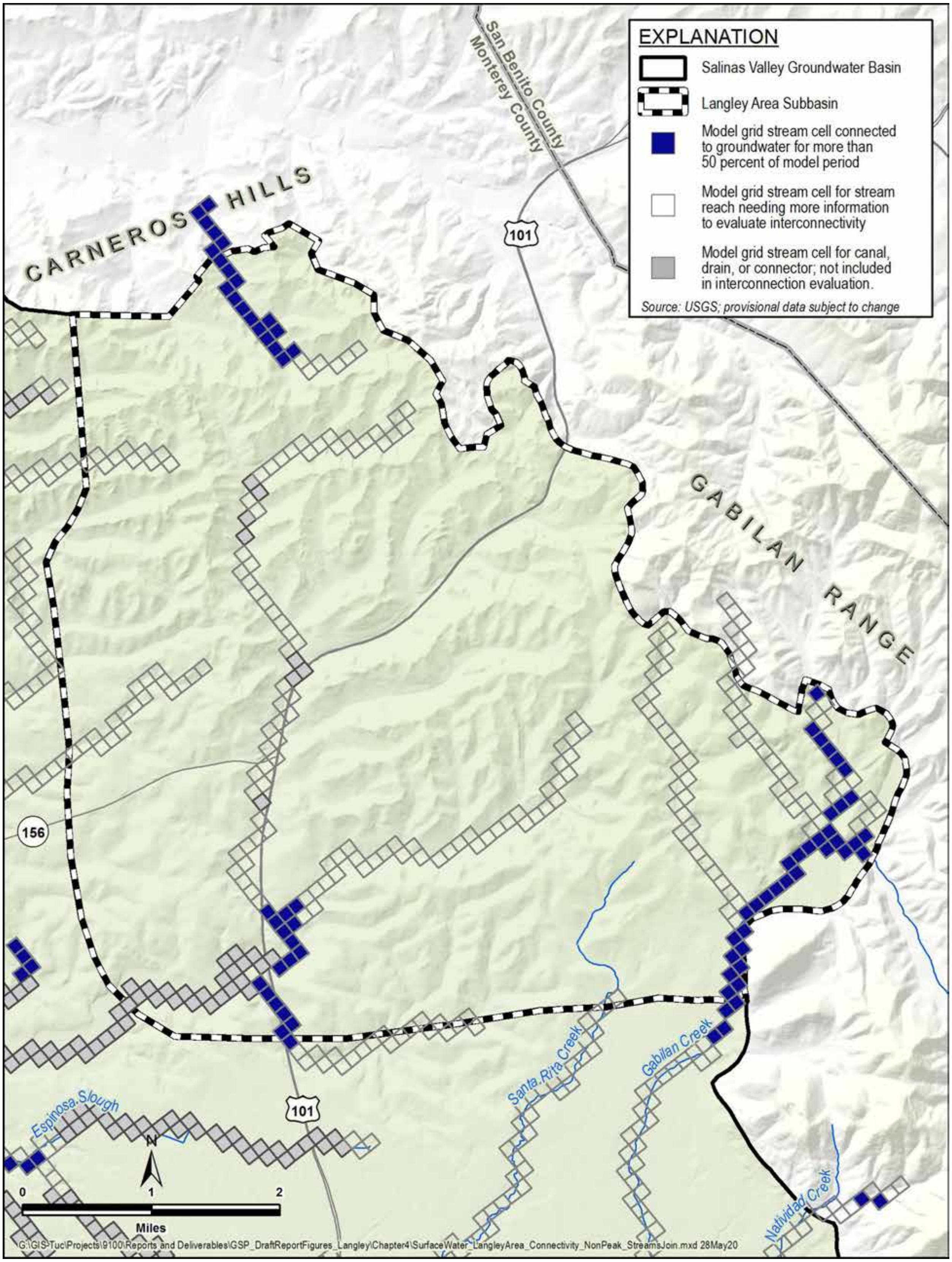


Figure 4-9. Locations of Interconnected Surface Water

4.4.5.2 Groundwater Dependent Ecosystems

GDEs refer to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Two main types of ecosystems are commonly associated with groundwater: wetlands associated with the surface expression of groundwater and vegetation that typically draws water from a shallow water table (phreatophytes).

GDEs may provide critical habitat for threatened or endangered species. Areas designated as critical habitat for threatened or endangered species contain the physical or biological features that are essential to the conservation of these species and may need special management or protection (U.S. Fish and Wildlife Service [USFWS], 2017). A list of threatened and endangered species that might rely on GDEs in the Subbasin was compiled using information from the USFWS, California Department of Fish and Wildlife (CDFW), and TNC. Several steps were taken to determine which threatened and endangered species were likely found in the Subbasin and of those, which were likely to rely on GDE habitat. A list of threatened and endangered species for Monterey County was downloaded from the USFWS website and cross-referenced to species identified in the CDFW California Natural Diversity Database. The threatened and endangered species for Monterey County was further cross-referenced with the TNC Critical Species LookBook to identify which species are likely to depend on groundwater, as indicated in Table 4-1.

Ten threatened and endangered species, including the Southern California Steelhead, and the California Red-legged Frog, were identified as likely to rely directly on groundwater in Monterey County, several of which may be found in the Subbasin. Ten species were identified as likely to rely indirectly on groundwater, and the remaining species are unknown with respect to whether they directly rely on GDEs or groundwater. All species listed have the potential for groundwater dependence. There are 8 species that appear in both the federal and state list for threatened or endangered species.

Table 4-1. Federal and State Listed Threatened and Endangered Species and Respective Groundwater Dependence for Monterey County

Groundwater Dependence	Common Name	Federal Status	State Status
Direct	California black rail	-	Threatened
	California red-legged frog	Threatened	-
	California Ridgway's rail	Endangered	Endangered
	longfin smelt	-	Threatened
	Santa Cruz long-toed salamander	Endangered	Endangered
	steelhead - central California coast DPS	Threatened	-
	steelhead - south-central California coast DPS	Threatened	-
	Tidewater Goby	Endangered	-
	tricolored blackbird	-	Threatened
Direct and Indirect	arroyo toad	Endangered	-
Indirect	bald eagle	-	Endangered
	bank swallow	-	Threatened
	Belding's savannah sparrow	-	Endangered
	California condor	Endangered	Endangered
	California least tern	Endangered	Endangered
	least Bell's vireo	Endangered	Endangered
	southwestern willow flycatcher	Endangered	Endangered
	Swainson's hawk	-	Threatened
	willow flycatcher	-	Endangered
Unknown	Bay checkerspot butterfly	Threatened	-
	California tiger salamander	Threatened	Threatened
	foothill yellow-legged frog	-	Endangered
	San Joaquin kit fox	Endangered	Threatened
	short-tailed albatross	Endangered	-
	Smith's blue butterfly	Endangered	-
	vernal pool fairy shrimp	Threatened	-

The areas in the Langley Subbasin where GDEs may be found are mainly along the Gabilan and Santa Rita Creeks and in canyons and washes where shallow alluvium is present. These areas of shallow alluvium may be saturated, but more investigation is needed to determine whether a continuous saturated zone connects to the principal aquifer. This area will require more analysis into the near surface stratigraphy to determine the connection to the principal aquifer.

Figure 4-10 shows the distribution of potential GDEs within the Subbasin based on the Natural Communities Commonly Associated with Groundwater (NCCAG) Dataset (DWR, 2020b). The NCCAG dataset maps vegetation, wetlands, springs, and seeps in California that are commonly associated with groundwater. These include: 1) wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions; and 2) phreatophytes. This map does not account for the depth to groundwater or level of interconnection between surface water and groundwater. Actual rooting depth data are limited and will depend on the plant species and site-specific conditions, and availability to other water sources.

The NCCAG dataset and the additional shallow groundwater analysis are not a determination of GDEs by DWR or SVBGSA, but rather represent the best available data to provide a starting point for this GSP, as well as to direct monitoring, fill data gaps, guide implementation, and support other field activities initiated or partnered by the SVBGSA. Field data are needed to ascertain the degree to which identified ecosystems are groundwater dependent, rather than sustained by soil moisture.

Additional resources that contributed to an initial mapping of GDE locations are the CDFW Vegetation Classification and Mapping Program(VegCAMP), the USFWS National Wetlands Inventory, and the USFWS online mapping tool for listed species critical habitat, as described in the methodology for the NCCAG development which is publicly accessible on the NC dataset website: https://gis.water.ca.gov/app/NCDatasetViewer/.

4.5 Surface Water Bodies

The primary surface water bodies in the Subbasin are shown on Figure 4-11. Two significant, named tributaries in the southeast section of the Langley Subbasin include Gabilan Creek and Santa Rita Creek.

4.5.1 Watersheds

Figure 4-12 shows several watersheds that contribute small tributary streams to the Salinas River in the Langley Subbasin. From the boundary with the Gabilan Range to the 180/400-Foot Aquifer Subbasin, the HUC12 watersheds within the Langley Subbasin are as follows:

- Mud Creek-Gabilan Creek
- Nativdad Creek-Gabilan Creek
- Alisal Slough-Tembladero Slough
- Elkhorn Slough

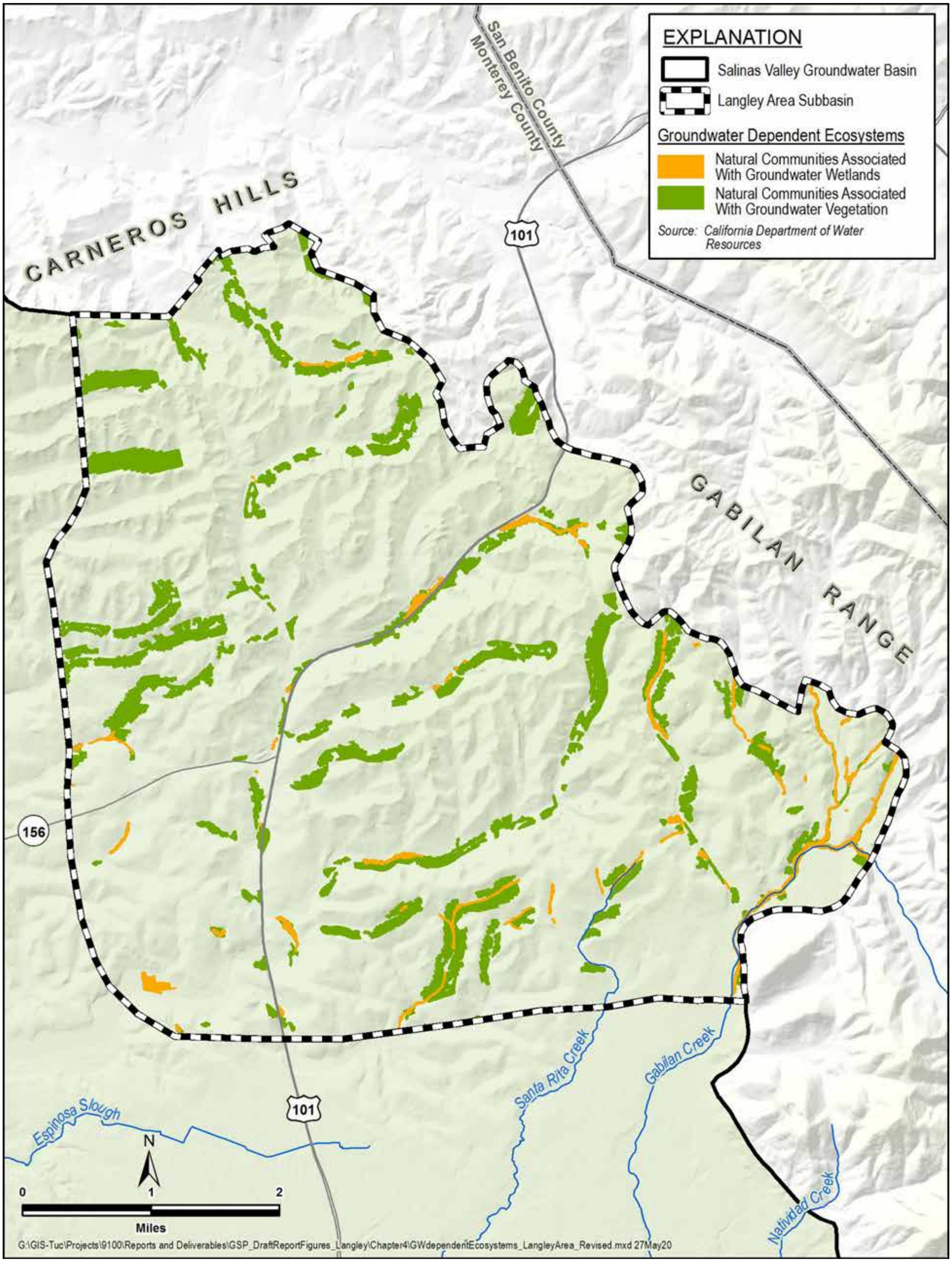


Figure 4-10. Groundwater Dependent Ecosystems

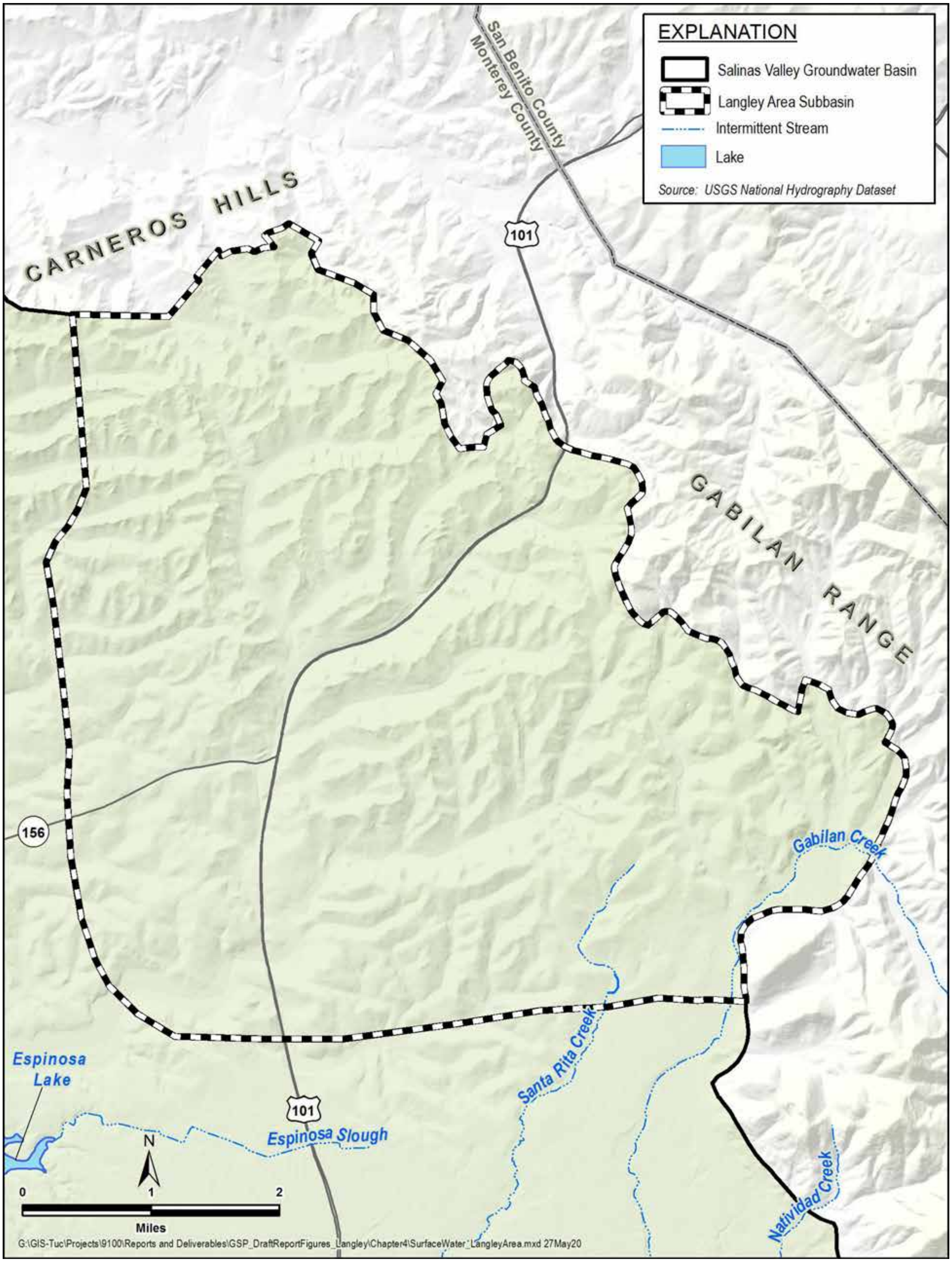


Figure 4-11. Surface Water Bodies in the Langley Area Subbasin

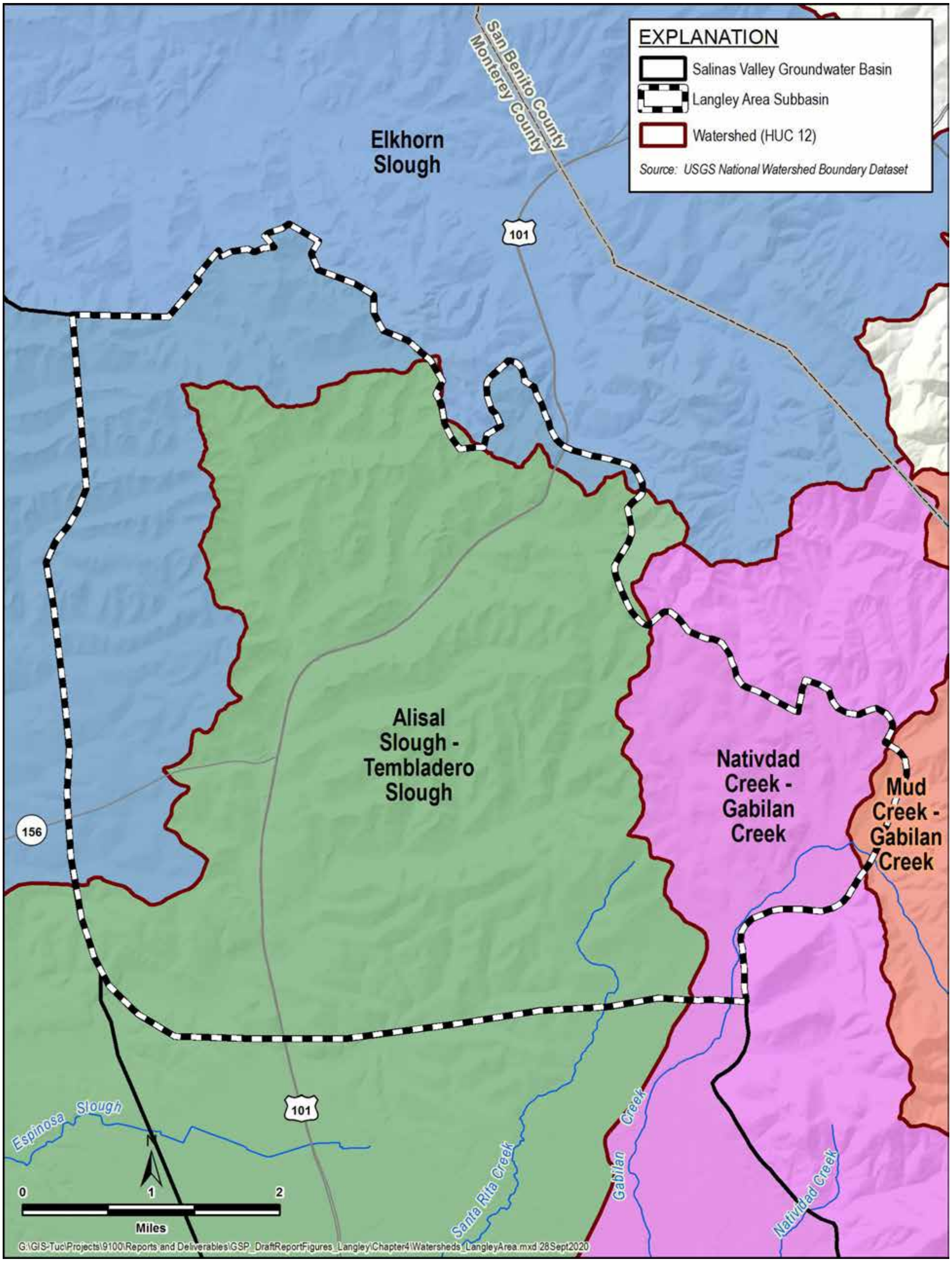


Figure 4-12. HUC12 Watersheds within the Langley Area Subbasin

4.5.2 Imported Water Supplies

There is no water imported into the Langley Subbasin.

4.6 Water Quality

Natural groundwater quality can determine how much treatment may be needed prior to being used for municipal uses, or how the water may impact crop production. This section presents a general discussion of the natural groundwater quality in the Subbasin, focusing on general minerals. This discussion is based on data from previous reports. Discussion of the distribution and concentrations of specific constituents of concern (COC) is presented in Chapter 5.

4.6.1 General Mineral Chemistry

General water chemistry provides a baseline understanding of the water by showing major ions that are dissolved in the groundwater. The major ions that are dissolved can inform users if the water is more alkaline or more acidic. In many areas with more alkaline water, which has more dissolved cations such as calcium, magnesium, and sodium, many users report their water as being ‘hard.’ Water in this subbasin is generally a calcium bicarbonate type (Fugro West Inc., 1995). Water from the Aromas Red Sands is high in magnesium and calcium (Johnson, 1983). Locally, water may also have high concentrations of iron and manganese (Johnson, 1983).

4.6.2 Seawater intrusion

There is no recorded seawater intrusion in the Langley Subbasin. Even though it is adjacent to the 180/400-Foot Aquifer Subbasin where seawater intrusion is occurring, seawater intrusion has not reached the Subbasin, which is approximately 5 miles from the coastline. However, there is a potential for seawater intrusion into the Subbasin. The most recent seawater intrusion contours in the 180-Foot Aquifer place the 500 mg/L chloride isocontour within 2.5 miles of the Langley Subbasin. The most recent seawater intrusion contours in the 400-Foot Aquifer place the 500 mg/L chloride isocontour leading edge within 3 miles of the Langley Subbasin.

The current seawater intrusion conditions are described more fully in Chapter 5.

4.7 Data Gaps and Uncertainty of the HCM

The HCM in the Langley Subbasin includes a few notable data gaps, including:

- Very few measurements of groundwater elevations exist in the Subbasin.
- Very few measurements of aquifer properties such as hydraulic conductivity and specific yield exist in the Subbasin.

- The hydrostratigraphy, vertical and horizontal extents, and potential recharge areas of the water producing zones are poorly known.

These data gaps have led to some minor uncertainties in how the principal aquifer functions, and the SVBGSA will minimize these uncertainties by filling data gaps. As described in Chapter 7, the GSP will include ongoing data collection and monitoring recommendations that will allow continued refinement and quantification of the groundwater system. Chapter 10 includes activities to address the identified data gaps and improve the HCM.

5 GROUNDWATER CONDITIONS

This chapter describes the current and historical groundwater conditions in the Langley Subbasin in accordance with the GSP Regulations § 354.16. In this GSP, current conditions are any conditions occurring after January 1, 2015. 2019 was chosen as the representative current year where possible. By implication, historical conditions are any conditions occurring prior to January 1, 2015. The chapter focuses on information required by the GSP Regulations and information that is important for developing an effective plan to achieve sustainability. This chapter provides a description of current and historical groundwater conditions at a scale and level of detail appropriate for meeting the GSP sustainability requirements under SGMA.

This chapter is organized to align the groundwater conditions descriptions with the 6 sustainability indicators relevant to this Subbasin, including:

1. Chronic lowering of groundwater levels
2. Changes in groundwater storage
3. Seawater intrusion
4. Groundwater quality
5. Subsidence
6. Depletion of ISW

5.1 Groundwater Elevations

5.1.1 Data Sources

The assessment of groundwater elevation conditions is largely based on data collected by MCWRA from 1944 through the present. MCWRA's monitoring programs are described in Chapter 3.

5.1.2 Groundwater Elevation Contours and Horizontal Groundwater Gradients

Groundwater elevation data are analyzed and presented with 2 sets of graphics:

- Maps of groundwater elevation contours show the geographic distribution of groundwater elevations at a specific time. These contours represent the elevation of the groundwater in feet, using the North American Vertical Datum of 1988 (NAVD88). The contours are of differing intervals and dashed where uncertain (Figure 5-1 to Figure 5-4).
- Hydrographs of individual wells show the variations in groundwater elevations at individual wells over an extended period of time (Figure 5-5).

MCWRA annually produces groundwater elevation contour maps for the Salinas Valley Groundwater Basin using data from their annual August trough and fall measurement programs. August groundwater elevations are contoured to assess the driving force of seawater intrusion because this is usually when the aquifer is the most stressed. The August measurements represent seasonal low conditions in the Subbasin in this GSP. MCWRA also contours fall groundwater elevations because these measurements are taken from mid-November to December after the end of the irrigation season and before seasonal recharge from winter precipitation increases groundwater levels. However, their contours do not extend into the Langley Subbasin. MCWRA does not produce groundwater elevation contour maps in the spring or collect spring groundwater elevation measurements in the Langley Subbasin, which are data gaps. Therefore, fall groundwater elevations are used to represent the seasonal high in the Subbasin in this GSP until the spring measurements data gap is filled.

Figure 5-1 through Figure 5-3 present the current (2019) and historical (1995) groundwater elevation contours developed with MCWRA groundwater elevation data. Figure 5-4 presents the historical (1994) August/September trough groundwater elevation contours adapted from the contours presented in *The North Monterey County Hydrogeologic Study, Volume I, Water Resources* report (Fugro West Inc., 1995). This is the best available data and highlights that August groundwater elevation measurements in the Langley Subbasin are a data gap.

Table 5-1. Figures Showing Current and Historical Groundwater Elevation Contours in the Langley Area

Figure #	Year	Season
Figure 5-1	Current (2019)	Fall
Figure 5-2	Current (2019)	August Trough
Figure 5-3	Historical (1995)	Fall
Figure 5-4	Historical (1994)	August/September Trough

The groundwater elevation contours only cover the portions of the Subbasin monitored by MCWRA. Contours do not always extend to subbasin margins, nor do they cover the entire Langley Subbasin. This is a data gap that will be addressed during GSP implementation.

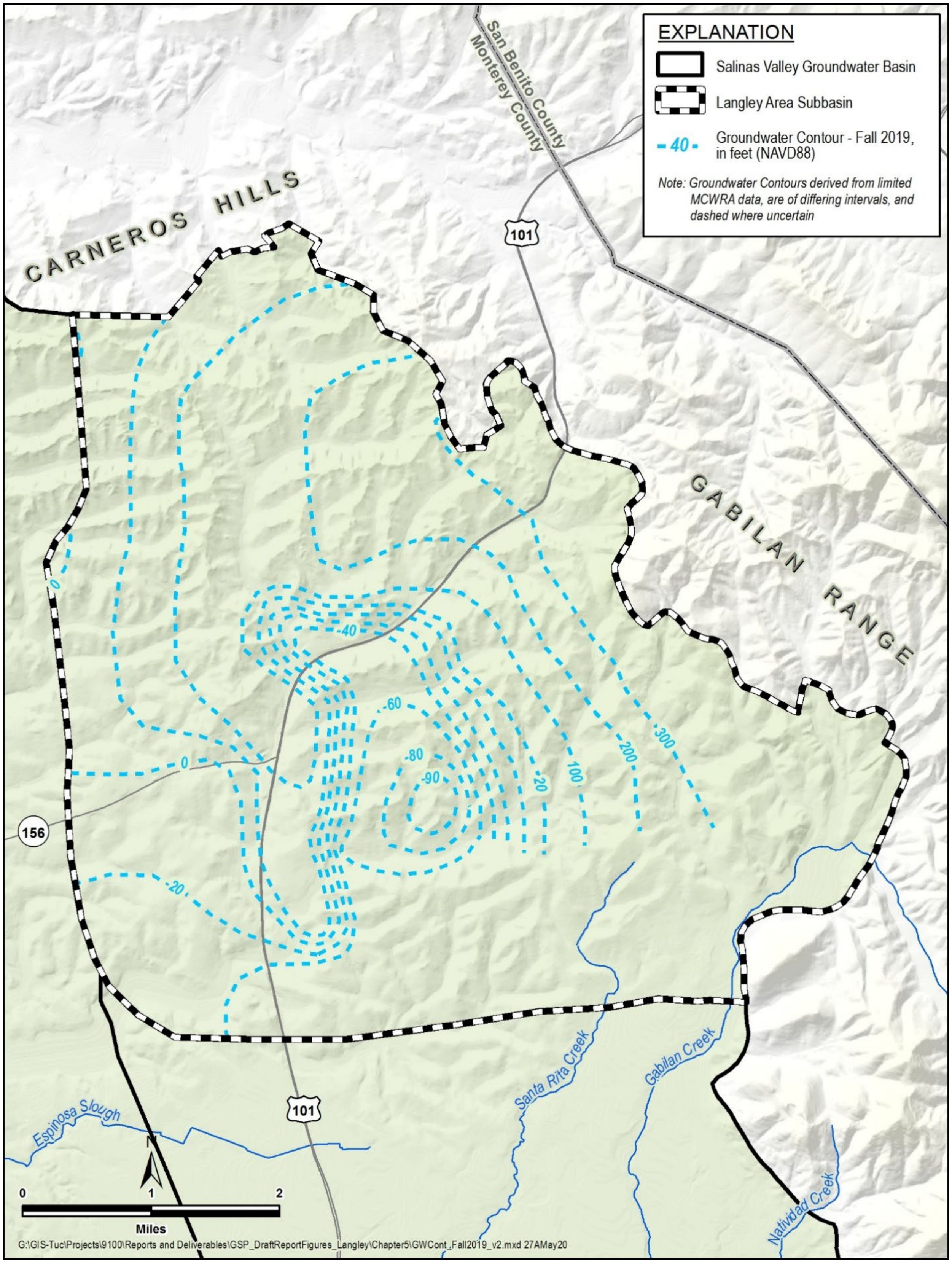


Figure 5-1. Fall 2019 Groundwater Elevation Contours

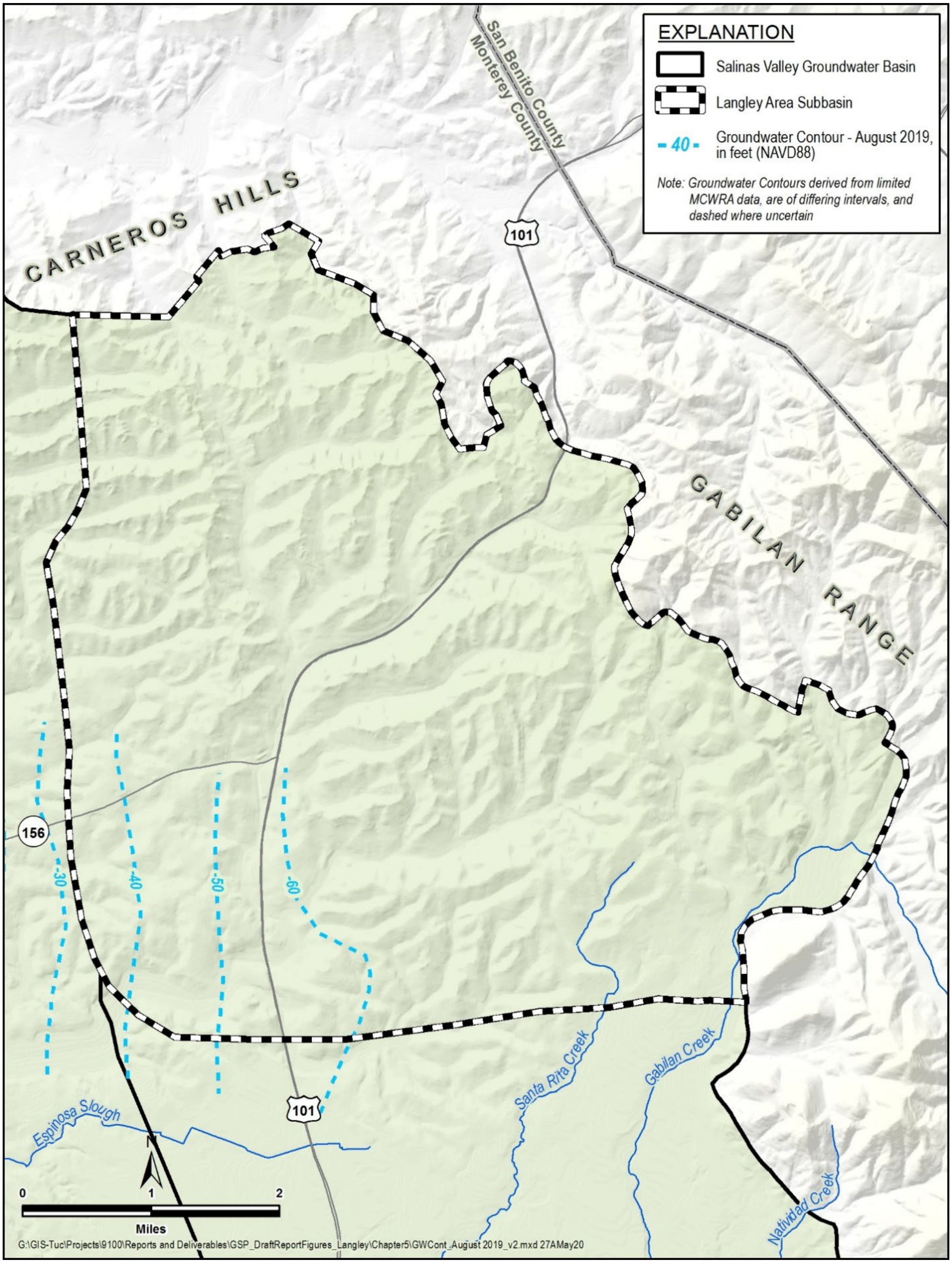


Figure 5-2. August 2019 Groundwater Elevation Contours

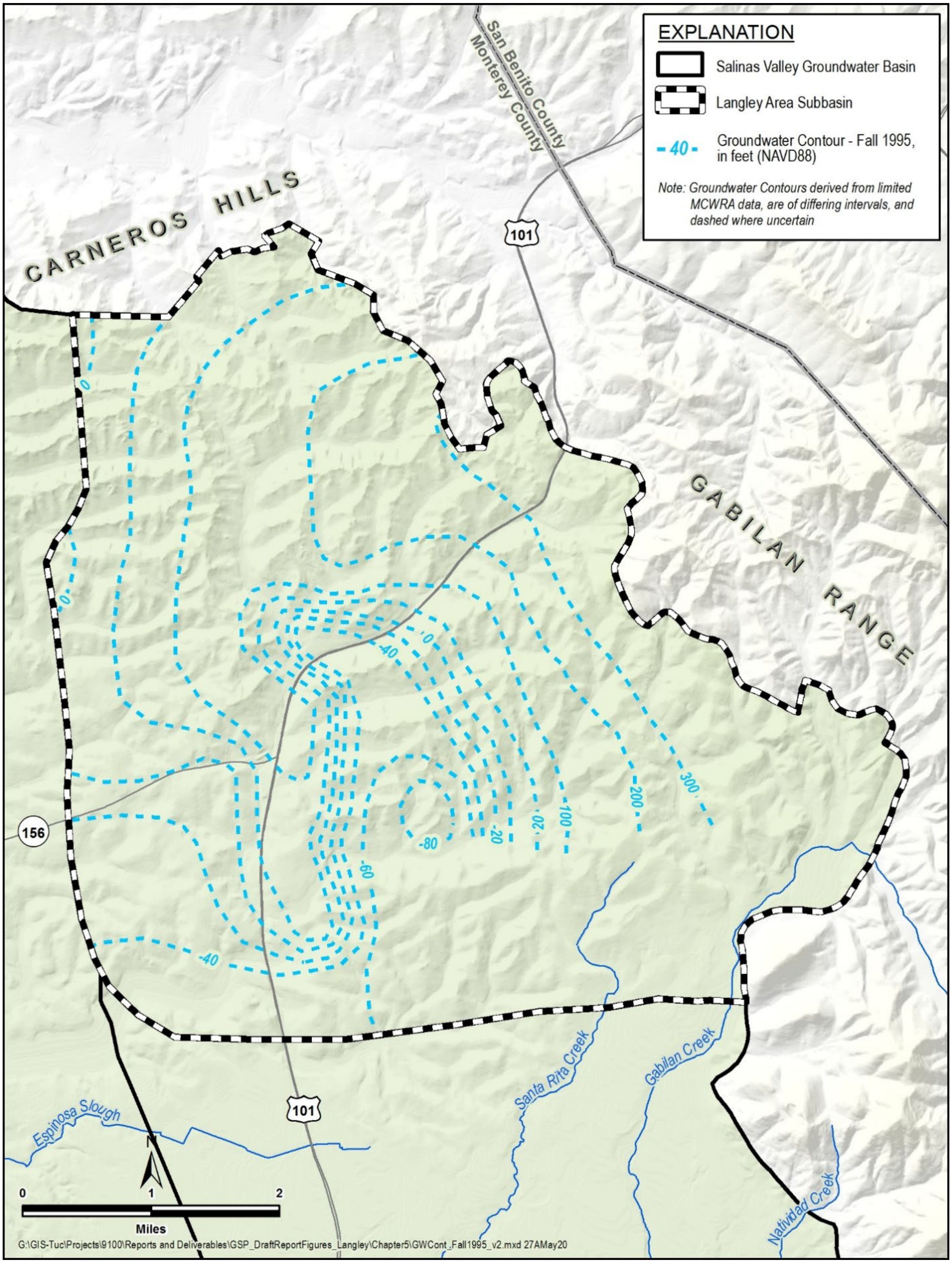


Figure 5-3. Fall 1995 Groundwater Elevation Contours

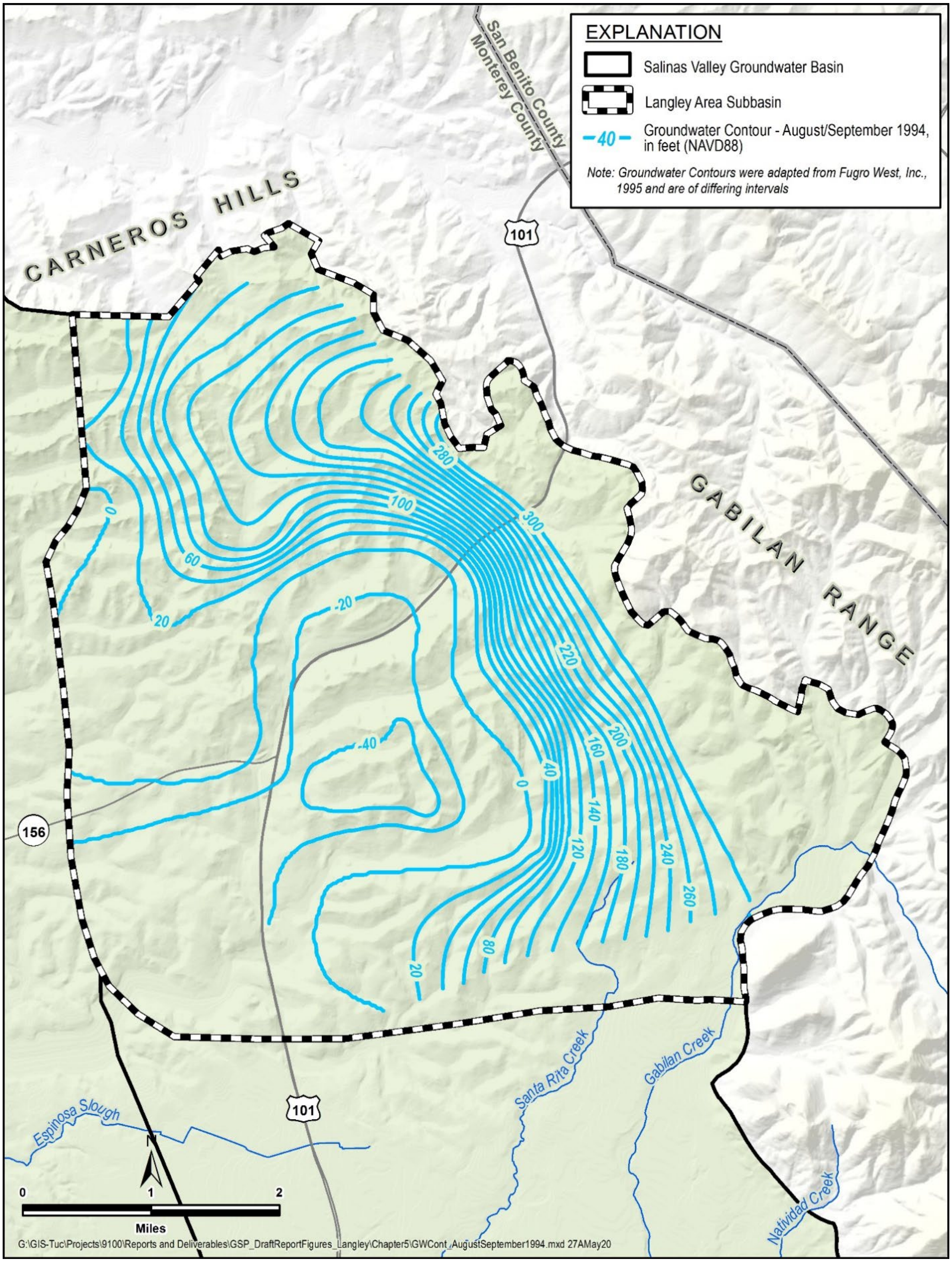


Figure 5-4. August/September 1994 Groundwater Elevation Contours

Groundwater generally flows from the north-northeast toward the south of the Subbasin. Under current conditions (Figure 5-1 and Figure 5-2), groundwater elevations in the southern half of the Subbasin are generally below sea level, estimated as zero feet NAVD88, as indicated by the negative values on the contour lines. The lowest groundwater elevations in the Subbasin occur near the center of the Subbasin with minimum groundwater elevations of approximately -90 feet NAVD88 during the fall measurements (Figure 5-1) and -60 feet NAVD88 during the August measurements (Figure 5-2). These low groundwater elevations are related to a pumping trough centered east of the junction of Highways 101 and 156. The hydraulic gradient differs across the Langley Subbasin due to variable groundwater elevations and thus is difficult to approximate.

Under the historical conditions of 1994, a flow pattern similar to that of current conditions was present in the Langley Subbasin; however, the magnitude of the pumping trough has varied over time. Examples of historical groundwater elevation changes at specific wells are presented in Section 5.1.3.

5.1.3 Hydrographs

Representative temporal trends in groundwater elevations can be assessed with hydrographs, which plot changes in groundwater elevations over time. Groundwater elevation data from wells in the Subbasin are available from monitoring conducted and reported by MCWRA.

Figure 5-5 depicts the locations and hydrographs of example monitoring wells in the Subbasin. Larger versions of the hydrographs for these wells, as well as all representative monitoring wells, are included in Appendix 5A. The locations of all the representative monitoring wells are shown on Figure 5-6. Chapter 7 provides more information specific to the wells and the monitoring system.

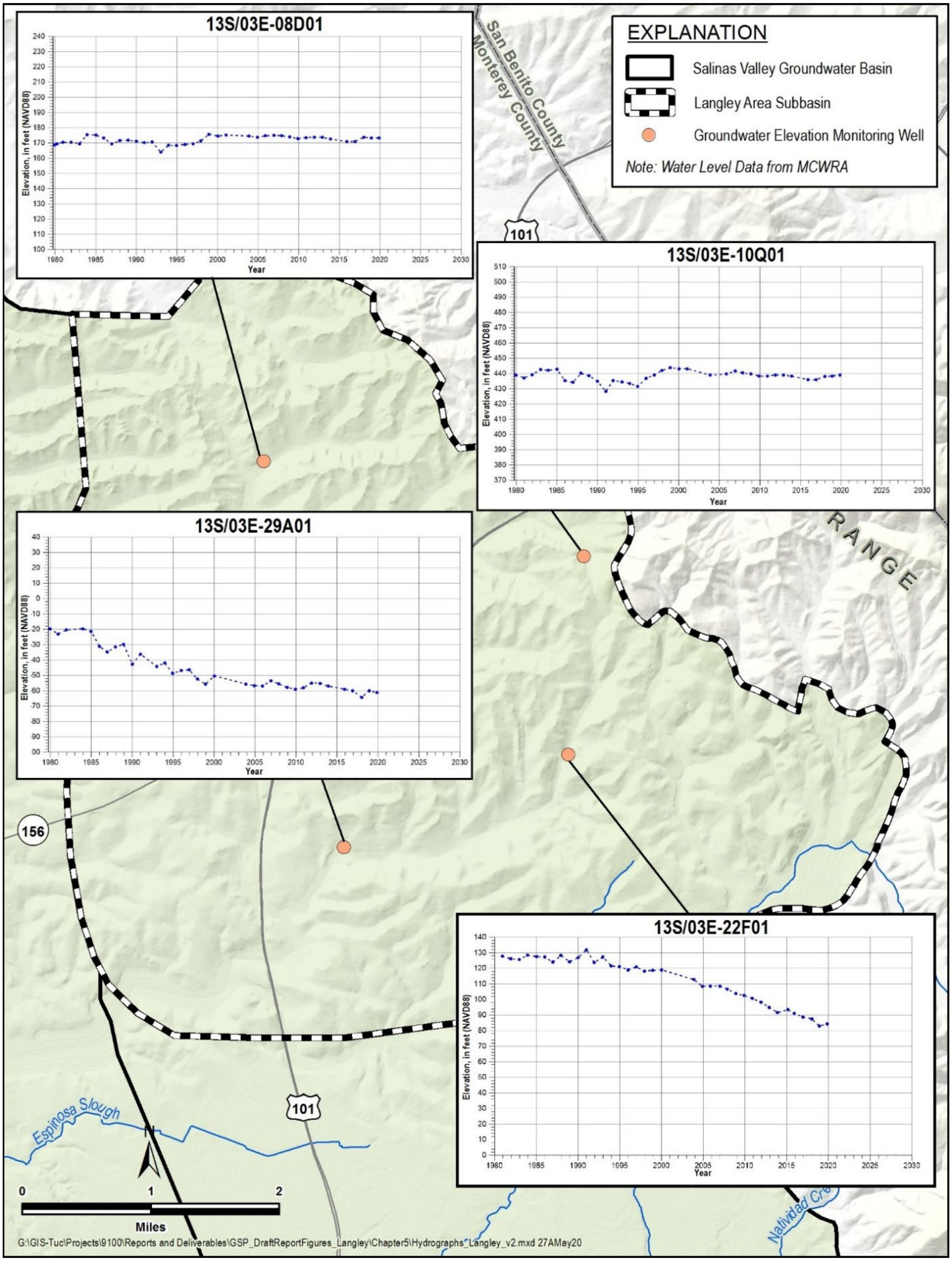


Figure 5-5. Map of Example Hydrographs

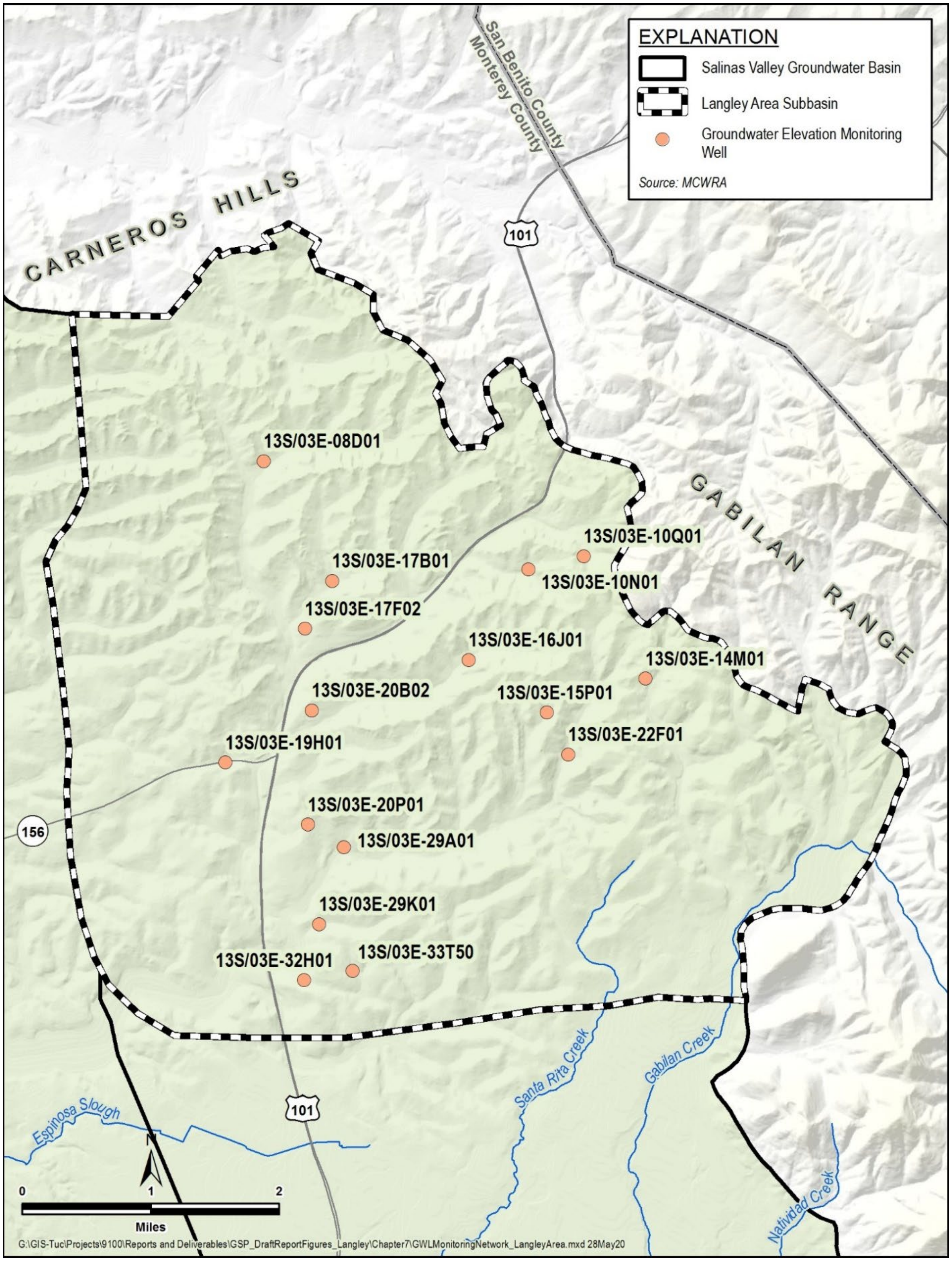


Figure 5-6. Locations of Wells with Hydrographs Included in Appendix 5A

Figure 5-7 presents a graph of cumulative groundwater elevation change for the Langley Subbasin. The graph was initially derived from a graph developed by MCWRA for the Eastside Subarea. Although a majority of the Langley Subbasin is covered by the Eastside Subarea, most of the sampled wells in the Eastside Subarea fall outside the Langley Subbasin (Figure 5-8). To make a graph more representative of the Subbasin, the cumulative analysis was completed using fall groundwater elevation data for wells in the Langley Subbasin only.

Fall measurements occur at the end of the irrigation season and before groundwater levels increase due to seasonal recharge by winter rains. These measurements record annual changes in storage reflective of groundwater recharge and withdrawals in the Subbasin. The cumulative groundwater elevation change plot is therefore an estimated average hydrograph for wells in the Subarea. Although this plot does not reflect the groundwater elevation change at any specific location, it provides a general illustration of how the average groundwater elevation in the Subarea changes in response to climatic cycles, groundwater extraction, and water resources management at the subbasin scale.

It is also important to note that the plot has several data gaps between years. These data gaps exist because groundwater levels are not collected with as much frequency in the Langley Subbasin. Frequency of groundwater elevation collection is a data gap that will be addressed during GSP implementation.

5.1.4 Vertical Groundwater Gradients

The Langley Subbasin is underlain by a single, unconfined aquifer with no extensive aquitards that might result in vertical groundwater gradients. However, vertical gradients could be developed by the cumulative confining effect of many discontinuous clay lenses. As mentioned in Chapter 4, there has been limited detailed hydrostratigraphic analysis in this Subbasin; thus, the level of interconnection among fine sediments is not well defined. Vertical groundwater gradients can be estimated using groundwater level measurements from well pairs or clusters. Insufficient data are available to assess if any vertical gradients exist in the Subbasin.

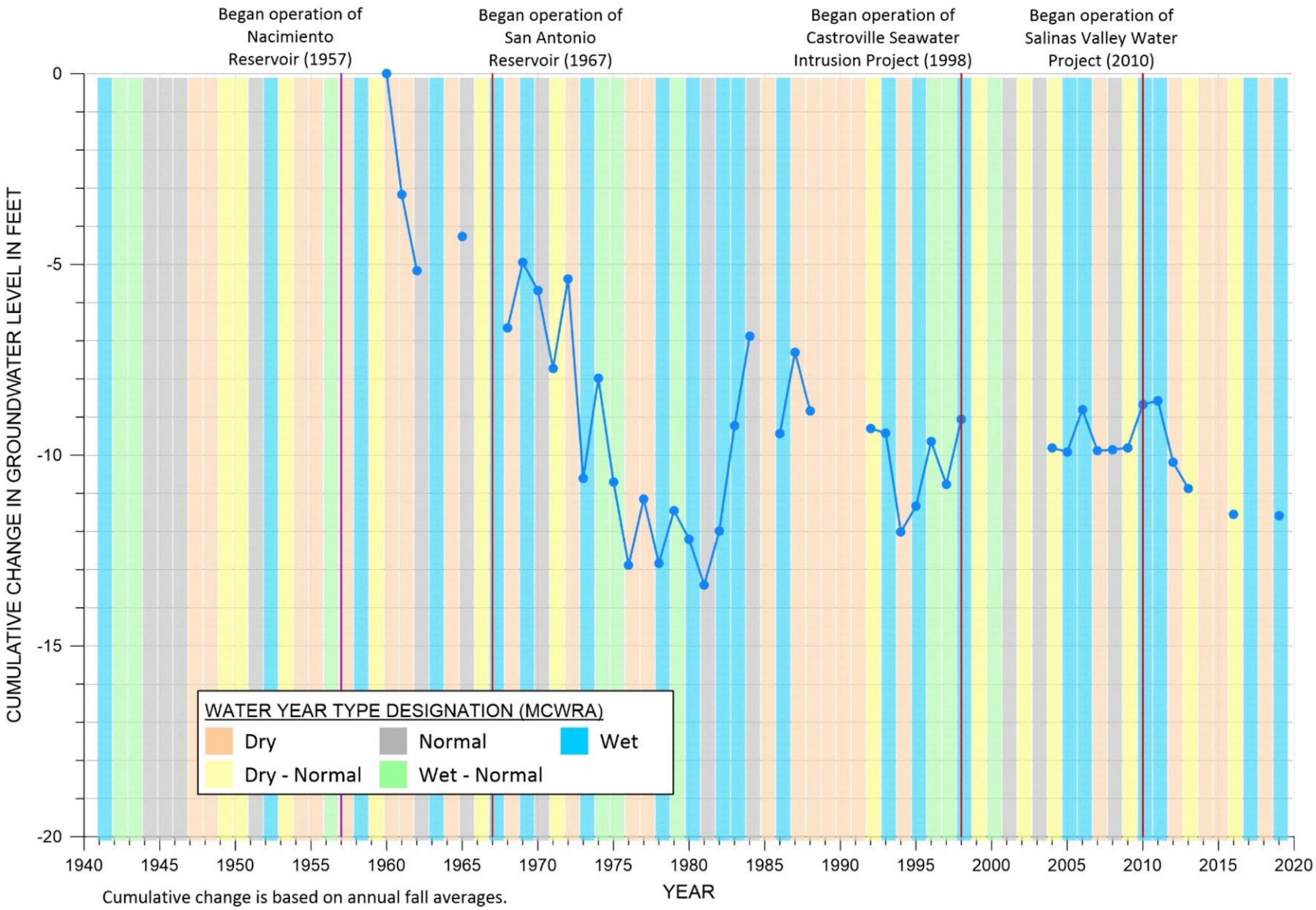


Figure 5-7. Cumulative Groundwater Elevation Change Graph for the Langley Area Subbasin (adapted from MCWRA, 2018a, personal communication)

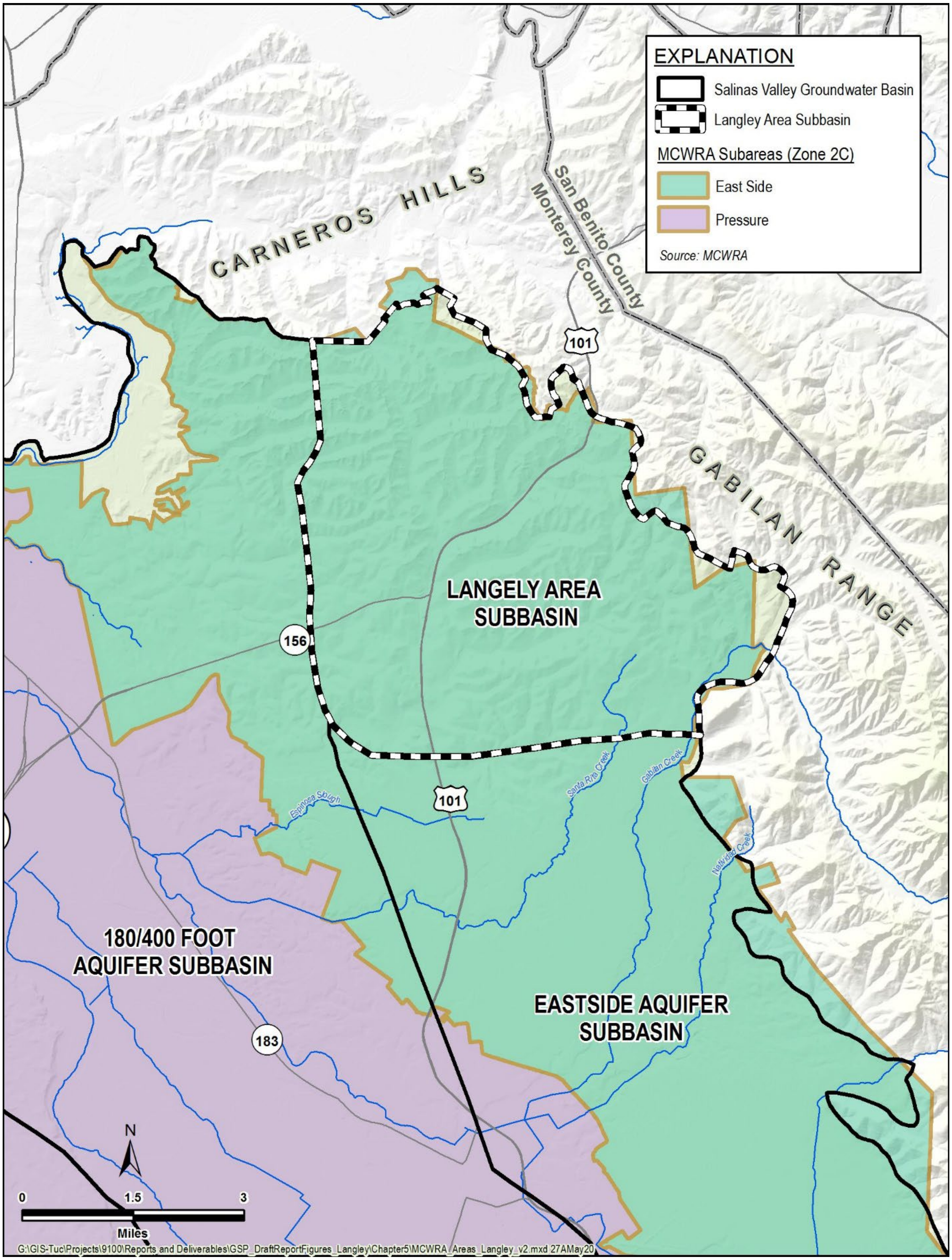


Figure 5-8. MCWRA Management Subareas

5.2 Change in Groundwater Storage

5.2.1 Data Sources

Change in storage is developed based on MCWRA's fall groundwater elevation measurements. This includes historical groundwater elevation measurements used to develop the cumulative change in groundwater elevation graph (Figure 5-7) that is used to estimate cumulative change in groundwater storage over time. Groundwater elevation measurements are also used to create fall groundwater elevation contour maps; the fall 1995 and fall 2019 contour maps are used to determine the spatial distribution of storage change. Fall groundwater elevation contour maps are used rather than spring contours to retain consistency with the cumulative change in groundwater elevation graph.

5.2.2 Change in Groundwater Storage

Change in groundwater storage is derived from change in groundwater elevations in the Subbasin in 2 ways: 1) using the cumulative subbasin-wide average change in groundwater elevations and 2) subtracting the fall 1995 from the fall 2019 groundwater elevation maps. Both approaches rely on observed groundwater elevation changes that provide a measure of the gain and loss of groundwater in storage each year. The change in storage is calculated by multiplying a change in groundwater elevation by a storage coefficient. Storage coefficients depend on the hydraulic properties of the aquifer materials and are commonly measured through long-term pumping tests or laboratory tests. The storage coefficient for the Langley Subbasin is estimated at 0.08 (Brown and Caldwell, 2015). The area of the Langley Subbasin is approximately 17,600 acres.

Both approaches for calculating the change in storage using groundwater elevation changes are based on the following relationship:

$$\Delta S = \Delta WL \times A \times SC$$

Where: ΔS = Annual change in storage volume in the Subbasin (AF/yr.)

ΔWL= Annual change in average groundwater elevation in the Subbasin (ft/yr)

A = Land area of Subbasin (acres)

SC = Storage coefficient (ft^3/ft^3)

Figure 5-9 shows estimated cumulative change in groundwater storage in the Langley Subbasin from 1960 through 2019. This graph is based on MCWRA's cumulative change in fall groundwater elevation data (Figure 5-7). The magnitudes of the groundwater storage changes are calculated by multiplying the annual groundwater elevation change by the storage coefficient and size of the Subbasin. Figure 5-9 shows that the Langley Subbasin has experienced a long-term decline in groundwater storage due to lowering groundwater elevations. The average annual storage loss in the Langley Subbasin between 1960 and 2019 is approximately 390 AF/yr. However, most of this storage loss occurred between 1960 and 1984. After 1984, the average annual storage loss in the Langley Subbasin has been approximately 290 AF/yr. Groundwater elevations have fluctuated over this time period. The change in storage calculation is a reflection of groundwater elevations in the start and end years, which captures the chronic lowering of groundwater levels in the Subbasin. Figure 5-9 also shows the annual change in storage and annual groundwater extractions. Groundwater extractions include an estimate of 600 AF/yr. to account for domestic pumping, as described in Chapter 6. Groundwater extractions reported to GEMS decline after 1996 because agricultural groundwater use decreases.

Figure 5-10 shows the distribution of estimated change in groundwater storage calculated by subtracting the Fall 2019 and the Fall 1995 groundwater elevation maps (Figure 5-1 and Figure 5-3, respectively). The change in the groundwater storage map shows calculated change in storage over an area of approximately 15,900 acres rather than the total Subbasin area because that is the approximate area of the Subbasin that is contoured. The most substantial loss in groundwater storage has occurred around the center of the Subbasin, with a loss of 2 to 4 AF per acre over an area of approximately 350 acres. Change in storage is variable throughout the Subbasin due to varying groundwater elevations, leading to patches of gain and loss of storage across the Subbasin.

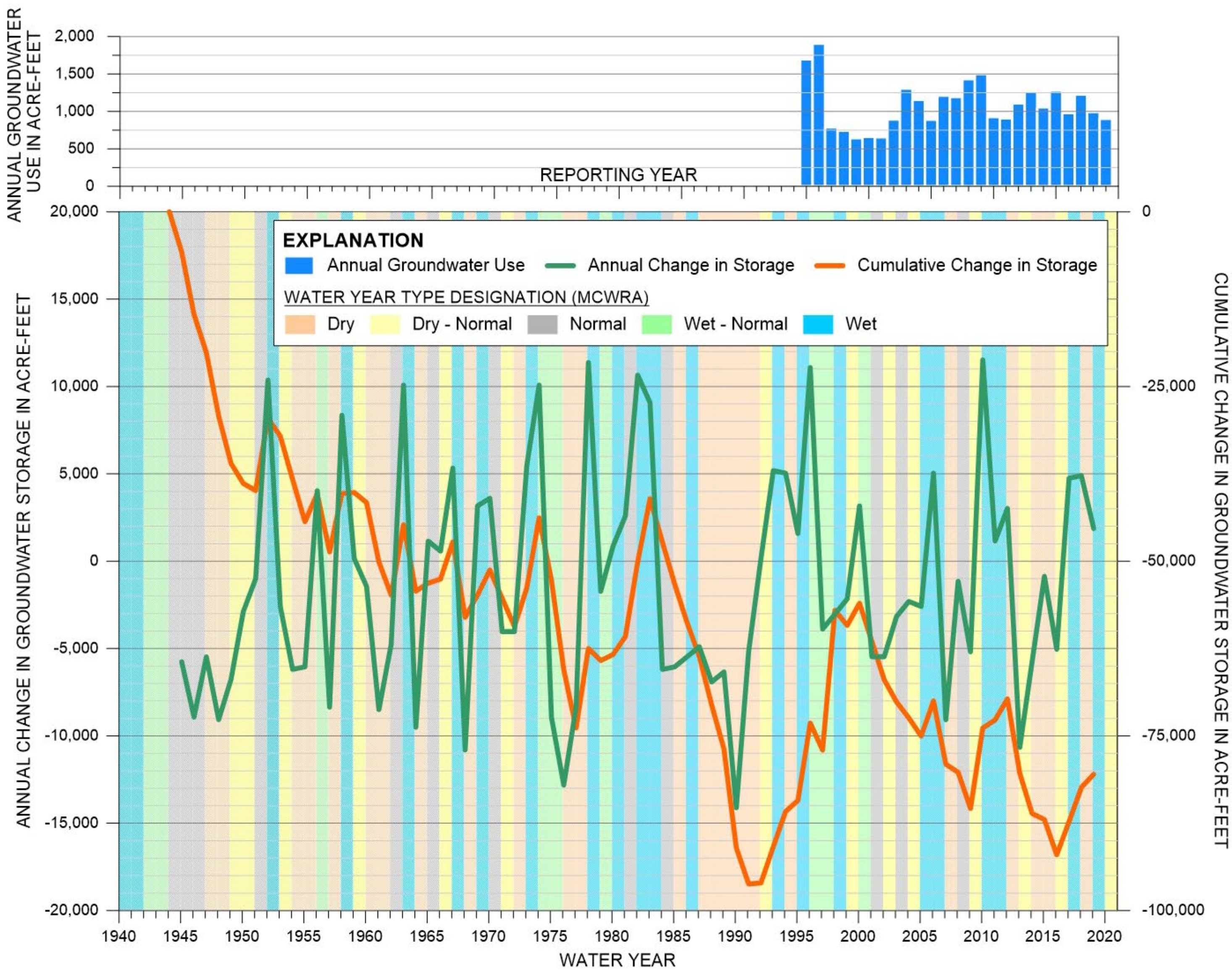


Figure 5-9. Annual and Cumulative Change in Groundwater Storage and Total Groundwater Extraction in the Langley Area Subbasin, Based on Groundwater Elevations (adapted from MCWRA, 2018a, personal communication)

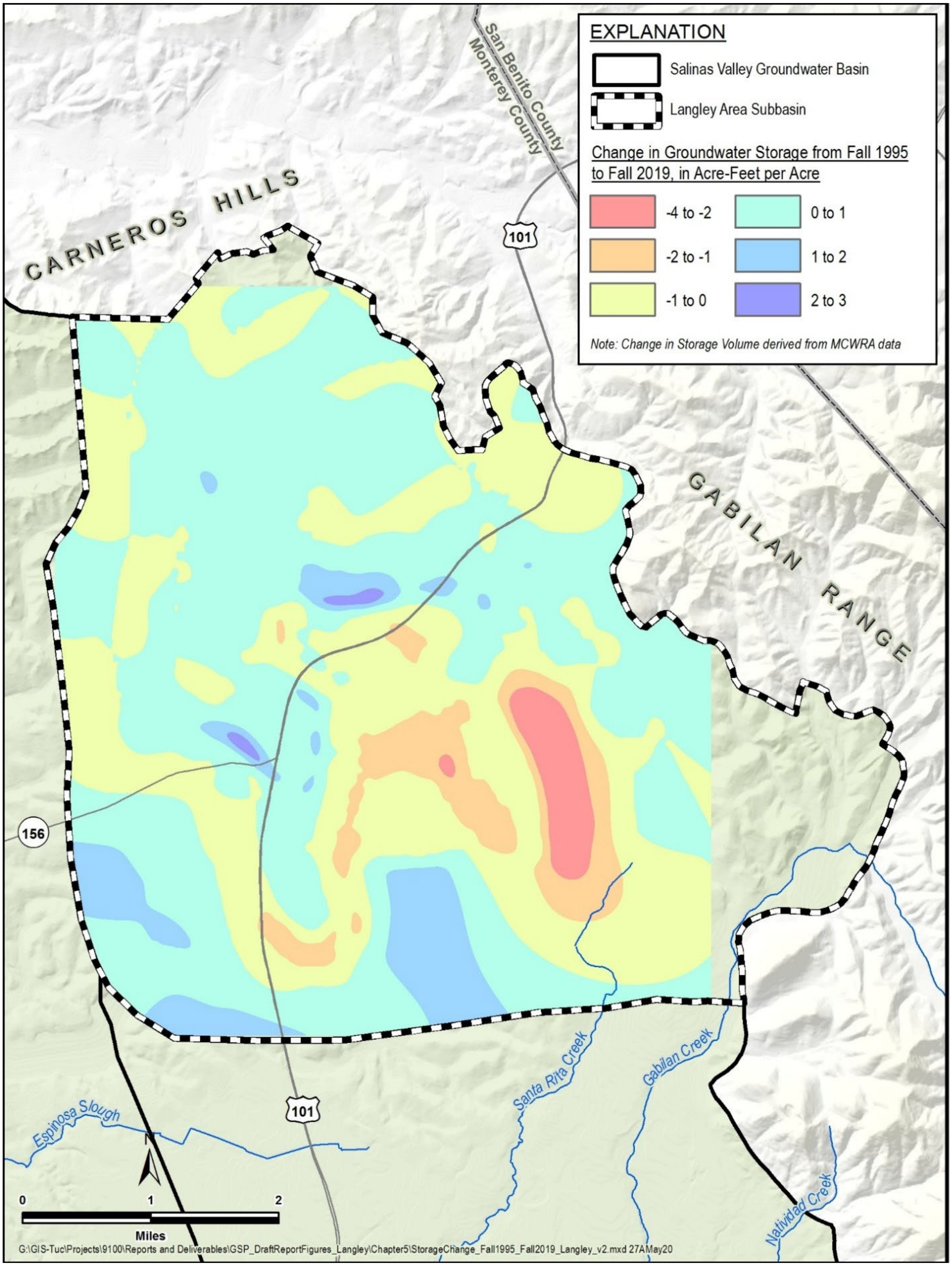


Figure 5-10. Change in Groundwater Storage from Fall 1995 to Fall 2019

5.3 Seawater Intrusion

There is currently no seawater intrusion in the Langley Subbasin. However, the adjacent 180/400-Foot Aquifer Subbasin has been subject to seawater intrusion for more than 70 years.

5.3.1 Data Sources

The extent and advance of seawater intrusion are monitored and reported by MCWRA. Monitoring seawater intrusion has been ongoing since the Agency formed in 1947, and currently includes a network of 152 dedicated monitoring and production wells that are sampled twice annually, in June and August. The water samples are analyzed for general minerals and the analytical results are used by MCWRA to analyze and report the following:

- Maps and graphs of historical chloride and specific conductivity trends
- Stiff diagrams and Piper diagrams
- Plots of chloride concentration vs. Na/Cl molar ratio trends

MCWRA publishes estimates of the extent of seawater intrusion every 2 years. The MCWRA maps define the extent of seawater intrusion as the location of the 500 mg/L chloride concentration isocontour. This chloride concentration is significantly lower than the 19,000 mg/L chloride concentration typical of seawater; however, it represents a concentration that may begin to impact beneficial uses. The 500 mg/L threshold is considered the Upper Limit SMCL for chloride as defined by the EPA and is approximately 10 times the concentration of naturally occurring groundwater in the Subbasin.

5.3.2 Seawater Intrusion Maps and Cross Section

Figure 5-11 shows the MCWRA mapped extents of current and historical seawater intrusion near the Langley Subbasin. The maximum extent of the shaded contours on the figure represents the extent of groundwater with chloride exceeding 500 mg/L during the 2019 monitoring period. The historical progression of the 500 mg/L extent is also illustrated on these figures through the colored overlays that represent the extent of seawater intrusion observed during selected years. The map shows that seawater is close but not yet observed in the Subbasin.

Figure 5-11 also shows the mapped August 2019 groundwater elevations for the Langley Subbasin and the adjacent 180/400-Foot Aquifer and Eastside Aquifer Subbasins. This map shows the groundwater elevations that are persistently below sea levels that, when paired with a pathway, enable seawater intrusion. The groundwater elevation contours show that groundwater is drawn toward the depression at the northern end of the Eastside Aquifer Subbasin. If the magnitude of this depression increases, it could potentially draw seawater intrusion into the Langley Subbasin. However, the contours themselves are not fully representative of flow between the subbasins. As described in Chapter 4, the key characteristic of the Langley Subbasin is the Aromas Sands, which are very permeable. Despite the high permeability and lowered groundwater elevations, the seawater intrusion front is not advancing in the direction of the Subbasin. The groundwater flow relationships between the Langley Subbasin and the Eastside and 180/400-Foot Subbasins are largely uncharacterized as a result of a lack of data both about the sediment changes and the groundwater elevations in the area. This is a data gap that will be addressed during implementation. Because there is no seawater intrusion in the Subbasin, no cross sections are presented showing the extent of seawater intrusion.

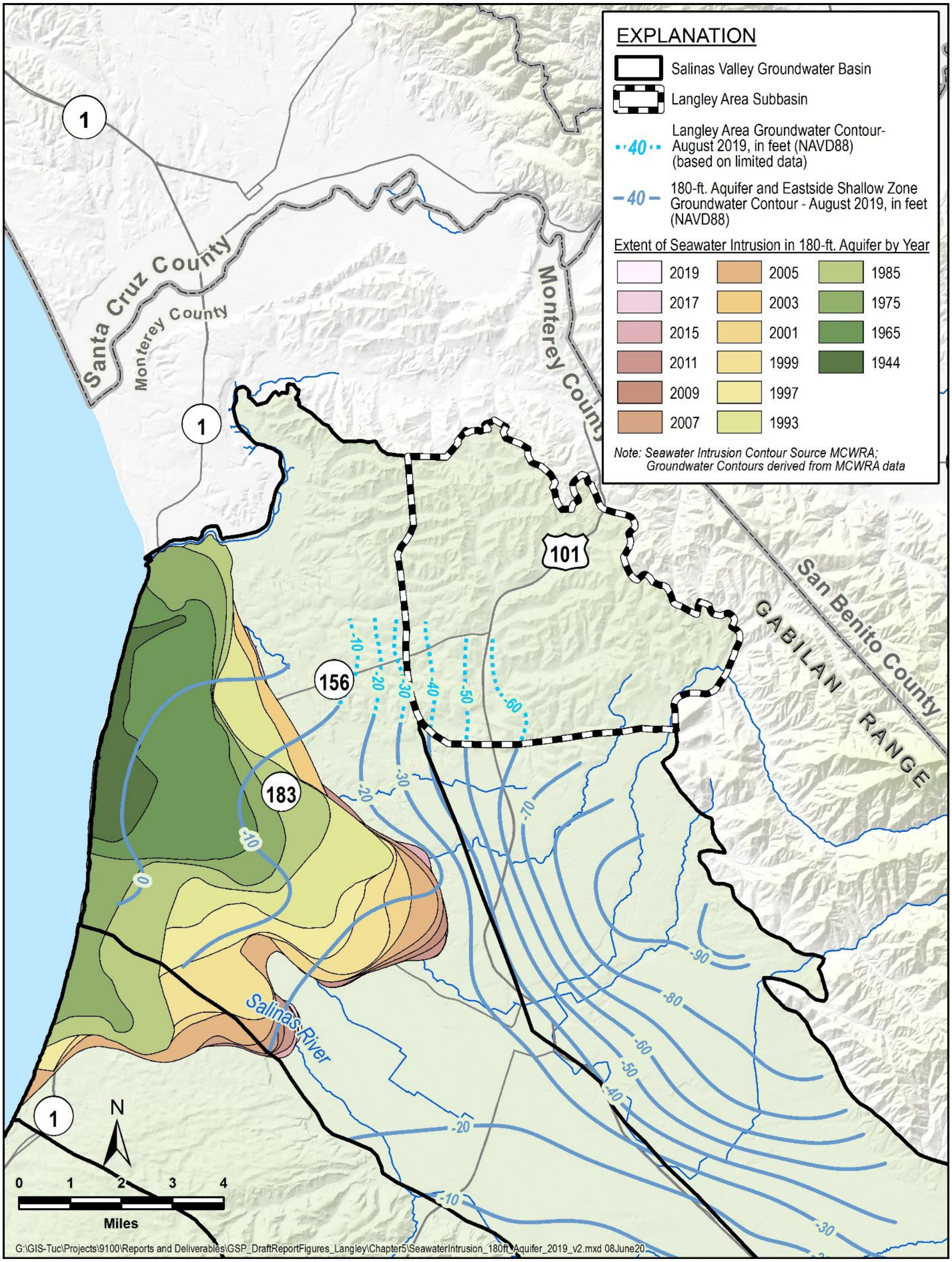


Figure 5-11. Seawater Intrusion in the 180-Foot Aquifer

5.4 Groundwater Quality

The SVBGSA does not have sole regulatory authority over groundwater quality and is not charged with improving groundwater quality in the Salinas Valley Groundwater Basin. Projects and actions implemented by the SVBGSA are not required to improve groundwater quality; however, they must not further degrade groundwater quality.

5.4.1 Data Sources

Groundwater quality samples have been collected and analyzed in the Langley Subbasin for various studies and programs. Groundwater quality samples have also been collected on a regular basis for compliance with regulatory programs. Groundwater quality data for this GSP were collected from:

- The Northern Counties Groundwater Characterization report (CCGC, 2015)
- The USGS's Groundwater Ambient Monitoring and Assessment Program (GAMA) reports (Kulongoski and Belitz, 2005; Burton and Wright, 2018)
- SWRCB's GeoTracker Data Management System (DMS) (SWRCB, 2020a)
- SWRCB's GAMA Groundwater Information System (SWRCB, 2020b)
- The California Department of Toxic Substances Control's (DTSC) EnviroStor DMS (DTSC, 2020)

5.4.2 Point Sources of Groundwater Contaminants

Clean up and monitoring of point source pollutants may be under the responsibility of either the CCRWQCB or the DTSC. The locations of these cleanup sites are visible in SWRCB's GeoTracker database map, publicly available at: https://geotracker.waterboards.ca.gov/. The GeoTracker database is linked to the DTSC's EnviroStor DMS that is used to track cleanup, permitting, and investigation efforts within the Subbasin. They do not include sites that have leaking underground storage tanks, which are not overseen by DTSC or the CCRWQCB.

Table 5-2 and Figure 5-12 provide a summary and map of the 1 active cleanup site within the Subbasin. They do not include sites that have leaking underground storage tanks, which are not overseen by DTSC or the CCRWQCB.

Table 5-2. Active Cleanup Sites

Site Name	Site Type	Status	Constituents of Concern (COC)	Address	City
Crazy Horse Sanitary Landfill	State Response or National Priorities List	Refer: Regional Water Quality Control Board	Biological waste other than sewage sludge, empty containers less than 30 gallons, empty pesticide containers 30 gallons or more, hydrocarbon solvents, other pesticide containers 30 gallons or more	Crazy Horse Canyon Road	Salinas

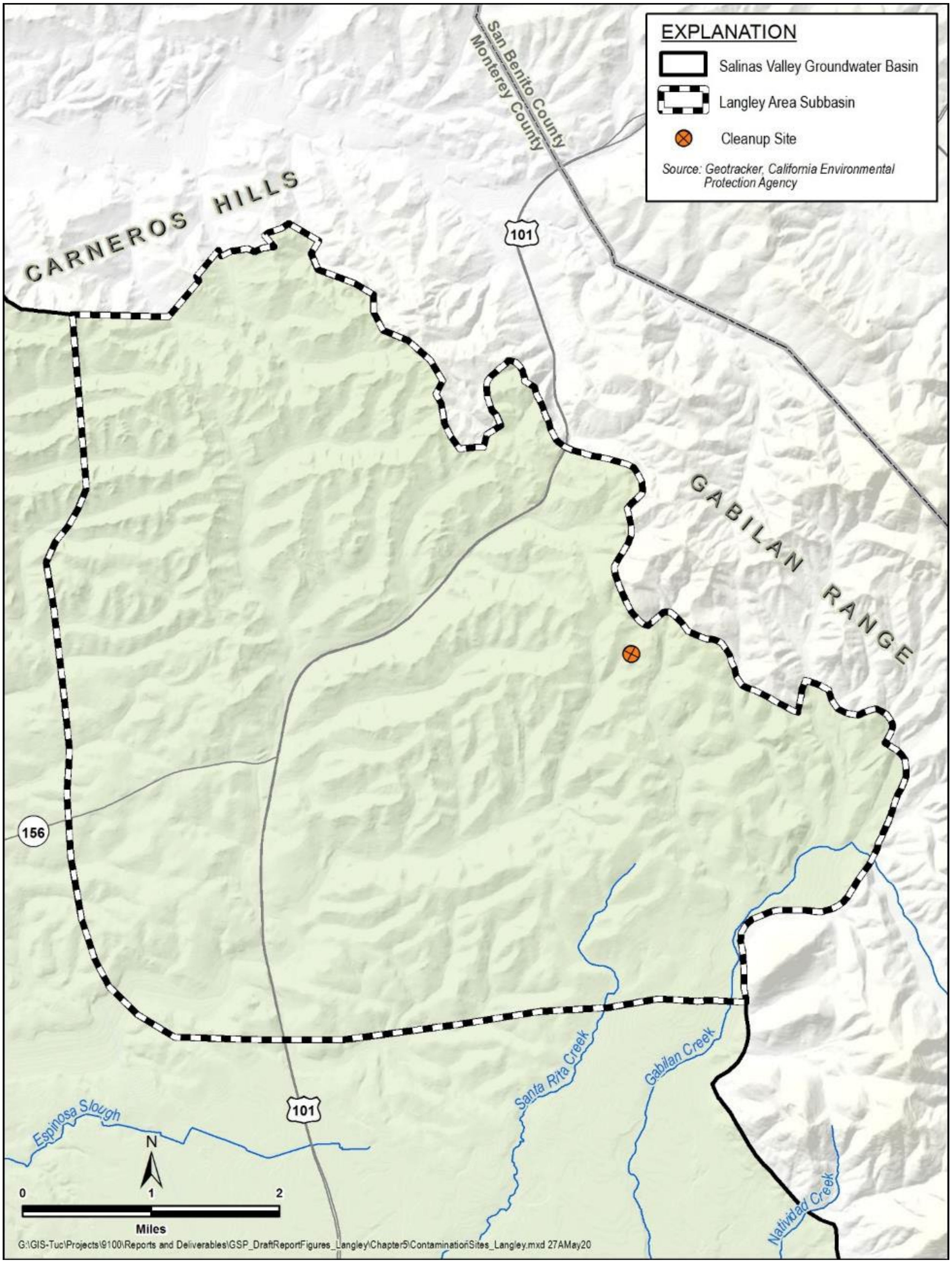


Figure 5-12. Active Cleanup Sites

5.4.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

In addition to the single point source of groundwater contamination described above, the CCRWQCB monitors and regulates activities and discharges that can contribute to non-point pollutants that are released to groundwater over large areas. In the Subbasin, the most prevalent non-point water quality concern is nitrate. The current distribution of nitrate was extensively monitored and evaluated by the CCGC and documented in a report submitted to the CCRWQCB (CCGC, 2015).

Figure 5-13 shows a map of nitrate distribution in the Subbasin prepared by CCGC. The orange and red areas in the north of the Subbasin illustrate the portions of the Subbasin where groundwater has nitrate concentrations above the drinking water MCL of 45 mg/L NO_3.

A May 2018 staff report to the CCRWQCB included a summary of nitrate concentrations throughout the Central Coast Region, including the Salinas Valley Groundwater Basin. The staff report includes data from 2008 to 2018 collected at 2,235 wells in the Salinas Valley Groundwater Basin, during Agricultural Orders 2.0 and 3.0 sampling events. The report states that none of the on-farm domestic wells in the Langley Subbasin exceeded the drinking water MCL with a mean concentration of 4.9 mg/L NO_3. In addition, 9% of irrigation supply wells in the Subbasin exceeded this MCL with a mean concentration of 26.6 mg/L NO_3 (CCRWQCB, 2018).

Some COC can be concentrated at various aquifer depths. Nitrate is a surficial constituent derived from such sources as fertilizer, livestock, and septic systems. Because the sources are all near the surface, nitrate is usually highest near ground surface and decreases with depth. Raising groundwater levels may mobilize additional nitrate. By contrast, arsenic concentrations usually increase with depth, and lowering groundwater levels may mobilize additional arsenic. The distribution and concentrations of COC can be further complicated by location and rate of groundwater pumping. The extent to which pumping affects groundwater quality depends on aquifer properties, distance to contamination, constituent characteristics and transport rate, and the time at which contaminants entered the subsurface. These general relationships have not been analyzed in this Subbasin.

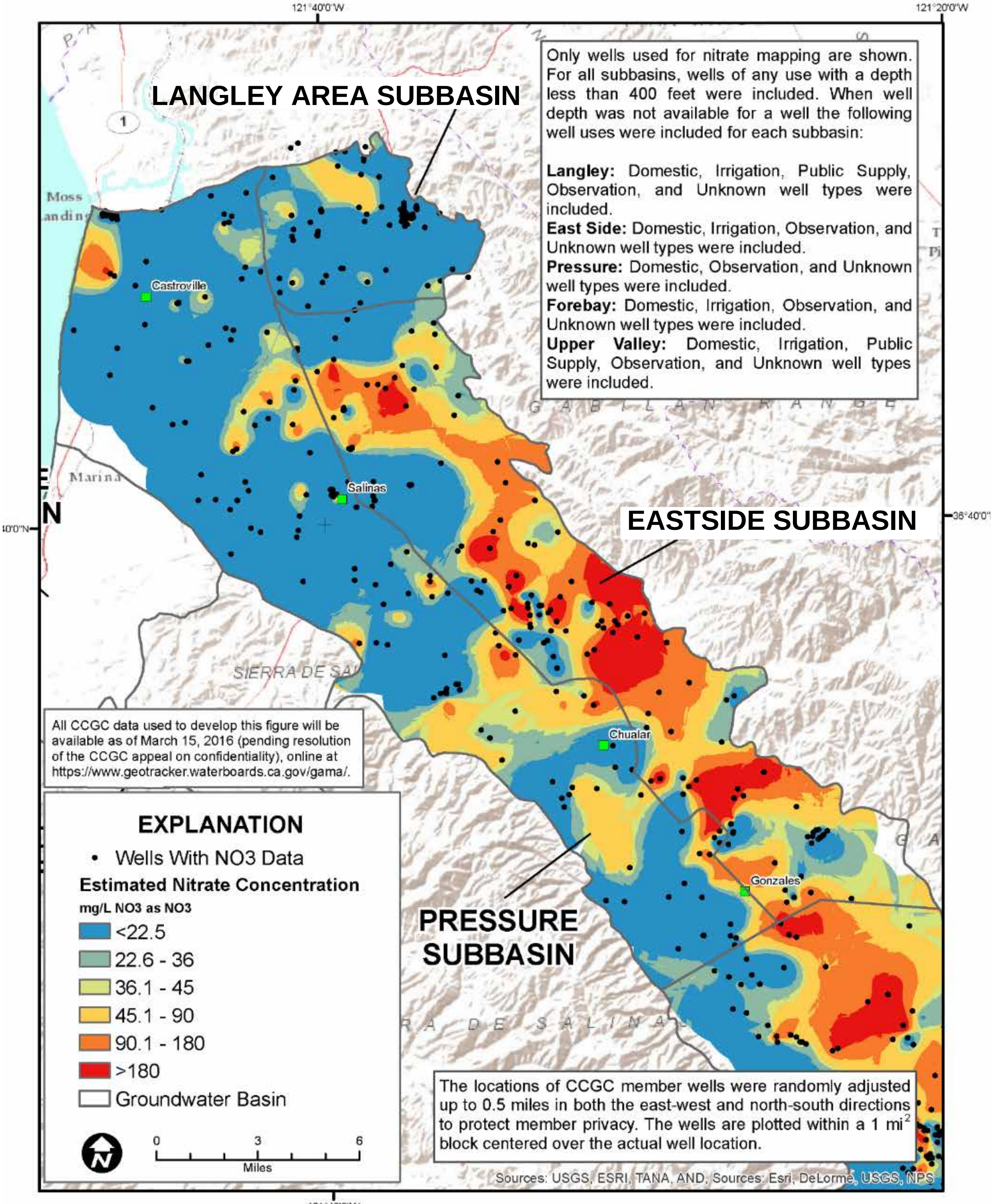


Figure 5-13. Estimated Nitrate Concentrations
(from CCGC, 2015)

Additional groundwater quality conditions in the Basin are summarized in 2 USGS water quality studies in the Salinas Valley. The USGS 2005 GAMA study characterized deeper groundwater resources used for public water supply (Kulongoski and Belitz, 2005). The USGS 2018 GAMA study focused on domestic well water quality (Burton and Wright, 2018). The source data used in these 2 studies and additional publicly available water quality data can be accessed through the SWRCB GAMA groundwater information system at https://gamagroundwater.waterboards.ca.gov/gama/datadownload.

The GAMA groundwater information system includes groundwater quality data for public water system supply wells from the SWRCB Division of DDW, and on-farm domestic wells and irrigation supply wells from CCRWQCB's Irrigated Lands Regulatory Program (ILRP). This GSP relies on established thresholds for COC: MCLs and SMCLs established by the State's Title 22 drinking water standards for public water system supply wells and on-farm domestic wells, and COC levels that may lead to reduced crop production for irrigation supply wells, as outlined in the CCRWQCB's Basin Plan (CCRWQCB, 2019).

Table 5-3 reports the COC in the Langley Subbasin based on GAMA groundwater information system data up to 2019. The number of wells that exceed the regulatory standard for any given COC is based on the latest sample for each well in the monitoring network. Not all wells have been sampled for all COC. Therefore, the percentage of wells with exceedances is the number of wells that exceed the regulatory standard divided by the total number of wells that have ever been sampled for that COC. Additionally, Table 5-3 does not report all constituents that are monitored under Title 22 or the Basin Plan; it only includes the constituents that exceed a regulatory standard. The total list of constituents sampled in the water quality monitoring network are listed in Table 8-5. Maps with the locations of wells that exceeded the regulatory standard for any of the COC listed in Table 5-3 from 2013 to 2019 are provided in Appendix 5B.

Table 5-3. Water Quality Constituents of Concern and Exceedances

Constituent of Concern	Regulatory Exceedance Standard	Standard Units	Number of Wells Sampled for COC	Number of Wells Exceeding Regulatory Standard from latest sample	Percentage of Wells with Exceedances
DDW Wells (Data from July 1986 to December 2019)					
Arsenic	10	UG/L	86	3	3%
Di(2-ethylhexyl) phthalate	4	UG/L	56	1	2%
Benzo(a)Pyrene	0.2	MG/L	56	1	2%
Chloride	500	MG/L	76	2	3%
1,2 Dibromo-3-chloropropane	0.2	UG/L	33	6	18%
Dinoseb	7	UG/L	87	8	9%
Iron	300	UG/L	78	17	22%
Hexachlorobenzene	1	UG/L	31	1	3%
Heptachlor	0.01	UG/L	31	2	6%
Manganese	50	UG/L	76	15	20%
Methyl-tert-butyl ether (MTBE)	13	UG/L	85	1	1%
Nitrate (as nitrogen)	10	MG/L	164	14	9%
Specific Conductance	1600	UMHOS/CM	88	2	2%
1,2,4-Trichlorobenzene	4	UG/L	84	1	1%
1,2,3-Trichloropropane	0.005	UG/L	89	6	7%
Total Dissolved Solids	1000	MG/L	76	2	3%
Vinyl Chloride	0.5	UG/L	188	88[1]	47%
ILRP On-Farm Domestic Wells (Data from January 2014 to August 2014)					
Iron	300	UG/L	1	1	100%
Manganese	50	UG/L	1	1	100%
ILRP Irrigation Supply Wells (Data from November 2012 to October 2019)					
Manganese	0.2	MG/L	9	1	11%

[1]All well exceedances of vinyl chloride occurred prior to 1988, but since they were the last samples taken in those wells, they are included in this count.

5.4.4 Groundwater Quality Summary

Based on the water quality information for DDW and ILRP wells from GAMA groundwater information system, the following are the COC for drinking water supply wells in the Subbasin and will be included in the GSP monitoring program:

- 1,2 dibromo-3-chloropropane
- 1,2,3-trichloropropane
- 1,2,4-trichlorobenzene

- arsenic
- benzo(a)pyrene
- chloride
- di(2-ethylhexyl) phthalate
- dinoseb
- heptachlor
- hexachlorobenzene
- iron
- manganese
- methyl-tert-butyl ether (MTBE)
- nitrate (as nitrogen)
- specific conductance
- total dissolved solids
- vinyl chloride

The only constituent of concern for irrigation supply wells in the Subbasin is manganese. Manganese is known to cause reductions in crop production when irrigation water includes it in concentrations above agricultural water quality objectives.

The COC for active cleanup site listed in Table 5-2 are not part of the monitoring network described in Chapter 7. However, the status of the constituents at this site will continue to be monitored by the DTSC or the CCRWQCB. Furthermore, the COC at this site that have a regulatory standard under Title 22 for drinking water wells, or the Basin Plan for irrigation supply wells will be monitored in the DDW and ILRP wells that are part of the monitoring network.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSA is dependent on the monitoring density and frequency of the DDW and ILRP. The monitoring system is further defined in Chapter 7.

5.5 Subsidence

Land subsidence is the lowering of the ground surface elevation. This is often caused by pumping below thick clay layers. Land subsidence can be elastic or inelastic. Elastic subsidence consists of small lowering and rising of the ground surface that is reversible, while inelastic subsidence is generally irreversible and is the focus of this GSP.

5.5.1 Data Sources

To estimate subsidence, DWR has made Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub. These are the only data used for estimating subsidence in this GSP.

5.5.2 Subsidence Mapping

Figure 5-14 presents a map showing the average annual InSAR subsidence data in the Langley Subbasin between June 2015 and June 2019 (DWR, 2020c). The yellow area on the map is the area with measured changes in ground elevation of between -0.1 and 0.1 foot per year. As discussed in Section 8.9.2.1, because of measurement error in this methodology, any measured ground level changes between -0.1 and 0.1 foot are not considered subsidence. The clear areas on the map are areas with no data available. The map shows that no measurable subsidence has been recorded anywhere in the Subbasin.

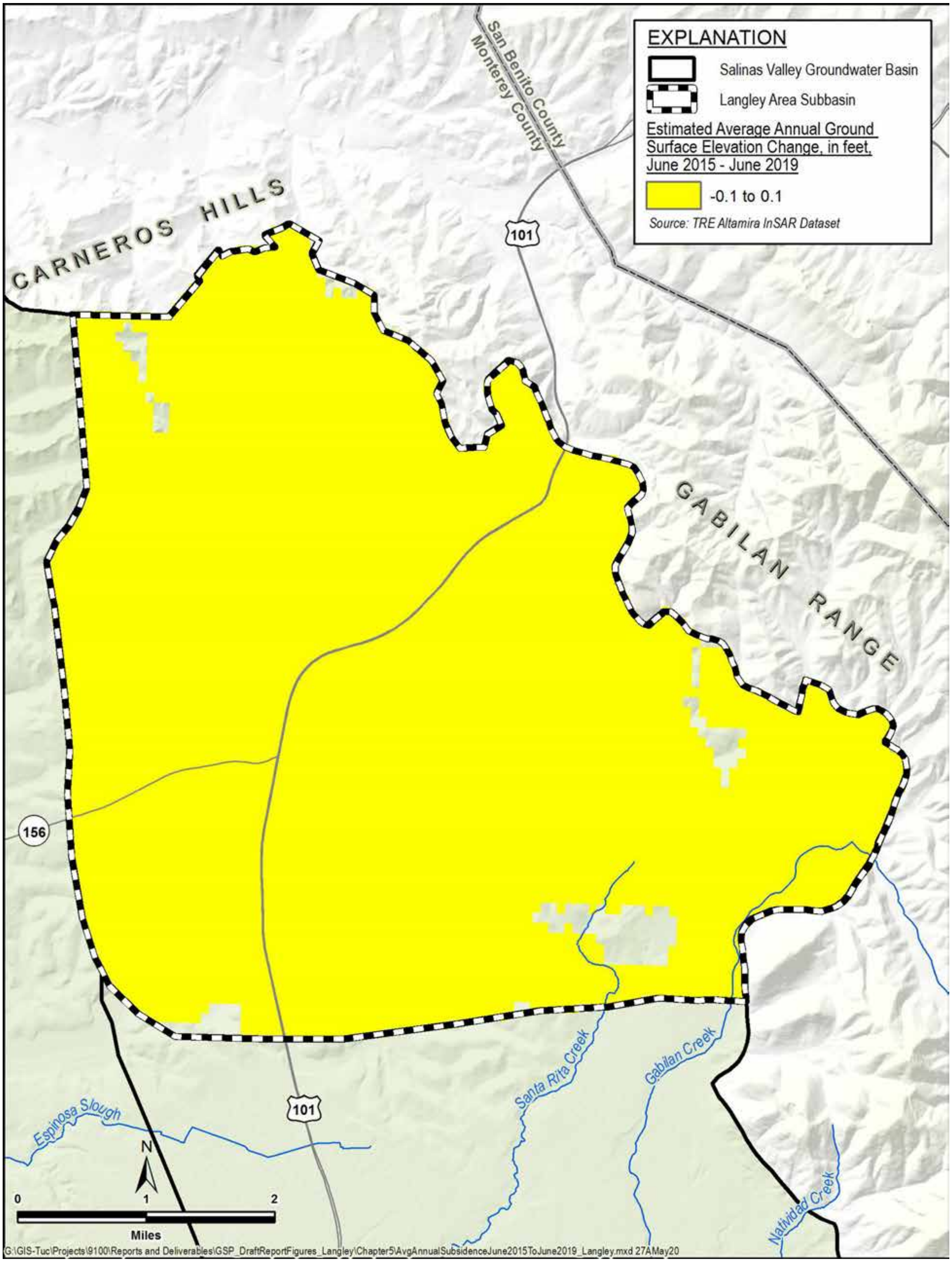


Figure 5-14. Estimated Average Annual InSAR Subsidence in Subbasin

5.6 Interconnected Surface Water

ISW is 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 completed. If groundwater elevations are higher than the water level in the stream, the stream is said to be a gaining stream because it gains water from the surrounding groundwater. If the groundwater elevation is lower than the water level in the stream, it is termed a losing stream because it loses water to the surrounding groundwater. If the groundwater elevation is below the streambed elevation, the stream and groundwater are considered to be disconnected. SGMA does not require that disconnected stream reaches be analyzed or managed. These concepts are illustrated on Figure 5-15. .

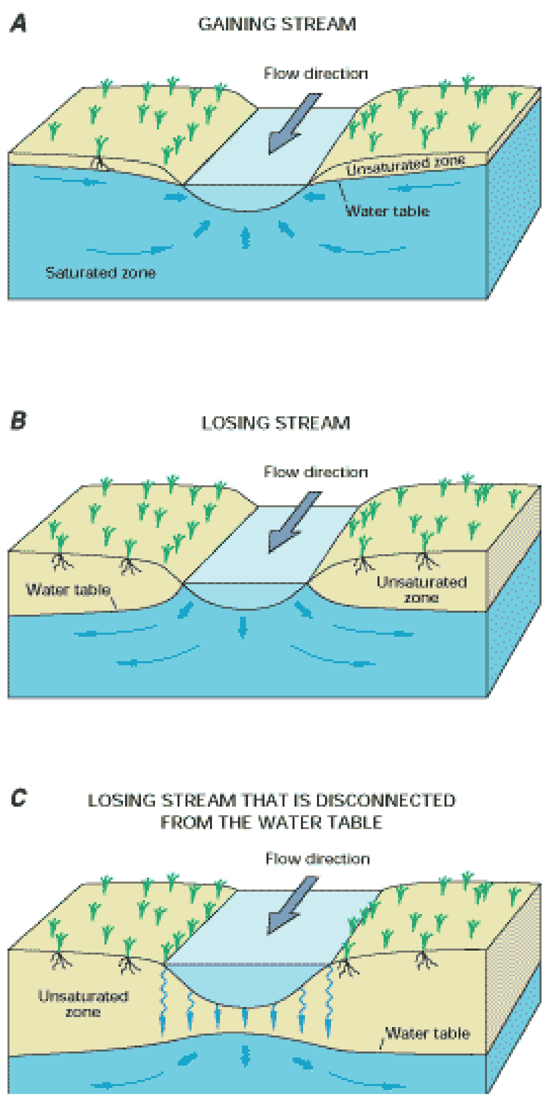


Figure 5-15. Conceptual Representation of Interconnected Surface Water (Winter, et al., 1999)

5.6.1 Data Sources

The preliminary SVIHM is used to map the potential locations of ISW, as described in Chapter 4 and shown on Figure 4-9. There is no data that verifies the location and extent of surface water connection to groundwater, nor the extent to which groundwater extraction depletes surface water. Therefore, this section describes the hydraulic principles that establish the relationship between surface water and groundwater, upon which the current conditions and monitoring network are based.

5.6.2 Evaluation of Surface Water and Groundwater Interconnection

Groundwater extraction can alter flows between surface water and groundwater. Flow changes related to interconnected surface and groundwater could be due to reductions in groundwater discharge to surface water or increases in surface water recharge to groundwater. These 2 changes together constitute the change in the amount of surface water depletion.

Depletion of ISW is estimated by evaluating the change in the modeled stream leakage with and without pumping (i.e., water flowing from the stream into the groundwater system). A model simulation without any groundwater pumping in the model (i.e., SVIHM with no pumping) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping). The difference in stream depletion between the 2 models is the depletion caused by the groundwater pumping. This comparison was undertaken for the entire area of the Salinas Valley included in the model and for the Subbasin. The stream depletion differences are only estimated for the interconnected segments identified on Figure 4-9. The methodology for quantifying stream depletion is described in detail by Barlow and Leake (2012).

Depletion of interconnected sections of surface water bodies in the Subbasin is estimated for every month of the year. Table 5-4 shows the estimated annual average depletion of the ISW along the stream segments shown on Figure 4-9 due to groundwater pumping. Depletions are caused by groundwater pumping within the Langley Subbasin and likely groundwater pumping in adjacent subbasins as well. This is the average historical rate, and as discussed in Chapter 8, surface water depletions from groundwater use in the Subbasin should not increase from this rate, as measured by shallow groundwater levels.

Table 5-4. Average SVIHM Simulated Depletion of Interconnected Surface Waters (AF/yr.)

	Average Annual Depletion
Interconnected Surface Waters	800

Note: provisional data subject to change.[2]

[2] These data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

6 WATER BUDGETS

This chapter summarizes the estimated water budgets for Langley Subbasin, including information required by the GSP Regulations and information that is important for developing an effective plan to achieve sustainability. In accordance with the GSP Regulations § 354.18, this water budget 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 groundwater in storage. Water budgets are reported in graphical and tabular formats, where applicable.

6.1 Overview of Water Budget Development

The water budgets are presented in 2 subsections: (1) historical and current water budgets, and (2) future water budgets. Within each subsection a surface water budget and groundwater budget are presented.

Historical and current water budgets are being developed using a provisional version of the Salinas Valley Integrated Hydrologic Model (SVIHM) developed by the USGS. The SVIHM is a numerical groundwater-surface water model that was constructed using the code MODFLOW-OWHM (Boyce et al., 2020). This code is a version of the USGS groundwater flow code MODFLOW that estimates the agricultural supply and demand, through the Farm Process.

The model area covers the Salinas Valley Groundwater Basin from the Monterey-San Luis Obispo County Line in the south to the Pajaro Basin in the north, including the offshore extent of the major aquifers. The model includes operations of the San Antonio and Nacimiento reservoirs. The SVIHM is supported by 2 sub models: a geologic model known as the Salinas Valley Geologic Model (SVGM) and a watershed model known as the Salinas Valley Watershed Model (SVWM), which uses the Hydrologic Simulation Program – Fortran (HSPF) code. The SVIHM is not yet released by the USGS. Details regarding source data, model construction and calibration, and results for historical and current water budgets will be summarized in more detail once the model and associated documentation are available. Appendix 6A includes an overview of the development and progress of the SVIHM.

Future water budgets are being developed using an evaluation version of the Salinas Valley Operational Model (SVOM), developed by the USGS and MCWRA. The SVOM is a numerical groundwater-surface water model constructed with the same framework and processes as in the SVIHM; however, the SVOM is designed for simulating future scenarios and includes complex surface water operations in the Surface Water Operations module. The SVOM is not yet released by the USGS. Appendix 6A includes an overview of the SVOM, its development, and inputs.

In accordance with GSP Regulations § 354.18, an integrated groundwater budget is being developed for the combined inflows and outflows of the principal aquifer for each water budget period. The Langley Subbasin has only 1 principal aquifer and groundwater is pumped from it for beneficial use.

6.1.1 Water Budget Components

The water budget is an inventory of surface water and groundwater inflows and outflows from the Subbasin. Some components of the water budget can be measured, such as groundwater pumping from a metered well, precipitation, and surface water diversions. Other components are not easily measured and can be estimated using groundwater models, such as the SVIHM; these include unmetered agricultural pumping, recharge from precipitation and irrigation return flows, and change of groundwater in storage. Figure 6-1 presents a general schematic diagram of the HCM that is included in the water budget (DWR, 2020d).

The water budgets for the Subbasin are calculated within the following boundaries:

- **Lateral boundaries.** The perimeter of the Langley Subbasin within the SVIHM is shown on Figure 6-2.
- **Bottom.** The base of the groundwater subbasin as described in the HCM is defined as the base of the usable and productive unconsolidated sediments (Durbin *et al.* 1978). This ranges from 200 feet below ground surface along Gabilan Creek in the southeast of the Subbasin to more than 1,000 feet deep in the southwest. The water budget is not sensitive to the exact definition of this base elevation because it is defined as a depth below where there is not significant inflow, outflow, or change in storage.
- **Top.** The top of the water budget area is above the ground surface, such that surface water is included in the water budget.

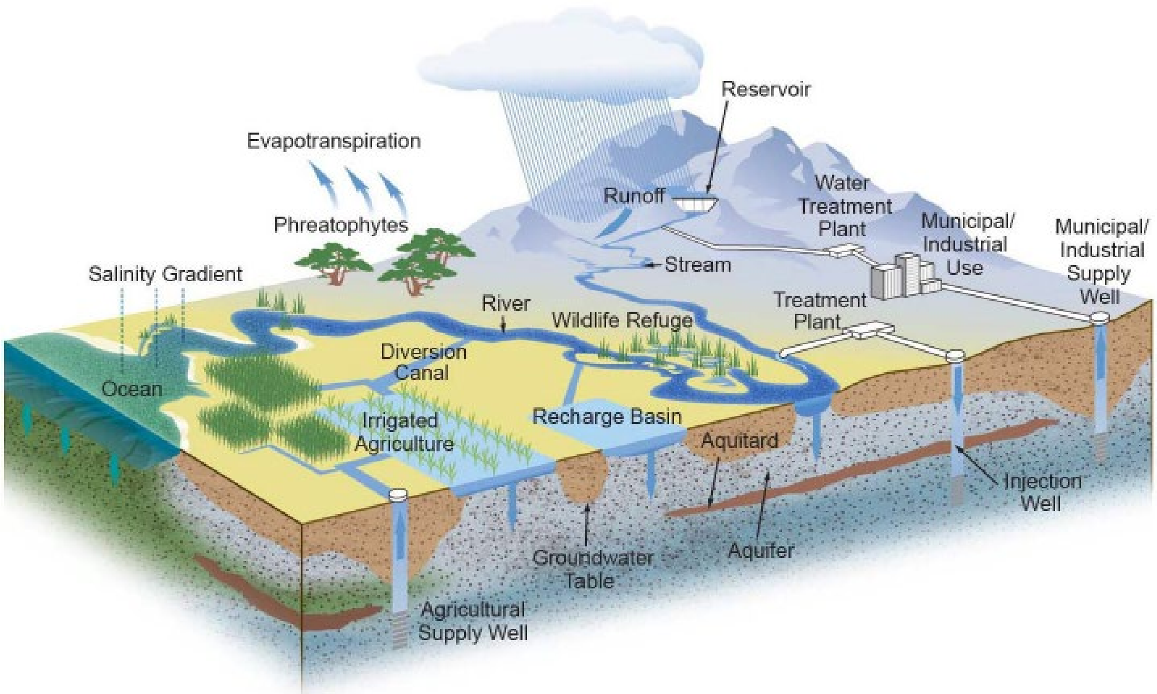


Figure 6-1. Schematic Hydrogeologic Conceptual Model (from DWR, 2020d)

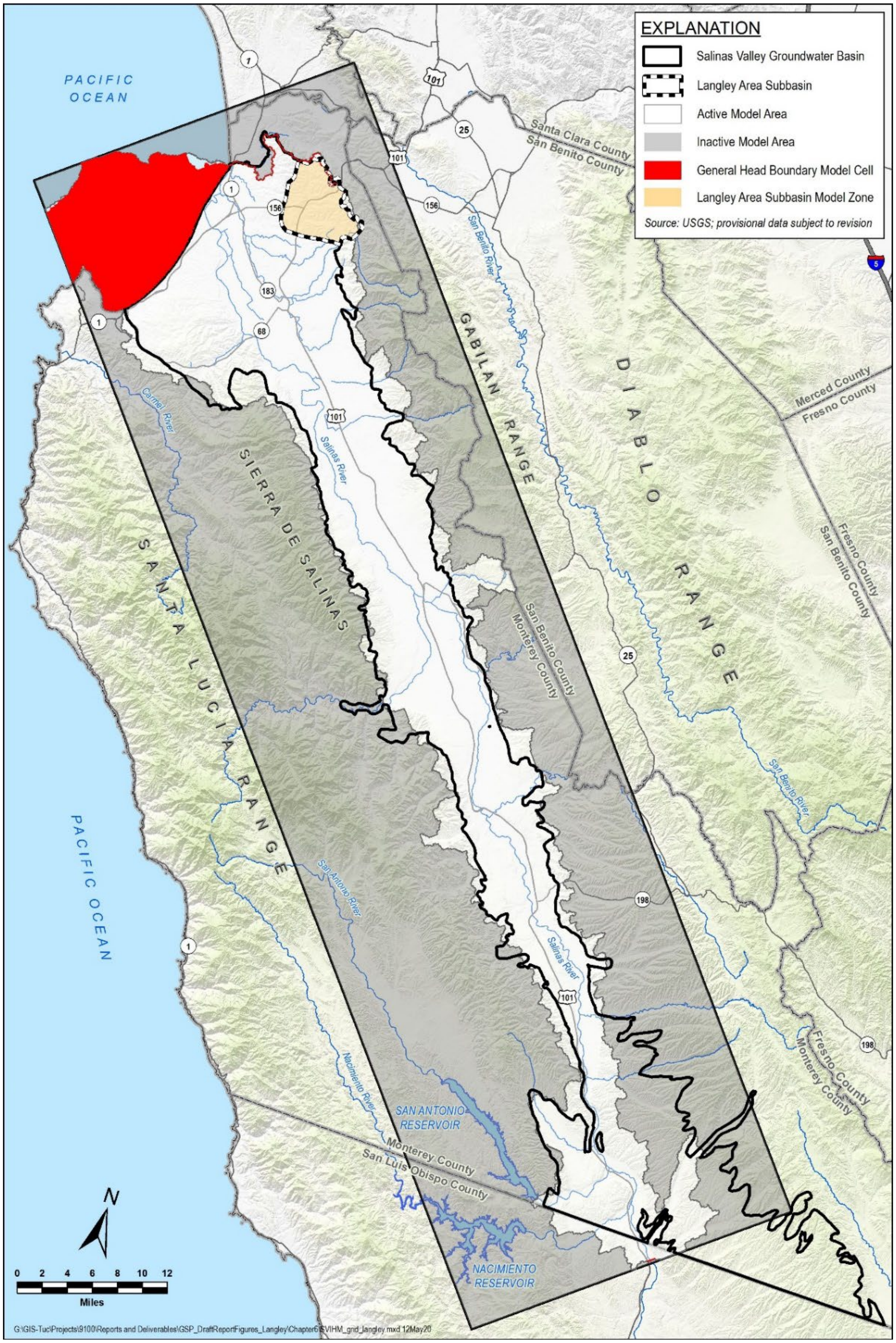


Figure 6-2. Zones and Boundary Conditions for the Salinas Valley Integrated Hydrologic Model

The Langley Subbasin water budget includes the following components:

Surface Water Budget:

- Inflows
  - Runoff of precipitation (overland flow)
  - Surface water inflows along Gabilan Creek and other smaller streams that enter the Subbasin
  - Groundwater discharge to streams
- Outflows
  - Stream recharge to groundwater
  - Outflow to neighboring subbasins along Gabilan Creek, Santa Rita Creek, and other smaller streams

Groundwater Budget:

- Inflows
  - Deep percolation from precipitation and applied irrigation water (recharge)
  - Streambed recharge to groundwater
  - Subsurface inflows:
    - Inflow from 180/400-Foot Aquifer Subbasin
    - Inflow from Eastside Aquifer Subbasin
    - Inflow from Pajaro Valley (Elkhorn Slough)
  - Subsurface inflow from the surrounding watershed that are not in other DWR subbasins
- Outflows
  - Groundwater pumping (including urban, industrial, domestic, and agricultural)
  - Crop and riparian ET
  - Groundwater discharge to streams
  - Groundwater discharge to drains
  - Subsurface outflows:
    - Outflow to Eastside Aquifer Subbasin
    - Outflow to 180/400-Foot Aquifer Subbasin

- Outflow to Pajaro Valley (Elkhorn Slough)

The difference between groundwater inflows and outflows is equal to the change of groundwater in storage.

6.1.2 Water Budget Time Frames

Time periods must be specified for each of the 3 required water budgets. The GSP Regulations require water budgets for historical conditions, current conditions, and projected conditions, as follows:

- The historical water budget is intended to evaluate how past land use and water supply availability has affected aquifer conditions and the ability of groundwater users to operate within the sustainable yield. GSP Regulations require that the historical water budget include at least the most recent 10 years of water budget information. DWR's Water Budget Best Management Practices (BMP) document further states that the historical water budget should help develop an understanding of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the basin within the sustainable yield. Accordingly, historical conditions should go back to the most reliable historical data that are available for GSP development and water budgets calculations.
- The current water budget is intended to allow the GSA and DWR to understand the existing supply, demand, and change in storage under the most recent population, land use, and hydrologic conditions. Current conditions are generally the most recent conditions for which adequate data are available and that represent recent climatic and hydrologic conditions. Current conditions are not well defined by DWR but can include an average over a few recent years with various climatic and hydrologic conditions.
- The projected water budget is intended to quantify the estimated future baseline conditions. The projected water budget estimates the future baseline conditions concerning hydrology, water demand, and surface water supply over a 50-year planning and implementation horizon. It is based on historical trends in hydrologic conditions which are used to project forward 50 years while considering projected climate change and sea level rise if applicable.

Although there is a significant variation between wet and dry seasons, the GSP does not consider separate seasonal water budgets for the groundwater budget. All water budgets are developed for complete water years. Selected time periods for the historical and current water budgets are summarized in Table 6-1 and Figure 6-3. and described in Sections 6.1.2.1 and 6.1.2.2.

Table 6-1. Summary of Historical and Current Water Budget Time Periods

Time Period	Proposed Date Range	Water Year Types Represented in Time Period	Rationale
Historical	Water years 1980 through 2016	Dry: 11 Dry-Normal: 7 Normal: 5 Wet-Normal: 3 Wet: 11	Provides insights on water budget response to a wide range of variations in climate and groundwater use over an extensive period of record. Begins and ends in years with average precipitation.
Current	Water Year 2016	Dry-Normal: 1	Best reflection of current land use and water use conditions based on best available data.

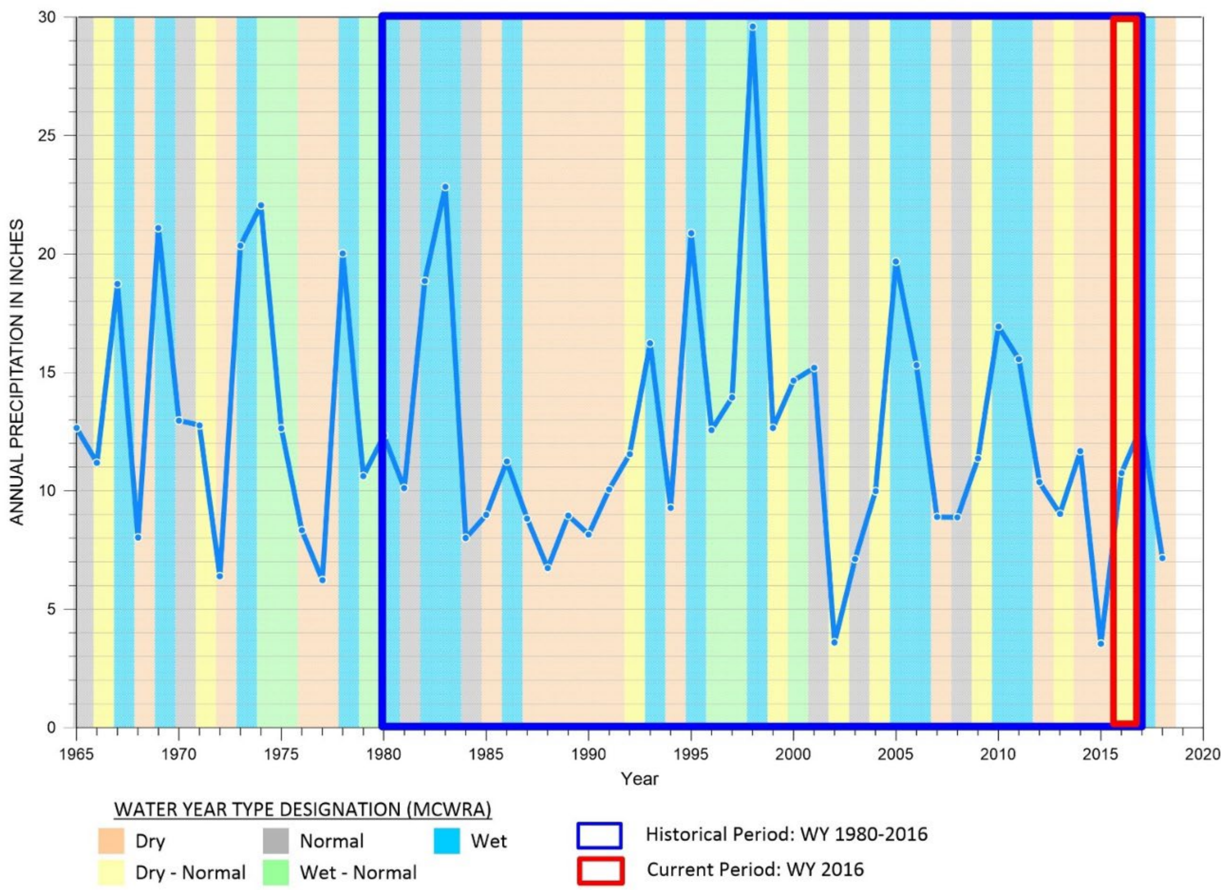


Figure 6-3. Climate and precipitation for Historical and Current Water Budget Time Periods

6.1.2.1 Historical Water Budgets Time Period

GSP Regulations § 354.18 require that the historical water budget be based on at least 10 years of data. The water budget is computed using results from the SVIHM numerical model for October 1980 through September 2016. The SVIHM simulation covers water years 1967 through

2017; however, model results for years prior to 1980 and the year 2017 were not used for this water budget due to potential limitations and uncertainties in the provisional SVIHM. Water years 1980 through 2016 comprise a representative time period with both wet and dry periods in the Subbasin (Table 6-1, Figure 6-3).

6.1.2.2 Current Water Budget Time Period

The current water budget time period is also computed using the SVIHM numerical model and is based on water year 2016. Water year 2016 is classified as dry-normal and is reflective of current and recent patterns of groundwater use and surface water use. Although Water Year 2016 appropriately meets the regulatory requirement for using the "…most recent hydrology, water supply, water demand, and land use information" (23 California Code of Regulations §354.18 (c)(1)), it is noted that water year 2016 was preceded by multiple dry or dry-normal years.

6.1.2.3 Future Projected Water Budgets Time Period

Future projected conditions are based on model simulations using the SVOM numerical flow model, using current reservoir operations rules, projected climate-change scenario, and estimated sea level rise. The projected water budget represents more than 50 years of future conditions. Following DWR guidance on implementing climate change factors, the future water budget simulations do not simulate a 47-year projected future, but rather simulate 47 likely hydrologic events that may occur in 2030, and 47 likely hydrologic events that may occur in 2070.

6.2 Overview of Model Assumptions for Water Budget Development

Table 6-2 provides the detailed water budget components and known model assumptions and limitations for each. A few water budget components are directly measured, but most water budget components are either estimated as input to the model or simulated by the model. Both estimated and simulated values in the water budgets are underpinned by certain assumptions. These assumptions can lead to uncertainty in the water budget. However, inputs to the preliminary SVIHM were carefully selected by the USGS and cooperating agencies using best available data, reducing the level of uncertainty.

In addition to the model assumptions, additional uncertainty stems from any model's imperfect representation of natural condition and level of calibration. The water budgets for the Langley Subbasin are based on a preliminary version of the SVIHM, with limited documentation of model construction. The model is in internal review at the USGS, and a final version will likely not be released to the SVBGSA until after the GSP is submitted. Nonetheless, the SVIHM's calibration error is within reasonable bounds. Therefore, the model is the best available tool for estimating water budgets for the GSP.

As GSP implementation proceeds, the SVIHM will be updated and recalibrated with new data to better inform model simulations of historical, current, and projected water budgets. Model assumptions and uncertainty will be described in future updates to this chapter after model documentation is released by the USGS.

Table 6-2. Summary of Water Budget Component Data Source from the Salinas Valley Integrated Hydrologic Model

Water Budget Component	Source of Model Input Data	Limitations
Precipitation	Incorporated in calibrated model as part of land use process	Estimated for missing years
Surface Water Inflows		
Inflow from Streams Entering Basin	Simulated from calibrated model for all creeks	Not all creeks are gauged
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks
Overland Runoff	Simulated from calibrated model	Based on land use, precipitation, and soils specified in model
Surface Water Outflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Diversions	Model documentation not available at this time	Based on calibration of streamflow to available data from gauged creeks
Outflow to Streams Leaving Basin	Simulated from calibrated model for all creeks	Not all creeks are gauged
Groundwater Inflows		
Streambed Recharge to Groundwater	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Deep percolation of irrigation water	Simulated from demands based on crop, acreage, temperature, and soil zone processes	No measurements available; based on assumed parameters for crops and soils
Subsurface Inflow from neighboring basins	Simulated from calibrated model	Limited groundwater calibration data in adjacent basins
Subsurface Inflow from surrounding watershed other than neighboring basins	Simulated from calibrated model	Limited groundwater calibration data in adjacent basins
Groundwater Outflows		
Groundwater Pumping	Reported data for historical urban and agricultural pumping, and some small water systems. Model documentation not available at this time.	Water budget pumping reported herein is from the SVIHM and might contain errors. Domestic pumping not simulated in model; estimated separately
Groundwater Discharge to Streams	Simulated from calibrated model	Based on calibration of streamflow to available data from gauged creeks and groundwater level data from nearby wells
Subsurface Outflow to Adjacent Basins	Simulated from calibrated model	Limited calibration data in adjacent boundaries
Riparian ET	Simulated from calibrated model	Based on representative plant group and uniform extinction depth

6.3 Historical and Current Water Budgets

Water budgets for the historical and current periods are presented below. The surface water budgets are presented first, followed by the groundwater budgets. These results are based on the provisional SVIHM and are subject to change in the future. Water budgets will be updated in future GSP updates after the SVIHM is formally released by the USGS.

6.3.1 Historical and Current Surface Water Budget

The surface water budget accounts for the inflows and outflows for the stream network within the Subbasin. This includes streamflows of tributaries that enter and exit the Subbasin as well as flows into and out of streams within the Subbasin. Flows within the Subbasin include overland runoff to streams, and stream-aquifer interactions. Stream-aquifer interactions within the Subbasin including recharge to groundwater and discharge from groundwater are also part of the groundwater budget. ET by riparian vegetation along stream channels is estimated by the provisional SVIHM as part of the groundwater system and is accounted for in the groundwater budget.

Figure 6-4 shows the surface water network simulated in the provisional SVIHM. The network includes the Gabilan Creek and other streams in the subbasin. The model accounts for surface water flowing in and out across the subbasin boundary. For this water budget, boundary inflows and outflows are the sum of all locations that cross the Subbasin boundary. In some instances, a simulated stream might enter and exit the Subbasin boundary at multiple locations, such as along the southern boundary of the Langley Subbasin.

Table 6-3 shows the surface water budget for the historical period, which also includes the current period. Table 6-3 shows the average values for components of the surface water budget for the historical and current periods, respectively. Positive values are inflows into the stream system, and negative values are outflows from the stream system. Boundary inflows and outflows dominate the surface water budget in all but the driest years. The streambed exchange in the Subbasin is generally net positive, which indicates more groundwater discharge to streams than deep percolation (seepage) of streamflow to groundwater. The value of the net streambed exchange depends less on year-to-year variability in precipitation, and more on longer-term variability in precipitation.

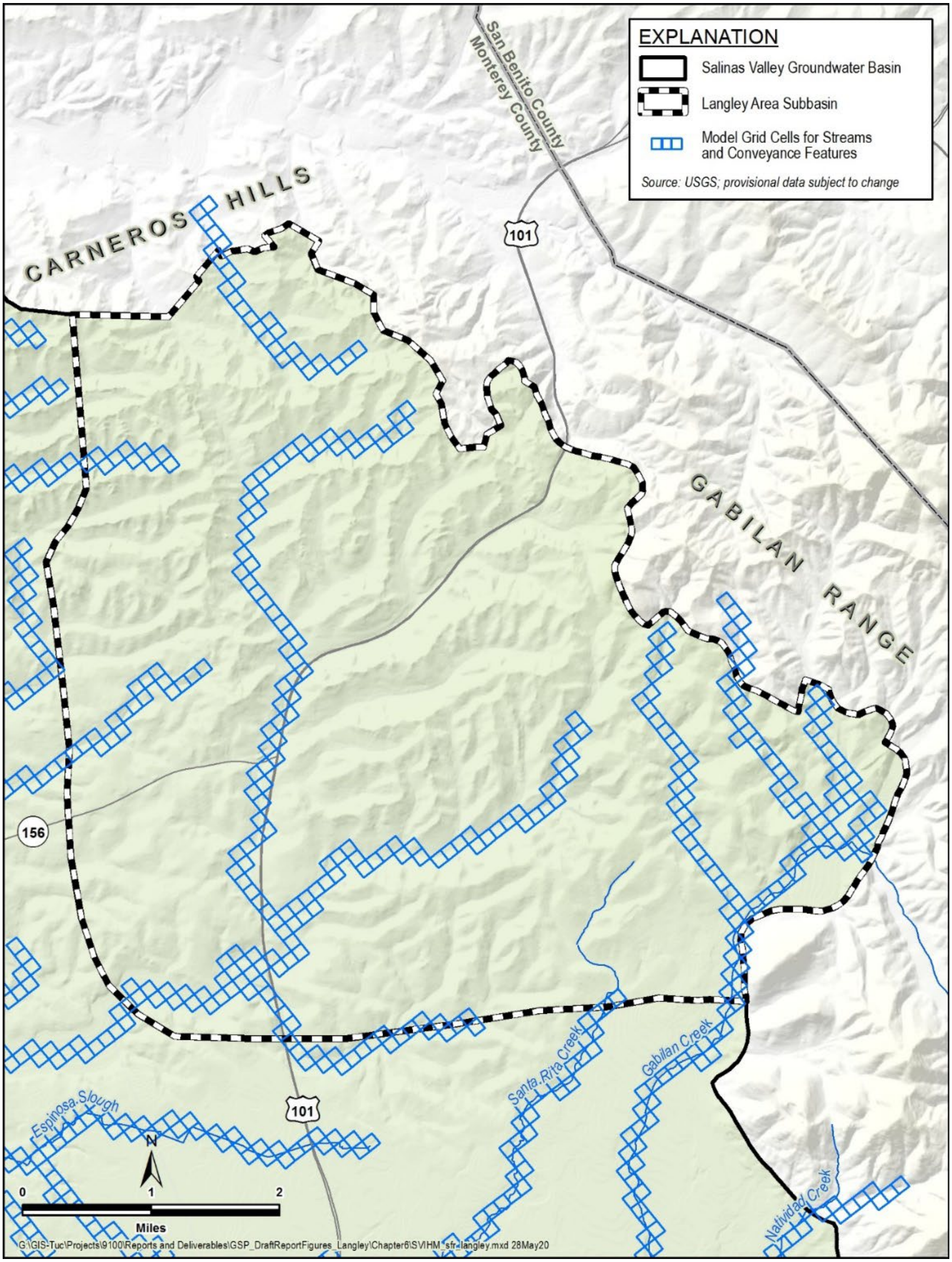


Figure 6-4. Surface Water Network in Langley Area Subbasin from the Salinas Valley Integrated Hydrologic Model

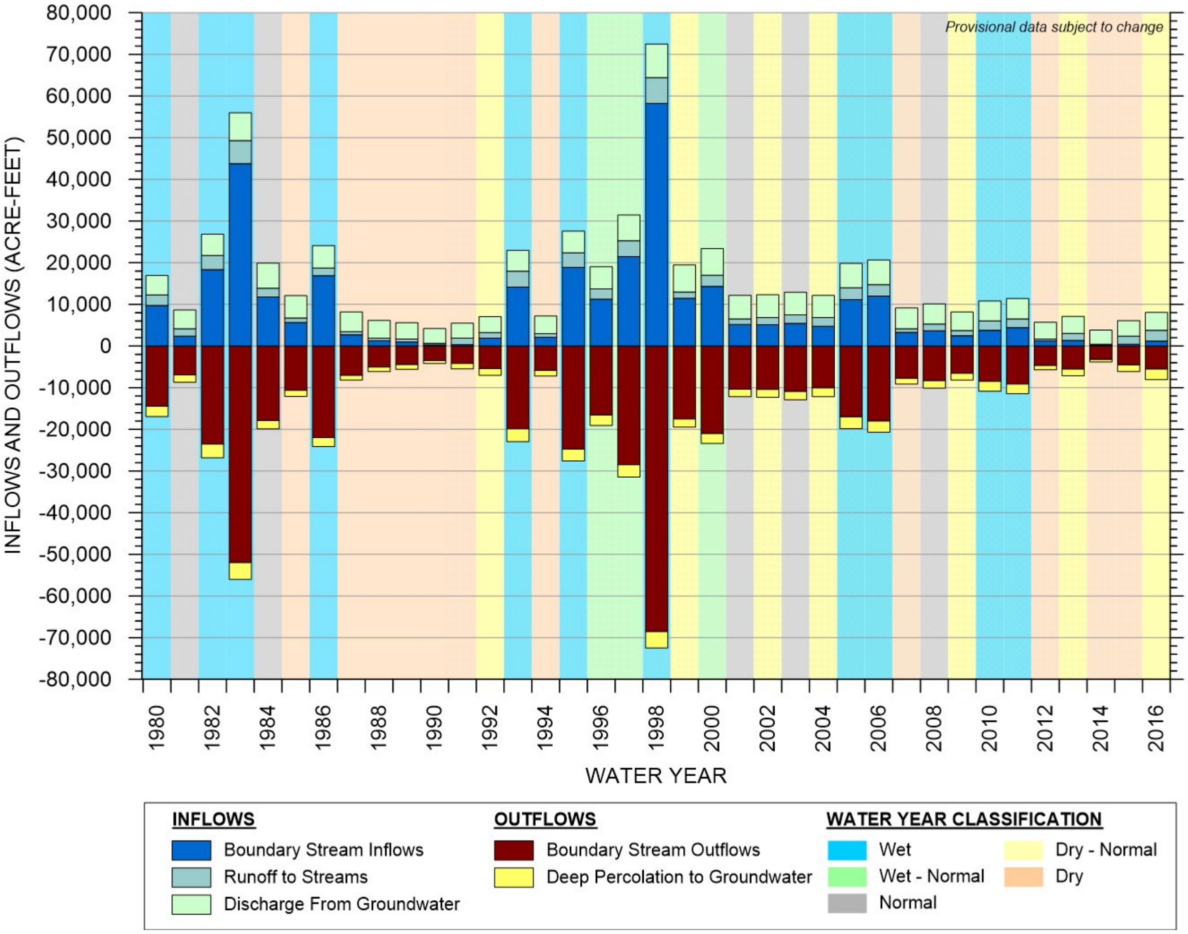


Figure 6-5. Historical and Current Surface Water Budget

Table 6-3. SVIHM Simulated Surface Water Budget Summary (AF/yr.)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Net Streambed Exchange	3,000	1,800
Overland Runoff to Streams	2,100	2,600
Boundary Stream Inflows	9,000	1,200
Boundary Stream Outflows	-14,000	-5,500

Note: provisional data subject to change.

6.3.2 Historical and Current Groundwater Budget

The groundwater budget accounts for the inflows and outflows to and from the Subbasin's aquifer, based on results from the SVIHM. This includes subsurface inflows and outflows of groundwater at the Subbasin boundaries, recharge, pumping, ET, and net streambed exchange.

SVIHM estimated annual inflows to the groundwater system for the historical and current time periods are shown on Figure 6-6. Inflows vary substantially from year to year. Table 6-4 provides average groundwater inflows for the historical and current period. The biggest inflow component is deep percolation of precipitation and excess irrigation water, which ranged from about 1,300 AF in 2014 to more than 28,000 AF in 1998, with a historical average of about 9,800 AF/yr. The estimated historical average deep percolation of streamflow is about 2,000 AF/yr. Subsurface inflows contribute a relatively minor amount of groundwater to the Subbasin. Total recharge for the current period is greater than average total recharge over the historical period.

Figure 6-7 shows the SVIHM estimated outflows from the groundwater system for the historical and current time periods. Outflows vary from year to year; however, the annual variation is dampened compared to the inflows. Table 6-5 provides SVIHM estimated annual averages for groundwater outflows of the historical and current periods. The largest outflow components in the Subbasin are subsurface flows and discharge to streams. Historical and current subsurface outflows are approximately 6,000 to 7,000 AF/yr., and discharge to streams is approximately 4,000 to 5,000 AF/yr. Compared to other subbasins in the Salinas Valley, the Langley Subbasin is mainly rural residential and agriculture is concentrated in the southern portion of the Subbasin. As a result, groundwater pumping accounts for only a small percentage of the total outflows. Outflows for the current period are similar to historical average outflows.

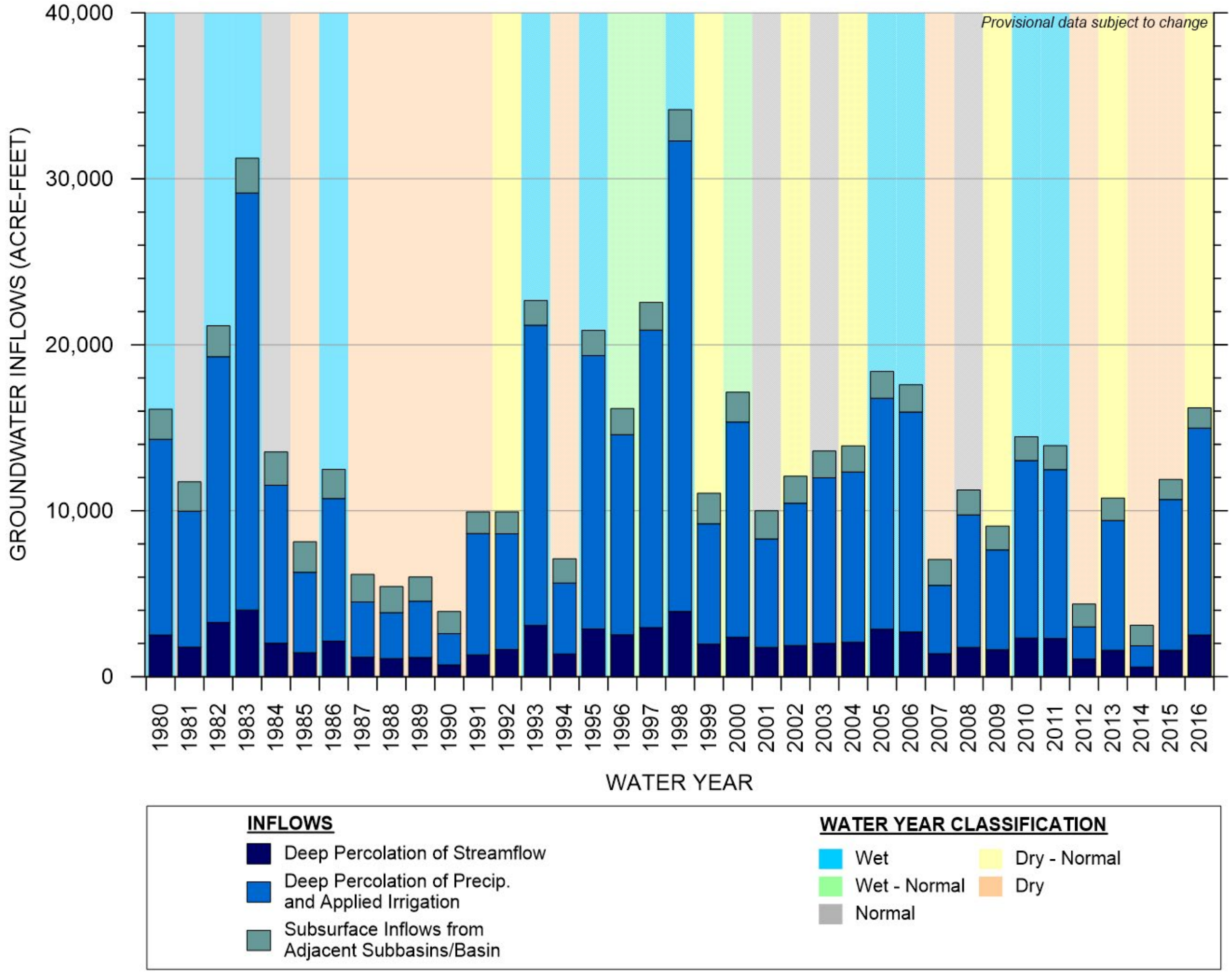


Figure 6-6. SVIHM Simulated Inflows to the Groundwater System

Table 6-4. SVIHM Simulated Groundwater Inflows Summary (AF/yr.)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Deep Percolation of Streamflow	2,000	2,500
Deep Percolation of Precipitation and Applied Water	9,800	12,500
Subsurface Inflow from Adjacent Subbasins/Basin	1,600	1,200

Note: provisional data subject to change.

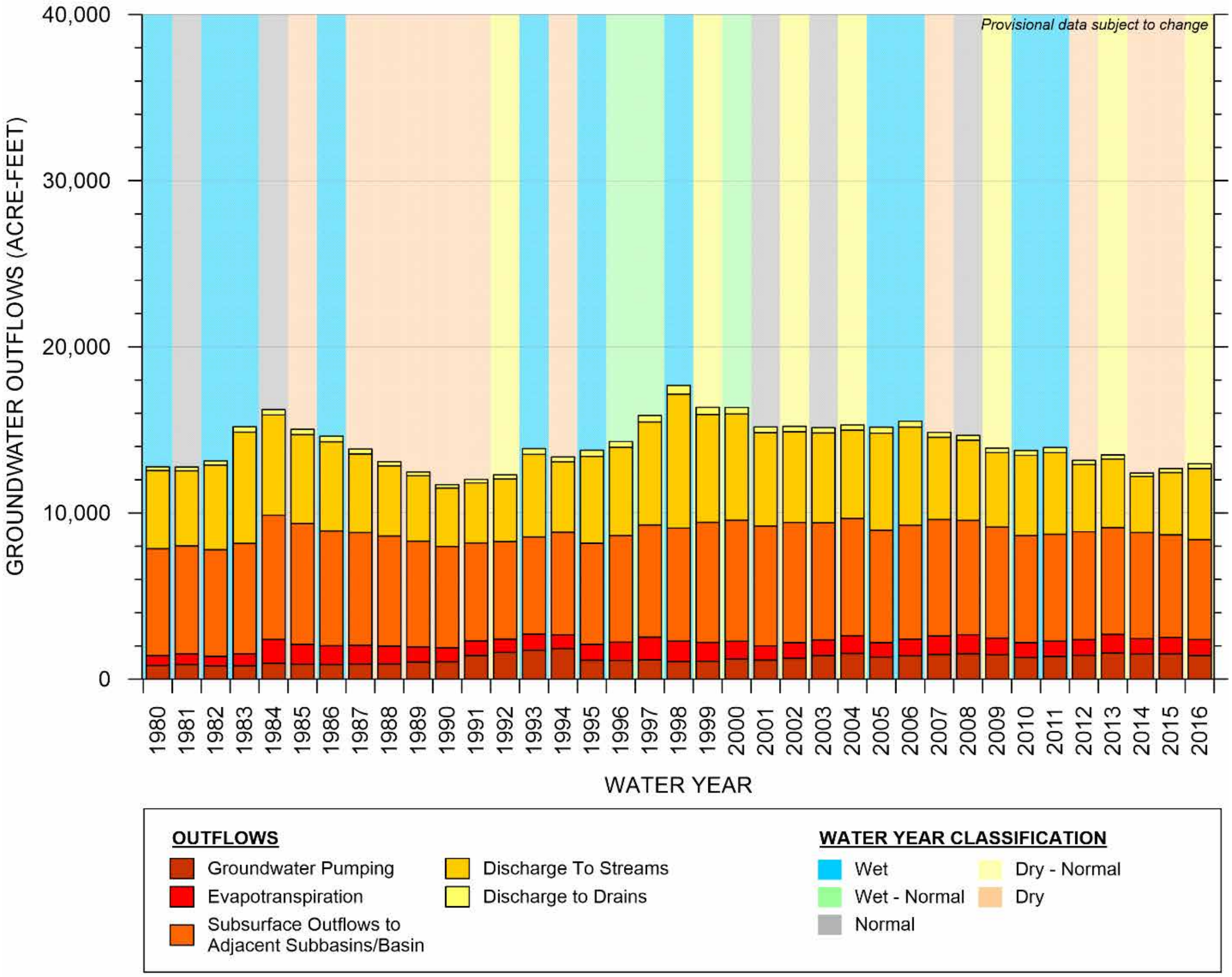


Figure 6-7. SVIHM Simulated Outflows from the Groundwater System

Table 6-5 SVIHM Simulated and Adjusted Groundwater Outflows Summary (AF/yr.)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Groundwater Pumping	-1,200	-1,400	1,000	1,100
Groundwater ET	-1,000	-1,000	-1,000	-1,000
Subsurface Outflow to Adjacent Subbasins/Basin	-6,600	-6,000	-6,600	-6,000
Discharge to Streams	-5,000	-4,300	-5,000	-4,300
Leakage to Drains	-300	-300	-300	-300

Note: provisional data subject to change.

Adjusted pumping is described below.

Comparing SVIHM data to Groundwater Extraction Management System (GEMS) data reveals that, on average, the preliminary SVIHM overestimates agricultural pumping in the Subbasin by approximately 64% over the pumping reported in the GEMS database for the Subbasin between 1995 and 2016. The GEMS data are likely more representative of historical conditions than the model generated pumping numbers for agriculture; however, reliable GEMS data are only available since 1995. To accurately estimate groundwater extraction for the full historical period, this 64% overestimation ratio was applied to the SVIHM-estimated 500 AF/yr. for historical agricultural pumping shown on Figure 6-8 yielding an estimated historical average agricultural pumping rate of 300 AF/yr. The 2016 current agricultural extraction in the GEMS database is 300 AF/yr. The SVIHM estimated historical urban pumping of 100 AF/yr. is consistent with GEMS data. Pumping values from the SVIHM and GEMS are shown in Table 6-6, along with the adjusted pumping values used for sustainable yield estimates.

Figure 6-8 and Table 6-6 show SVIHM simulated groundwater pumping by water use sector. The majority of groundwater pumping from within the Subbasin is used for agricultural and domestic purposes. Urban and agricultural pumping are simulated in the SVIHM; however, domestic pumping is not included in the model. For the purposes of the water budget, urban pumping includes most public water systems and domestic pumping includes the remaining drinking water wells, which are both *de minimis* rural residential wells and small state and small local water system wells. The SVIHM does not simulate domestic pumping because it is a relatively small portion of overall groundwater pumping in the larger Salinas Valley Basin. However, domestic pumping accounts for a substantial portion of total pumping in the Langley Subbasin. Domestic pumping is estimated separately and incorporated into the water budgets. The simulated historical average on Figure 6-8 is not strictly comparable to the GEMS historical average because the time periods used to calculate the averages are different; however, the ratio between these values is used to adjust simulated pumping to be more consistent with GEMS data.

Domestic pumping is estimated by applying a constant rate of 0.3 AF/yr. to all non-vacant residential use parcels in the Subbasin that are not located in the service area of a public water system. The 0.3 AF/yr. constant value is estimated by dividing 2019 reported urban pumping for a selection of public water systems in the Subbasin by the number of dwellings located in the service areas of those water systems. Pumping data for public drinking water systems were obtained from the SWRCB's Electronic Annual Report. Water usage for these water systems range from 0.26 to 0.51 AF/yr. per dwelling, with values in the upper ranges associated with parcels that were substantially larger than the median parcel size in the Subbasin. A value of 0.3 AF/yr. per dwelling is associated with parcels similar to the median parcel size of 1.25 acres and is selected as the representative annual rate for domestic pumping in the Subbasin.

Based on a review of available parcel information for Monterey County and water system boundaries, there are about 2,015 non-vacant residential use parcels units located outside the service areas of public water systems in the Subbasin. Applying these numbers, total annual domestic pumping is estimated to be 600 AF/yr. in the Langley Subbasin. The average historical and current water budget is adjusted by adding the estimated domestic pumping rate to average and current simulated pumping rates, shown in Table 6-6.

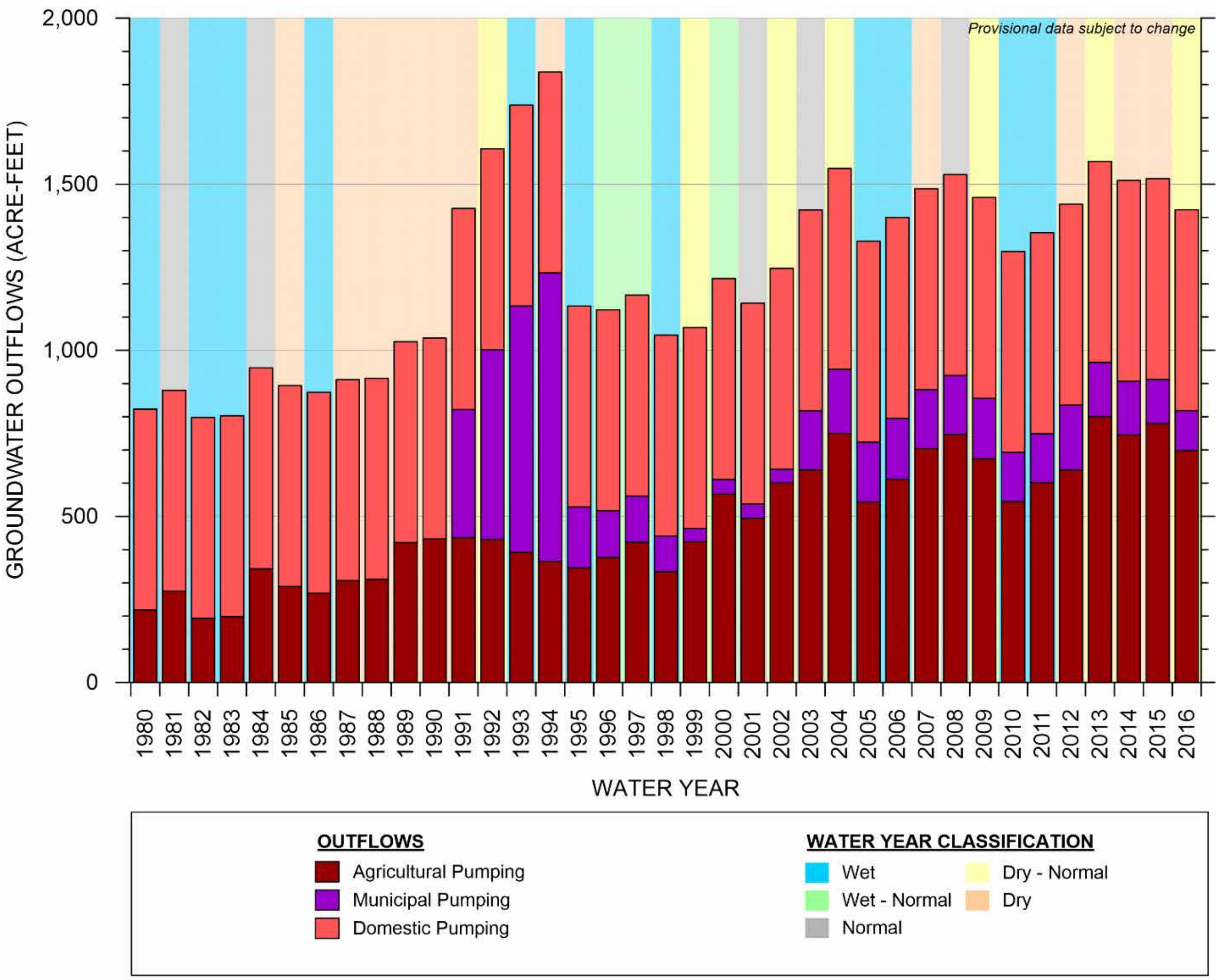


Figure 6-8. SVIHM Simulated and Estimated Domestic Groundwater Pumping by Water Use Sector

Table 6-6. SVIHM Simulated and Adjusted Groundwater Pumping by Water Use Sector (AF/yr.)

	Simulated Historical Average (WY 1980-2016)	Simulated Current (WY 2016)	GEMS Historical Average (WY 1995-2016)	GEMS Current (WY 2016)	Adjusted Historical Average (WY 1980-2016)	Adjusted Current (WY 2016)
Urban & Industrial	-100	-100	-100	-100	-100	-100
Agricultural	-500	-700	-400	-300	-300	-400
Domestic (not simulated in model, considered significant)	0	0	0	0	-600	-600
Total Pumping	-1,200	-1,400	-500	-400	-1,000	-1,100

Note: provisional data subject to change.

[1]Adjusted agricultural pumping is based on the ratio between SVIHM and GEMS agricultural pumping, as described in text above.

Figure 6-9 shows SVIHM estimated net subsurface flows entering and exiting the Subbasin by watershed and neighboring subbasin. For the majority of the historical period, the Subbasin's subsurface outflows are 3 to 5 times greater than the inflows. This is a result of the Langley Subbasin being bordered by no substantial upgradient subbasins, and influence from groundwater pumping in downgradient subbasins. Table 6-7 shows SVIHM estimated historical mean and current year subsurface flows. Of the adjacent basins, the largest amount of subsurface outflow is to the 180/400-Foot Aquifer Subbasin. There is a net inflow from areas outside DWR mapped subbasins east of the Langley Subbasin; however, these are minor flows.

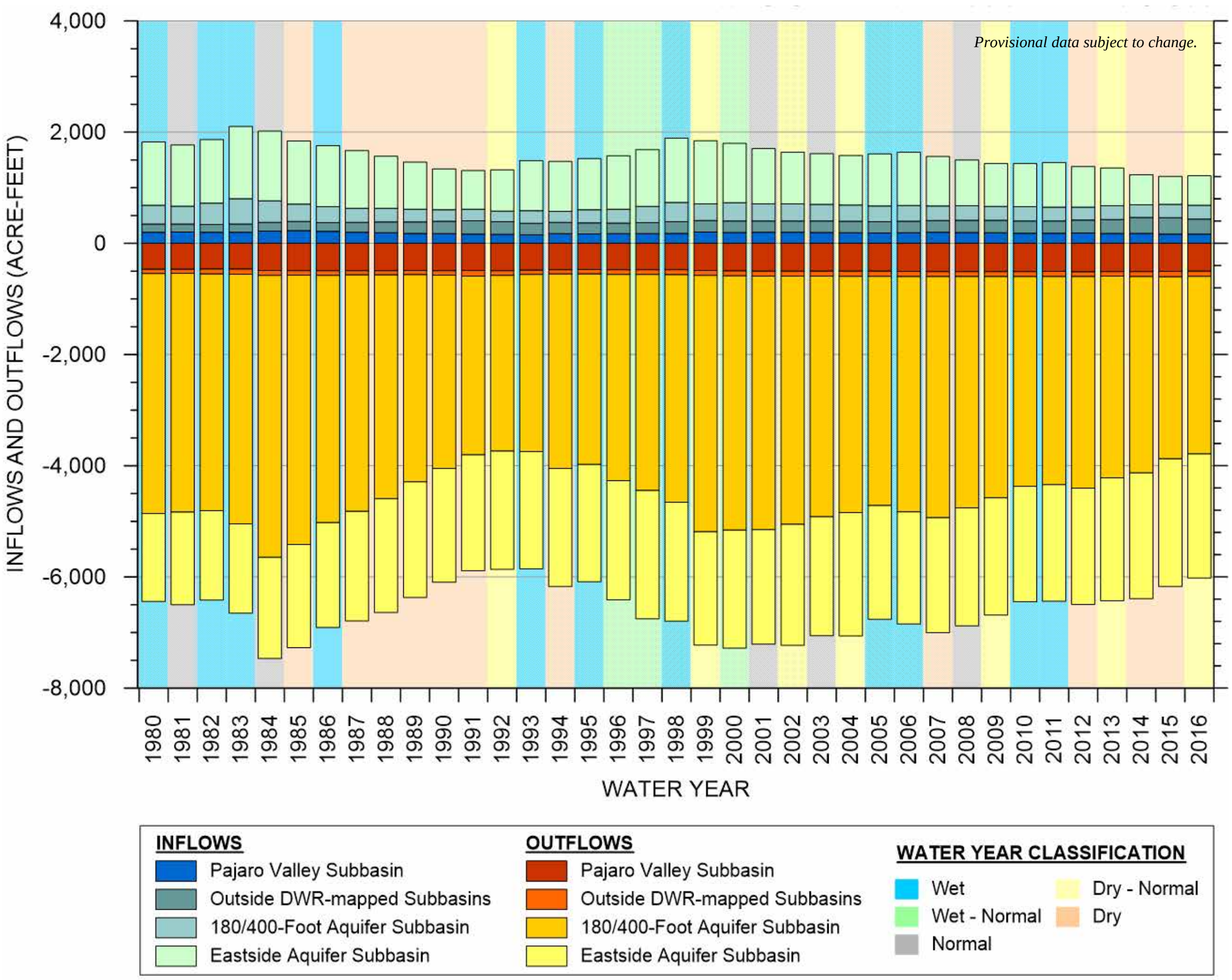


Figure 6-9. SVIHM Simulated Subsurface Inflows and Outflows from Watershed Areas and Neighboring Basins/Subbasins

Table 6-7. SVIHM Simulated Net Subbasin Boundary Flows (AF/yr.)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Eastside Subbasin	-1,100	-1,700
180/400 Subbasin	-3,700	-2,900
Pajaro Subbasin	-300	-300
Outside Areas	100	200

Note: provisional data subject to change

Change in groundwater storage is equal to total inflows to storage (such as deep percolation) minus total outflows from storage (such as pumping). A negative change in groundwater storage value indicates groundwater storage depletion associated with lower groundwater levels, while a positive value indicates groundwater storage accretion associated with higher groundwater levels. Averaged over the historical period, the preliminary SVIHM estimates that the Langley Subbasin is in overdraft by about 200 AF/yr.; however, that does not account for the pumping adjustments made thus far. The calculated overdraft contains significant variability and uncertainty. Figure 6-10 shows considerable variability in change in storage from one year to the next. In water year 2016, simulated (unadjusted) inflows exceeded outflows by more than 3,800 AF, while in 2014 outflows exceeded inflows by roughly 8,100 AF. These annual rates are snapshots in time showing variability within the model simulation and are not necessarily representative of actual current conditions. These results are provisional and subject to change in future updates of the GSP after the SVIHM is officially released to the public.

Although the cumulative change in storage line on Figure 6-10 shows that, during the 37-year historical period, the Subbasin was in overdraft during only 10 years, hydrographs shown on Figure 5-5 indicate historical decline in groundwater levels at wells in some areas of the Subbasin. These data indicate that the Subbasin has historically been in overdraft on the order of 300 AF/yr. decline, as described in Section 5.2.2. Therefore, although the change in storage simulated by the SVIHM is -200 AF/yr., this GSP considers -300 AF/yr. as the average change in storage based on best available data.

6.3.3 Historical and Current Groundwater Budget Summary

The main groundwater inflows into the Subbasin are: (1) the percolation of precipitation and applied agricultural irrigation water, (2) streambed recharge, and (3) subsurface inflow from adjacent DWR groundwater basins and subbasins. Discharge to streams and subsurface outflows to adjacent subbasins are the predominant groundwater outflows. The smaller outflow terms are groundwater pumping, ET, and flows to drains.

Figure 6-10 shows the entire groundwater water budget from the SVIHM and includes annual change in groundwater storage. Changes in groundwater storage are strongly correlated with changes in deep percolation of precipitation and excess streamflow. For example, 1983 and 1998 were comparatively very wet years and represent the greatest increase in deep percolation (recharge) and, correspondingly, groundwater storage over the historical period. Estimated cumulative groundwater storage increased in response to wet periods and declined in response to dry periods.

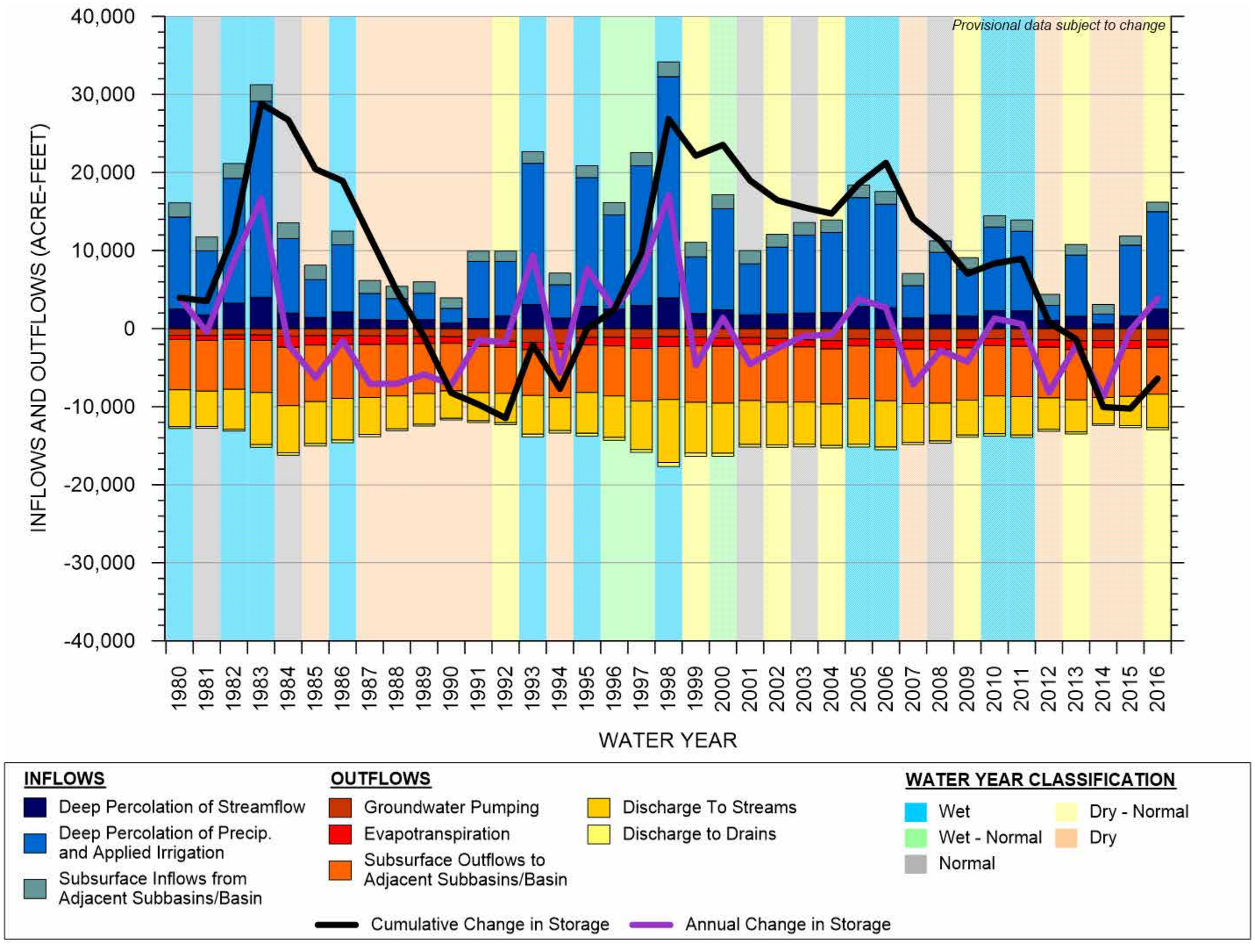


Figure 6-10. SVIHM Simulated Historical and Current Groundwater Budget

The SVIHM results for streambed exchange terms indicates net gaining flow conditions along streams in the Subbasin. Although the interannual estimate of groundwater storage increases and decreases from year to year, the outflows are generally greater than inflows into the groundwater system, resulting in an estimated decline in groundwater storage in the historical water budget period.

A comparison of the historical and current net summary of groundwater budgets is shown in Table 6-8. The values in the table are based on the inflows and outflows presented in previous tables and reflect the adjustments for pumping and change in groundwater storage. Negative values indicate outflows or depletions. This table is informative in showing the relative magnitude of various water budget components. The annual variability in deep percolation and storage might be overestimated in the model; however, these components do not appear to substantially influence other components of the groundwater budget such as pumping and ET. These results are based on a provisional model that might contain errors. The results will be updated in future updates to this GSP after the SVIHM is completed and released by the USGS.

Table 6-8. Summary of Groundwater Budget (AF/yr.)

	Historical Average (WY 1980-2016)	Current (WY 2016)
Groundwater Pumping	-1,000	-1,100
Flows to Drains	-300	-300
Net Stream Exchange (loss to streams)	-3,000	-1,800
Deep Percolation	9,800	12,500
Net flow from Eastside	-1,100	-1,700
Net Flow from Outside Areas	100	200
Net flow from Pajaro	-300	-300
Net flow from 180/400-Foot	-3,700	-2,900
Groundwater ET	-1,000	-1,000
Net Storage Gain (+) or Loss (-)	-300	3,500

Note: provisional data subject to change.

The net storage value is the estimated historical overdraft based on observed groundwater levels, as described in Sections 5.2.2 and 6.3.2. Model error, as reflected in change in storage, for the historical average period is 1.5%, which is considered reasonable and acceptable.

6.3.4 Historical and Current Sustainable Yield

The historical and current sustainable yields reflect the amount of Subbasin-wide pumping reduction needed to balance the water budget, resulting in no net decrease in storage. The sustainable yield can be estimated as:

Sustainable yield = pumping + change in storage

Table 6-9 provides estimates of the historical sustainable yield using the GEMS-derived historical pumping and an adjusted estimate for historical change in groundwater storage. Although the cumulative change in storage line on Figure 6-10 shows that, during the 37-year historical period, the Subbasin was in overdraft during only 10 years, hydrographs shown on Figure 5-5 indicate historical decline in groundwater levels at wells in some areas of the Subbasin. These data indicate that the Subbasin has historically been in overdraft on the order of 300 AF/yr. decline, as described in Section 5.2.2. To present a range of possible values, the average change in storage for the calculations in Table 6-9 is set to -300 AF/yr.

The estimate of sustainable yield varies depending on the extraction that occurred, so this GSP develops a likely range of sustainable yields, presented in Table 6-9. This range represents plus and minus 1 standard deviation around the average GEMS reported pumping between 1995 and 2016 (500 AF/yr.), plus the domestic pumping estimate of 600 AF/yr. These values are the likely range of the minimum sustainable yield of the Subbasin. This GSP adopts the range of likely minimum sustainable yields as the best estimate for the Subbasin.

Table 6-9. Historical Sustainable Yield for the Langley Area Subbasin Derived from GEMS, Estimated Domestic Pumping, and Observed Groundwater Levels (AF/yr.)

	Low Historical Average (WY 1995-2016)	High Historical Average (WY 1995-2016)
Total Subbasin Pumping	800	1,400
Change in Storage	-300	-300
Estimated Sustainable Yield	500	1,100

Note: Pumping is shown as positive value for this computation.

Change in storage value is based on observed groundwater measurements, as previously described in the text.

6.4 Projected Water Budgets

Projected water budgets are extracted from the SVOM, which simulates future hydrologic conditions with assumed climate change. Two projected water budgets are presented, 1 incorporating estimated 2030 climate change projections and 1 incorporating estimated 2070 climate change projections.

The climate change projections are based on data provided by DWR (2018). Projected water budgets will be useful for showing that sustainability will be achieved in the 20-year implementation period and maintained over the entire 50-year planning and implementation horizon. However, the projected water budgets are based on a provisional version of the SVOM and are subject to change. Model information and assumptions summarized in this section of the report are based on provisional documentation on the model. Additional information will be provided in future GSP updates after the model is released by the USGS.

6.4.1 Assumptions Used in Projected Water Budget Development

The assumptions incorporated into the SVOM for the projected water budget simulations include:

- Land Use: The land use is assumed to be static, aside from a semi-annual change to represent crop seasonality. The annual pattern is repeated every year in the model. Land use specified in the model by USGS reflects the 2014 land use.
- No urban growth is included in this simulation to remain consistent with USGS assumptions. If urban growth is infill, this assumption may result in an underestimate of net pumping increases and an underestimate of the Subbasin's future overdraft. If urban growth replaces agricultural irrigation, the impact may be minimal because the urban growth will replace existing agricultural water use.
- Reservoir Operations: The reservoir operations reflect the current approach to reservoir

management taken by MCWRA.

- Stream Diversions: The SVOM explicitly simulates only 2 stream diversions in the Salinas Valley Basin: Clark Colony and the Salinas River Diversion Facility (SRDF). The Clark Colony diversion is located along Arroyo Seco and diverts stream water to an agricultural area nearby. The SRDF came online in 2010 and diverts water from the Salinas River to the CSIP area. Clark Colony diversions are repeated from the historical record to match the water year. SRDF diversions are made throughout the duration of the SVOM whenever reservoir storage and streamflow conditions allow during the period from April through October. For purposes of the projected water budgets, SRDF diversions are specified at a rate of 18 cubic feet per second (cfs).
- Recycled Water Deliveries: Recycled water has been delivered to the CSIP area since 1998 as irrigation supply. The SVOM includes recycled water deliveries throughout the duration of the model.

6.4.1.1 Future Projected Climate Assumptions

Several modifications were made to the SVOM in accordance with recommendations made by DWR in their *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development* (2018). Three types of datasets were modified to account for 2030 and 2070 projected climate change: climate data (precipitation, reference ET, and potential ET), streamflow, and sea level.

Climate Data. This GSP uses the climate change datasets provided by DWR for use by GSAs. The climate scenarios were derived by taking the historical interannual variability from 1915 through 2011 and increasing or decreasing the magnitude of events based on projected changes in precipitation and temperature from general circulation models. These datasets of climate projections for 2030 and 2070 conditions were derived from a selection of 20 global climate projections recommended by the Climate Change Technical Advisory Group as the most appropriate projections for California water resources evaluation and planning. Because the DWR climate datasets are only available through December 2011 and the SVOM uses a climate time series through December 2014, monthly change factors for January 2012 to December 2014 are assumed. DWR provided climate datasets for central tendency scenarios, as well as extreme wet and dry scenarios; the future water budgets described herein are based on the DWR central tendency scenarios for 2030 and 2070. Historical data were analyzed from the Salinas Airport precipitation gauge record to identify years from 1968 to 2011 that were most similar to conditions in 2012, 2013, and 2014. As a result, projected climate data from 1981, 2002, and 2004 are applied as the climate inputs for 2012, 2013, and 2014, respectively. Future updates to the SVOM will include climate change data through the current period.

The modified monthly climate data for the entire model period are applied as inputs to the model, which reads precipitation and potential ET data on a monthly basis.

Streamflow. DWR provided monthly change factors for unimpaired streamflow throughout California. For the Salinas Valley and other areas outside of the Central Valley, these change factors are provided as a single time series for each major watershed. Streamflows along the margins of the Basin are modified by the monthly change factors. As with the climate data, an assumption is required to extend the streamflow change factor time series through December 2014. It is assumed that the similarity in rainfall years at the Salinas Airport rainfall gauge could reasonably be expected to produce similar amounts of streamflow; therefore, the same years (1981, 2002, and 2004) are repeated to represent the 2012, 2013, and 2014 streamflows. Future updates to the SVOM will incorporate streamflow change data through the current period.

Sea Level. DWR guidance recommends using a single static value of sea level rise for each of the climate change scenarios (DWR, 2018). For the 2030 climate change scenario, the DWR-recommended sea level rise value of 15 centimeters was used. For the 2070 climate change scenario, the DWR-recommended sea level rise value of 45 centimeters is used. The amount of sea level rise is assumed to be static throughout the duration of each of the climate change scenarios.

6.4.2 Projected Surface Water Budget

The inflow and outflow components of the projected surface water budget are the same as described for the historical and current water budgets, including:

- Net Streambed Exchange
- Overland Runoff to Streams
- Diversions from Streams
- Boundary Outflows
- Boundary Inflows

Average projected surface water budget inflows and outflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-10.

Table 6-10. SVOM Simulated Average Surface Water Inflow and Outflow Components for Projected Climate Change Conditions (AF/yr.)

Projected Climate Change Timeframe	2030	2070
Net Streambed Exchange	900	1,100
Overland Runoff to Streams	2,400	2,600
Boundary Inflows	9,000	10,100
Boundary Outflows	-12,300	-13,800

Note: provisional data subject to change.

6.4.3 Projected Groundwater Budget

The inflow components of the projected groundwater budget are the same as described for the historical and current water budgets, including:

- Deep percolation of precipitation and irrigation
- Stream leakage
- Underflow from the 180/400-Foot Subbasin
- Underflow from the Eastside Subbasin
- Underflow from the Pajaro Valley basin (Elkhorn slough)
- Underflow from adjacent watersheds

Average SVOM projected groundwater budget inflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-11. In both the 2030 and 2070 simulations, the biggest contributors to groundwater inflows are deep percolation of precipitation and irrigation.

Table 6-11. SVOM Simulated Average Groundwater Inflow Components for Projected Climate Change Conditions (AF/yr.)

Projected Climate Change Timeframe	2030	2070
Deep percolation of stream flow	2,200	2,300
Deep percolation of precipitation. and irrigation	10,600	11,600
Underflow from 180-400 ft Subbasin	300	400
Underflow from Eastside Subbasin	1,100	1,100
Underflow from Pajaro Subbasin	200	200
Underflow from Surrounding Watersheds	200	200
Total Inflows	14,600	15,800

Note: provisional data subject to change.

The outflow components of the projected groundwater budget include:

- Total groundwater extraction including urban, agricultural, and domestic pumping
- Flow to agricultural drains
- Stream gains from groundwater
- Underflow to the 180/400-Foot Subbasin
- Underflow to the Eastside Subbasin
- Underflow to the Pajaro Valley Subbasin
- Underflow to adjacent watersheds

Average projected groundwater budget outflows for the future simulation period with 2030 and 2070 climate change assumptions are quantified in Table 6-12. Similar to historical and current water budgets, estimated domestic pumping and the GEMS pumping adjustment, discussed in Section 6.3.2, were incorporated into the adjusted SVOM water budgets. Projected pumping is summarized below in Section 6.4.4.

Table 6-12. SVOM Simulated and Adjusted Average Groundwater Outflow Components for Projected Climate Change Conditions (AF/yr.)

Projected Climate Change Timeframe	Simulated 2030	Simulated 2070	Adjusted 2030	Adjusted 2070
Groundwater Pumping	-700	-800	-1,100	-1,100
Flows to Drains	-600	-600	-600	-600
Flow to Streams	-3,100	-3,400	-3,100	-3,400
Groundwater ET	-1,900	-2,100	-1,900	-2,100
Underflow to Eastside Subbasin	-2,000	-2,000	-2,000	-2,000
Underflow to Surrounding Watersheds	-100	-100	-100	-100
Underflow to Pajaro	-500	-500	-500	-500
Underflow to 180-400 ft Subbasin	-4,400	-4,600	-4,400	-4,600
Total Outflows	-13,300	-14,100	-13,700	-14,400

Note: provisional data subject to change.

[1]Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.3.2.

As described for the historical water budget, data indicate that the Subbasin has historically been in overdraft (on the order of 300 AF/yr. decline), as described in Section 5.2.2. Even though the SVOM anticipates 1,400 AF/yr. and 1,600 AF/yr. change in storage for 2030 and 2070 respectively, the historical decline in storage is used with the adjusted pumping estimates to provide a likely more reasonable estimate for projected sustainable yield. The model includes increased precipitation from climate change; however, it does not account for the frequency and magnitude of storm events. If storm events concentrate precipitation within short periods, more water may run off than infiltrate. More analysis needs to be done with regards to future recharge. Therefore, this projected water budget adopts the historical annual change in storage as the most reasonable estimate, assuming extraction continues. This is reflected in the adjusted average change in storage in Table 6-13, which is set to negative 300 AF/yr.

Combining Table 6-11 and Table 6-12 yields the SVOM simulated net groundwater inflow and outflow data for the future simulation with 2030 and 2070 climate change assumptions. These flows are shown in Table 6-13. Negative values indicate outflows or depletions.

Table 6-13. Average SVOM Simulated and Adjusted Annual Groundwater Budget for Projected Climate Change Conditions (AF/yr.)

Projected Climate Change Timeframe	Simulated 2030	Simulated 2070	Adjusted 2030	Adjusted 2070
Groundwater Pumping	-700	-800	-1,100	-1,100
Flow to Drains	-600	-600	-600	-600
Net Stream Exchange	-900	-1,100	-900	-1,100
Deep Percolation	10,600	11,600	10,600	11,600
Net Flow to Eastside	-900	-900	-900	-900
Net Flow to Surrounding Watersheds	100	100	100	100
Net Flow to Pajaro	-300	-300	-300	-300
Net Flow to 180/400-Foot	-4,100	-4,300	-4,100	-4,300
Groundwater ET	-1,900	-2,100	-1,900	-2,100
Net Storage Gain (+) or Loss (-)	1,400	1,600	-300	-300

Note: provisional data subject to change.

Based on the adjusted change in storage, which is the historical average decline as described in the text, model error is 8.9% for 2030 and 10.1% for 2070; these error values are unreasonably large and will be addressed and improved in future model updates.

[1]Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.3.2.

SVOM projected groundwater pumping by water use sector is summarized in Table 6-14. Similar to the SVIHM, domestic pumping is not included in the SVOM future projections simulation. The estimated 600 AF/yr. of domestic pumping is added to the projected groundwater budgets. Because the model assumes no urban growth, future urban pumping was assumed to be equal to current urban pumping. Future agricultural pumping is then calculated as the total projected pumping minus domestic pumping minus current urban pumping.

Table 6-14. SVOM Simulated and Adjusted Annual Groundwater Pumping by Water Use Sector (AF/yr.)

Water Use Sector	Simulated 2030	Simulated 2070	Adjusted 2030	Adjusted 2070
Urban & Industrial	-100	-100	-100	-100
Agricultural	-600	-700	-400	-400
Domestic (not simulated in model, considered significant)	0	0	-600	-600
Total Pumping	-700	-800	-1,100	-1,100

Note: provisional data subject to change.
[1]Adjusted pumping is based on the ratio between historical average SVIHM and GEMS agricultural pumping, as described in Section 6.3.2.

6.4.4 Projected Sustainable Yield

Projected sustainable yield is the long-term pumping that can be sustained once all undesirable results have been addressed. However, it is not the amount of pumping needed to stop undesirable results before sustainability is reached. The SVBGSA recognizes that, dependent on the success of various proposed projects and management actions, there may be some years when pumping must be held at a lower level to achieve necessary rises in groundwater elevation. The actual amount of allowable pumping from the Subbasin will be adjusted in the future based on the success of projects and management actions.

To retain consistency with the historical sustainable yield, projected sustainable yield can be estimated by summing all the average groundwater extractions and subtracting the average change in storage. This represents the change in pumping that results in no change in storage, assuming no other projects or management actions are implemented. Projected SVOM simulated sustainable yield estimates are quantified in Table 6-15. For this sustainable yield discussion and associated computations, groundwater pumping outflows are reported as positive values, which is opposite of how the values are reported in the water budget tables. These results indicate that projected future sustainable yield is larger than projected future groundwater pumping. This suggests that the Subbasin would benefit from climate change, assuming no substantial increase in water demands. However, these estimates are initial estimates. The sustainable yield value will be updated in future GSP updates as more data are collected and additional analyses are conducted.

Table 6-15 provides estimates of the future sustainable yield using estimated future pumping calculated in Table 6-14 and a correction for change in groundwater storage. As described for the historical water budget, data indicate that the Subbasin has historically been in overdraft (on the order of 300 AF/yr. decline), as described in Section 5.2.2. This historical decline in storage is used with the adjusted SVOM pumping estimates to provide a likely more reasonable estimate for projected sustainable yield. The average change in storage for the calculations in Table 6-15 is set to -300 AF/yr.

Table 6-15. Projected Sustainable Yields Adjusted based on GEMS, Estimated Domestic, and Observed Groundwater Levels (AF/yr.)

	2030 Projected Sustainable Yield	2070 Projected Sustainable Yield	Historical Sustainable Yield Range
Groundwater Pumping	1,100	1,100	800 to 1,400
Change in Storage	-300	-300	-300
Projected Sustainable Yield	800	800	500 to 1,100

Note: Pumping is shown as positive value for this computation.

Table 6-15 includes the GEMS database estimate of historical sustainable yield for comparison purposes. Although the sustainable yield values provide guidance for achieving sustainability, simply reducing pumping to within the sustainable yield is not proof of sustainability. Sustainability must be demonstrated through the SMC. The sustainable yield value will be modified and updated as more data are collected, and more analyses are performed.

6.4.5 Uncertainties in Projected Water Budget Simulations

Models are mathematical representations of physical systems. They have limitations in their ability to represent physical systems exactly and due to limitations in the data inputs used. There is also inherent uncertainty in groundwater flow modeling itself, since mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute data. However, DWR (2018) recognizes that although models are not exact representations of physical systems because mathematical depictions are imperfect, they are powerful tools that can provide useful insights.

There is additional inherent uncertainty involved in projecting water budgets with projected climate change based on the available scenarios and methods. The recommended 2030 and 2070 central tendency scenarios that are used to develop the projected water budgets with the SVIHM provide a dataset that can be interpreted as what might be considered the most likely future conditions; there is an approximately equal likelihood that actual future conditions will be more stressful or less stressful than those described by the recommended scenarios (DWR, 2018).

As stated in DWR (2018):

> *"Although it is not possible to predict future hydrology and water use with certainty, the models, data, and tools provided [by DWR] are considered current best available science and, when used appropriately should provide GSAs with a reasonable point of reference for future planning."*

6.5 Subbasin Water Supply Reliability

Water is not imported into the Langley Subbasin from other basins.

6.6 Uncertainties in Water Budget Calculations

The level of accuracy and certainty is highly variable between water budget components. A few water budget components are directly measured, but most water budget components are either estimated inputs to the model or simulated by the model. Additional model uncertainty stems from an imperfect representation of natural condition and is reflected in model calibration error. However, inputs to the models are carefully selected using best available data, the model's calculations represent established science for groundwater flow, and the model calibration error is within acceptable bounds. Therefore, the models are the best available tools for estimating water budgets. The model results are provisional and subject to change in future GSP updates after the models are released by the USGS.

The following list groups water budget components in increasing order of uncertainty:

- Measured: metered municipal, agricultural, and some small water system pumping
- Estimated: domestic pumping, including depth, rate, and location
- Simulated primarily based on climate data: precipitation, ET, irrigation pumping
- Simulated based on calibrated model: all other water budget components

Simulated components based on calibrated model have the most uncertainty because those simulated results encompass uncertainty of other water budget components used in the model in addition to model calibration error.

7 MONITORING NETWORKS

This chapter describes the networks that will monitor the SMC explained further in Chapter 8. This description of the monitoring network has been prepared in accordance with the GSP Regulations § 354.32 *et seq.* to include monitoring objectives, monitoring protocols, and data reporting requirements.

7.1 Introduction

7.1.1 Monitoring Network Objectives

SGMA requires monitoring networks to collect data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Demonstrate progress toward achieving measurable objectives
- Monitor impacts to the beneficial uses or users of groundwater
- Quantify annual changes in water budget components

7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the 6 sustainability indicators that are relevant to the Subbasin:

1. Chronic lowering of groundwater levels
2. Reduction in groundwater storage
3. Seawater intrusion
4. Degraded water quality
5. Land subsidence
6. Depletion of ISW

Other monitoring networks, such as groundwater extraction, that are necessary to comply with GSP Regulations are also included in this chapter. Representative Monitoring Sites (RMS) are monitoring sites with data that are publicly available and not confidential.

The SVBGSA estimated the density of monitoring sites and the frequency of measurements required to demonstrate short-term, seasonal, and long-term trends. If the required monitoring site density does not currently exist, the SVBGSA will expand monitoring networks during GSP implementation. Filling data gaps and developing more extensive and complete monitoring networks will improve the SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. Chapter 10 provides a plan and schedule for resolving data gaps. The SVBGSA will review the monitoring network in each 5-year assessment, including a determination of uncertainty and whether there are remaining data gaps that could affect the ability of the Plan to achieve the sustainability goal for the Subbasin.

7.1.3 Management Areas

No management areas have been defined for the Langley Subbasin.

7.2 Groundwater Level Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by monitoring groundwater elevations in designated monitoring wells. The regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

Figure 7-1 shows 16 wells in the Subbasin monitored by MCWRA for groundwater elevations that are used to develop groundwater elevation contours and have publicly available data on the SVBGSA Web Map. All the wells shown on Figure 7-1 are part of the groundwater level monitoring RMS network. Criteria for selecting wells as part of the RMS network include:

- RMS wells must have known depths and well completion data
- RMS wells should have a relatively long period of historical data
- Hydrographs of RMS wells should be visually representative of the hydrographs from surrounding wells. Appendix 5A includes the hydrograph comparisons used to establish that RMS wells are representative of surrounding wells
- RMS locations must cover the basin and provide data near basin boundaries
- RMS should be selected for each aquifer. There is only 1 aquifer in the Langley Subbasin
- Data from RMS wells is public data and will be used for groundwater elevation maps and analysis. SVBGSA notified well owner of intent to include will in monitoring network.

The RMS wells currently in the water level monitoring network are listed on Figure 7-1 and in Table 7-1. The need for any additional wells is discussed in Section 7.2.2. Appendix 5A presents well construction information and historical hydrographs for each RMS well.

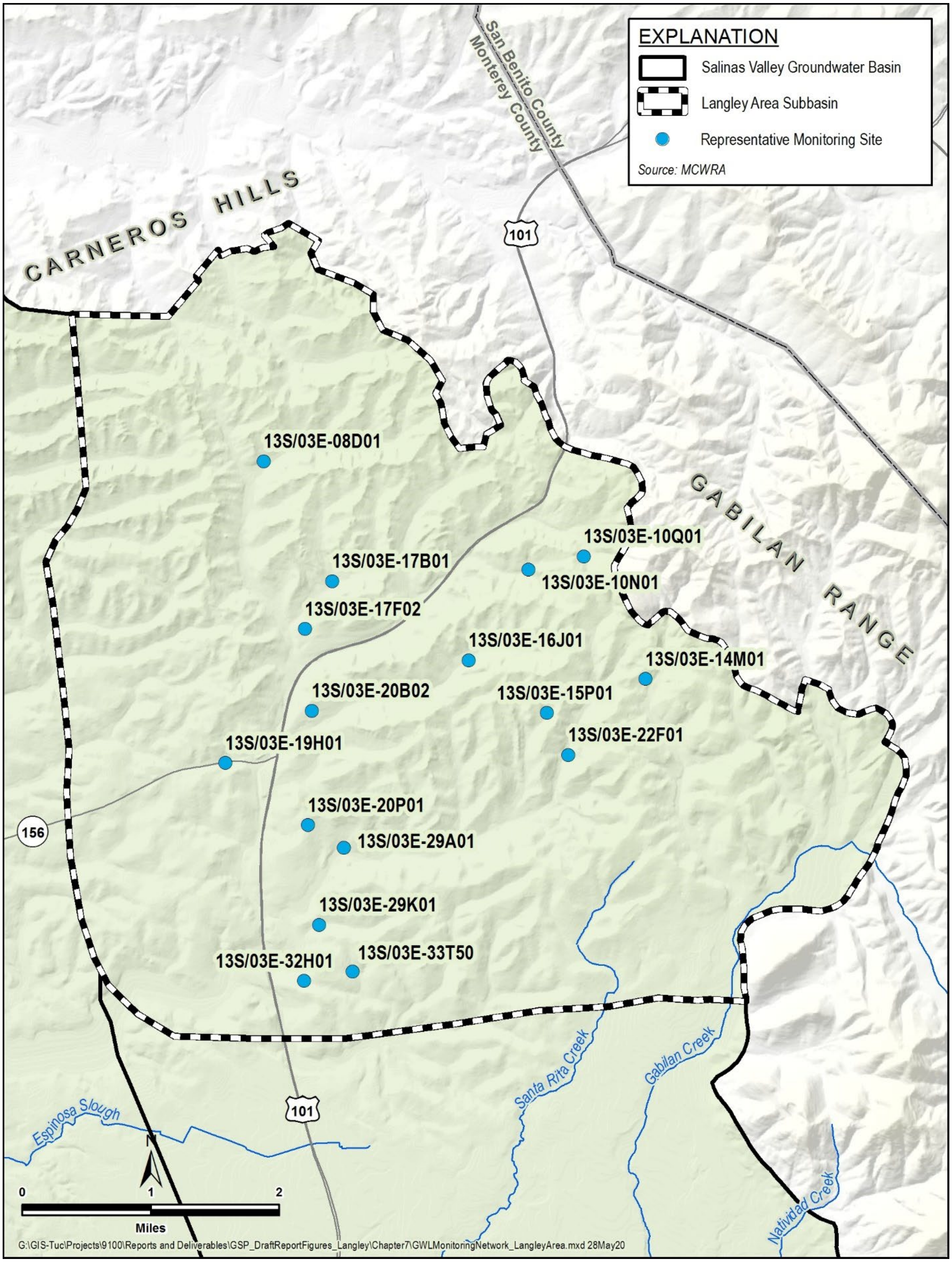


Figure 7-1. Langley Area Representative Monitoring Network for Groundwater Levels

Table 7-1. Langley Area Groundwater Level Representative Monitoring Site Network

State Well Number	CASGEM Well Number	Local Well Designation	Well Use	Total Well Depth (ft)	Reference Point (ft, NAVD88)	Latitude (NAD 83)	Longitude (NAD 83)	Period of Record (years)
13S/03E-08D01	N/A	13306	Domestic	130	260.0	36.8228	-121.6706	58
13S/03E-10N01	N/A	13507	Domestic	145	383.0	36.8114	-121.6330	58
13S/03E-10Q01	N/A	13513	Domestic	76	495.0	36.8131	-121.6253	58
13S/03E-14M01	N/A	13543	Domestic	402	452.7	36.7994	-121.6162	39
13S/03E-15P01	367953N1216300W001	13572	Domestic	430	365.1	36.7953	-121.6300	38
13S/03E-16J01	368011N1216412W001	13625	Domestic	252	270.0	36.8011	-121.6412	58
13S/03E-17B01	N/A	13668	Domestic	78	208.0	36.8095	-121.6606	58
13S/03E-17F02	N/A	13680	Domestic	392	220.5	36.8040	-121.6642	39
13S/03E-19H01	N/A	13783	Domestic	192	140.0	36.7886	-121.6748	58
13S/03E-20B02	N/A	20545	Irrigation	Unknown	200.0	36.7948	-121.6629	58
13S/03E-20P01	N/A	13866	Irrigation	192	223.0	36.7818	-121.6630	57
13S/03E-22F01	367906N1216267W001	13950	Domestic	334	236.2	36.7906	-121.6267	39
13S/03E-29A01	N/A	14072	Domestic	200	70.5	36.7794	-121.6579	58
13S/03E-29K01	N/A	14115	Domestic	335	170.7	36.7706	-121.6610	39
13S/03E-32H01	N/A	14189	Municipal	400	116.0	36.7654	-121.6561	14
13S/03E-33T50	N/A	14211	Municipal	500	150.0	36.7642	-121.6629	14

7.2.1 Groundwater Level Monitoring Protocols

Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of existing groundwater elevation monitoring procedures (MCWRA, 2015). The CASGEM groundwater elevation monitoring protocols established by MCWRA are adopted by this GSP and are included in Appendix 7A. Groundwater elevation measurements will be collected at least 2 times per year to represent seasonal low and seasonal high groundwater conditions. The monitoring protocols described in Appendix 7A cover multiple monitoring methods for collecting data by hand and by automated pressure transducers. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.2.2 Groundwater Level Monitoring Network Data Gaps

Based on the GSP Regulations and the BMPs published by DWR on monitoring networks (DWR, 2016b), a visual analysis of the existing monitoring network was performed using professional judgment to evaluate whether there are data gaps in the groundwater level monitoring network.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins and Anderson, 2016) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgment should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The Langley Subbasin encompasses 27.5 square miles. If the BMP guidance recommendations are applied to the Subbasin, the well network should include between 1 and 3 wells. The current network includes 16 wells. The number of groundwater elevation monitoring wells in the Subbasin exceeds the range of the BMP guidance. However, visual inspection of the geographic distribution of the well network indicates that additional wells are necessary to adequately characterize the Subbasin.

Figure 7-2 shows the locations of existing groundwater level monitoring wells and the generalized locations where monitoring wells are needed in the Langley Subbasin. The data gap areas shown on Figure 7-2 will be addressed during GSP implementation by adding an existing well to the monitoring network, if possible, or drilling a new well in each area, as further described in Chapter 10. The generalized location for new monitoring wells was based on addressing the criteria listed in the monitoring BMP including:

- Providing adequate data to produce seasonal potentiometric maps
- Providing adequate data to map groundwater depressions and recharge areas
- Providing adequate data to estimate change in groundwater storage

- Demonstrating conditions at Subbasin boundaries

Additionally, groundwater elevation measurements for most of the monitoring wells in the Subbasin occur only once a year. SVBGSA will work with MCWRA to have groundwater levels collected at least twice a year as outlined in Section 7.2.1. Furthermore, some of the wells in the monitoring network have unknown well construction information and that is a data gap that will be addressed during GSP implementation.

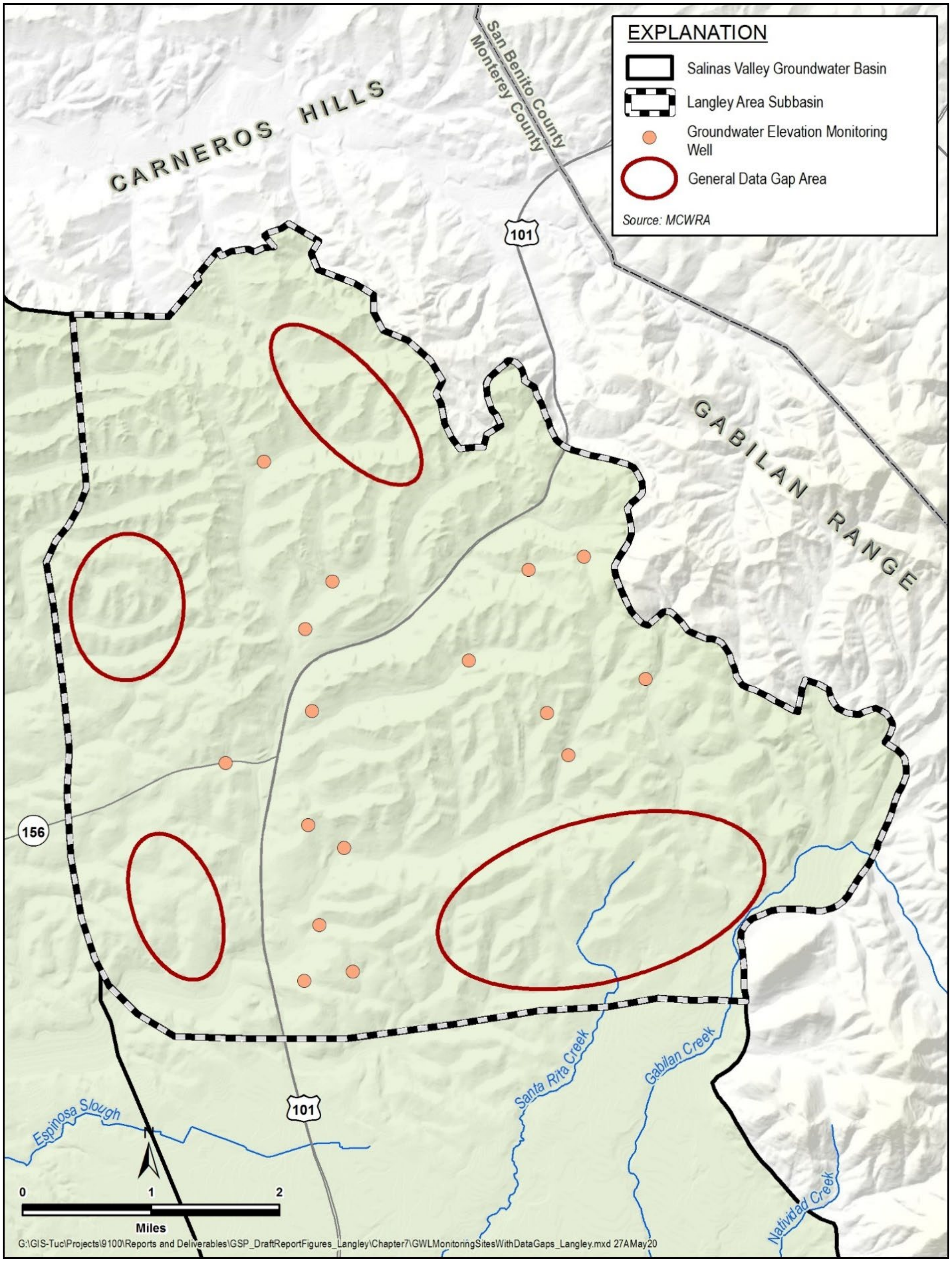


Figure 7-2. Data Gaps in the Groundwater Level Monitoring Network

7.3 Groundwater Storage Monitoring Network

As discussed in Chapter 8, the sustainability indicator for reduction of groundwater storage is measured using groundwater elevations as proxies. Thus, the groundwater storage monitoring network is the same as the groundwater level monitoring network.

7.4 Seawater Intrusion Monitoring Network

The MCWRA seawater intrusion monitoring network does not extend into the Langley Subbasin because seawater intrusion is not considered an imminent threat to the Subbasin, as shown on Figure 5-11. However, seawater intrusion does exist in the adjacent 180/400-Foot Aquifer Subbasin and is closely monitored by MCWRA. The Langley Subbasin relies on the monitoring network in the 180/400-Foot Aquifer Subbasin to track the position of the seawater intrusion front. Should seawater intrusion come within one-half mile of the Langley Subbasin boundary, the SVBGSA's Seawater Intrusion Working Group (SWIG) will consider expanding the existing seawater intrusion monitoring network into the Subbasin. The monitoring protocols and chloride data contouring protocols established by MCWRA are provided in Appendix 7B and 7C, respectively.

7.5 Groundwater Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated by adopting the SWRCB, DDW, and CCRWQCB ILRP groundwater quality networks. The water quality monitoring network for the Subbasin is composed of public water system supply wells monitored under DDW, and on-farm domestic wells and irrigation supply wells monitored under ILRP.

As described in Chapter 8, separate minimum thresholds are set for the COC for public water system supply wells, on-farm domestic wells, and irrigation supply wells. Therefore, although there is a single groundwater quality monitoring network, different wells in the network are reviewed for different constituents. COC for drinking water are assessed at public water supply wells and on-farm domestic wells, and COC for crop health are assessed at irrigation supply wells. The COC for the 3 sets of wells are listed in Chapter 5.

The public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. The SWRCB collects data for municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. The RMS network consists of 101 DDW wells, as shown on Figure 7-3 and listed in Appendix 7D.

All on-farm domestic wells and irrigation supply wells that have been sampled through the CCRWQCB's ILRP are included in the RMS network. Under the existing Ag Order there are

15 ILRP wells, consisting of 12 irrigation supply wells and 3 on-farm domestic wells, that are all part of the RMS network. The locations of these wells are shown on Figure 7-4 and listed in Appendix 7D. The SVBGSA assumes that Ag Order 4.0 will have a similar representative geographic distribution of wells within the Subbasin. The agricultural groundwater quality monitoring network will be revisited and revised when the Ag Order 4.0 monitoring network is finalized.

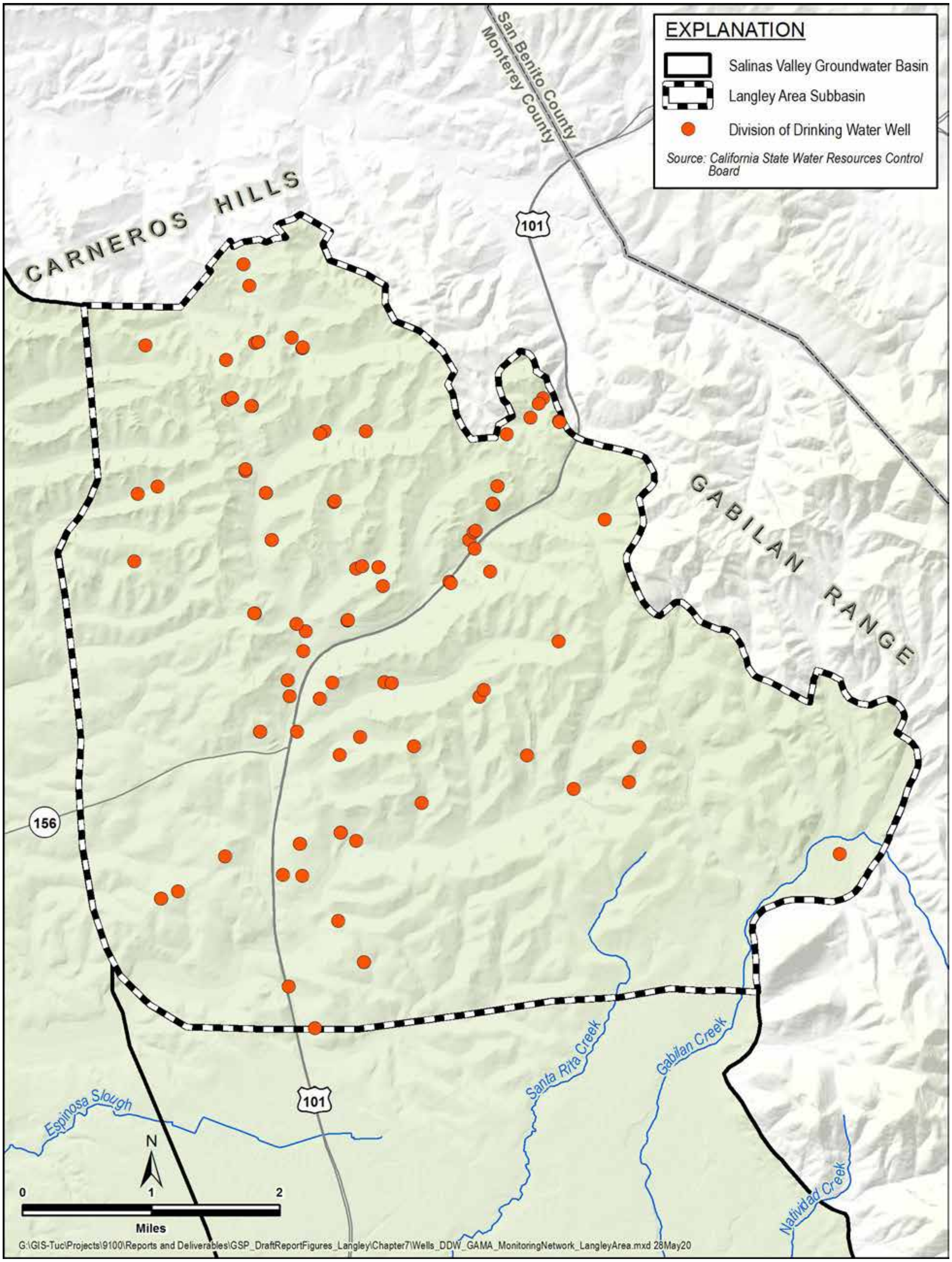


Figure 7-3. DDW Public Water System Supply Wells in the Groundwater Quality Monitoring Network

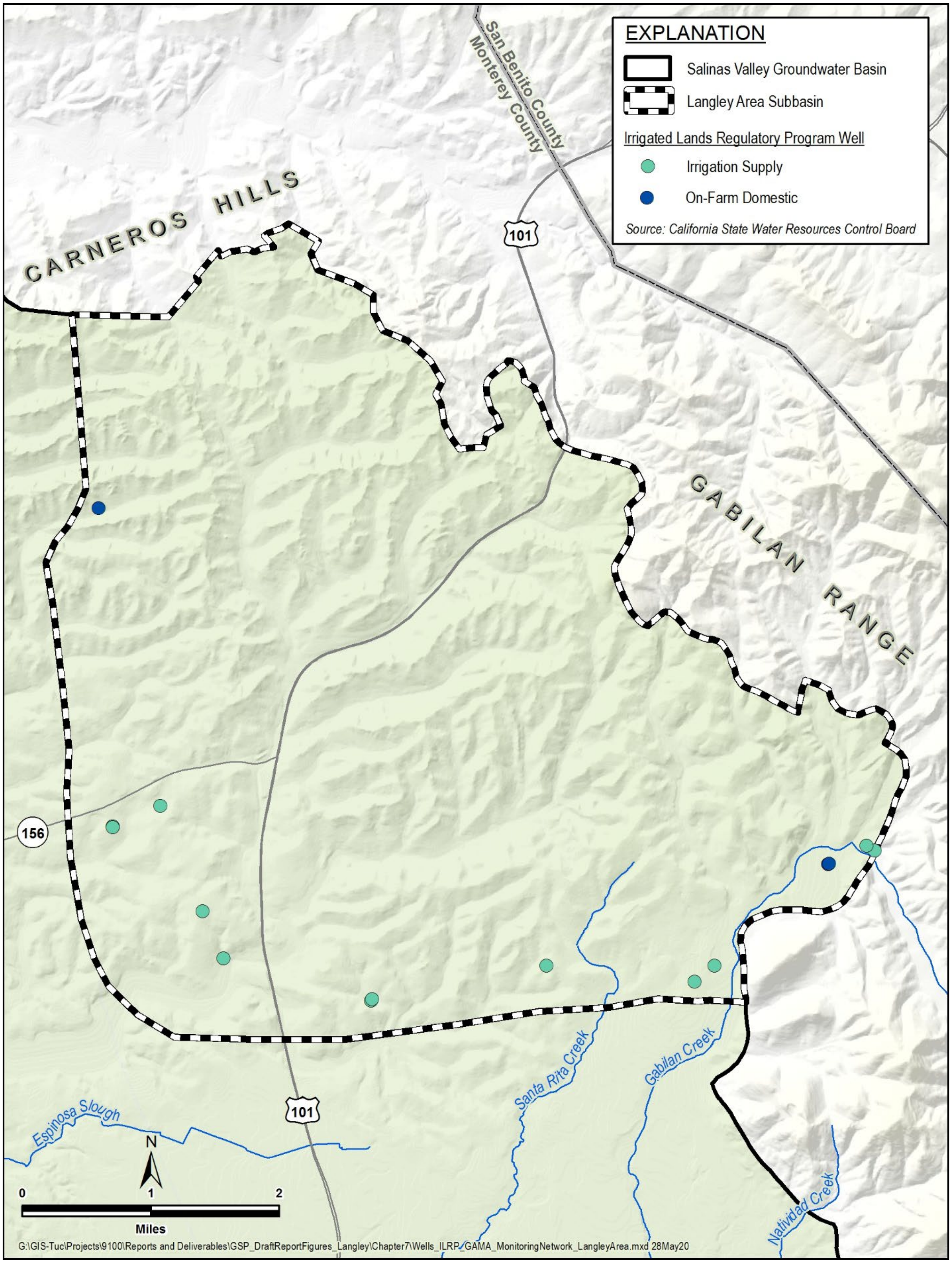


Figure 7-4. ILRP Wells in the Groundwater Quality Monitoring Network

7.5.1 Groundwater Quality Monitoring Protocols

The SVBGSA does not independently sample wells for any COC. Instead, the GSA analyzes water quality data that are collected through the DDW and ILRP. Therefore, the GSA is dependent on the monitoring density and frequency of DDW and ILRP.

Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB DDW, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

ILRP data are currently collected under CCRWQCB Ag Order 3.0. ILRP samples are collected under the Tier 1, Tier 2, or Tier 3 monitoring and reporting programs. Under Ag Order 4.0, ILRP data will be collected in 3 phases and each groundwater basin within the Central Coast Region has been assigned to one or more of these phases. Ag Order 4.0 will take effect in the Subbasin beginning in 2027. The designated phase for each ILRP well is provided in SWRCB's GeoTracker database and is publicly accessible at: https://geotracker.waterboards.ca.gov/. Copies of the Ag Orders 3.0 and 4.0 monitoring and reporting programs are included in Appendix 7E and are incorporated into this GSP. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.5.2 Groundwater Quality Monitoring Data Gaps

The DDW and ILRP monitoring network provide sufficient spatial and temporal data to determine groundwater quality trends for water quality indicators to address known water quality issues. Additionally, there is adequate spatial coverage in the water quality monitoring network to assess impacts to beneficial uses and users.

7.6 Land Subsidence Monitoring Network

As described in Section 5.5, DWR collects land subsidence data using InSAR satellite data and makes these data available to GSAs. This subsidence dataset represents the best available science for the Langley Subbasin and is therefore used as the subsidence monitoring network.

7.6.1 Land Subsidence Monitoring Protocols

Land Subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. DWR adapted their methods to measure subsidence on hard surfaces only and interpolate between them to minimize the change in land surface elevation captures in soft surfaces that are likely not true subsidence. The cell size of this interpolated surface is 302 feet by 302 feet. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be correlated to groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.6.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

7.7 Interconnected Surface Water Monitoring Network

The primary tool for assessing depletion of ISW due to pumping will be shallow monitoring wells adjacent to streams in the Subbasin. There are no existing monitoring wells in the Subbasin that can be used to monitor ISW. Figure 7-5 shows the location of a proposed new monitoring well along Gabilan Creek near where preliminary SVIHM results show there is ISW (Figure 4-9). Although the SVIHM identified other locations of ISW, a new well will be installed near the Gabilan Creek location because it can be paired with the nearby USGS gauge on Gabilan Creek, which is located within the Eastside Aquifer Subbasin shown on Figure 7-5. Although the well is within the Eastside Aquifer Subbasin, it will allow for monitoring of groundwater elevations near Gabilan Creek near the Langley Subbasin and may provide insight on the relationship between streamflow and groundwater elevations. Additionally, the combined use of groundwater elevation and streamflow data will allow SVBGSA to assess temporal changes in conditions due to variations in stream discharge and regional groundwater extraction, as well as other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water as discussed in Chapter 8. All ISW monitoring wells are RMS. More information on the development of the ISW monitoring network is provided in Appendix 7F.

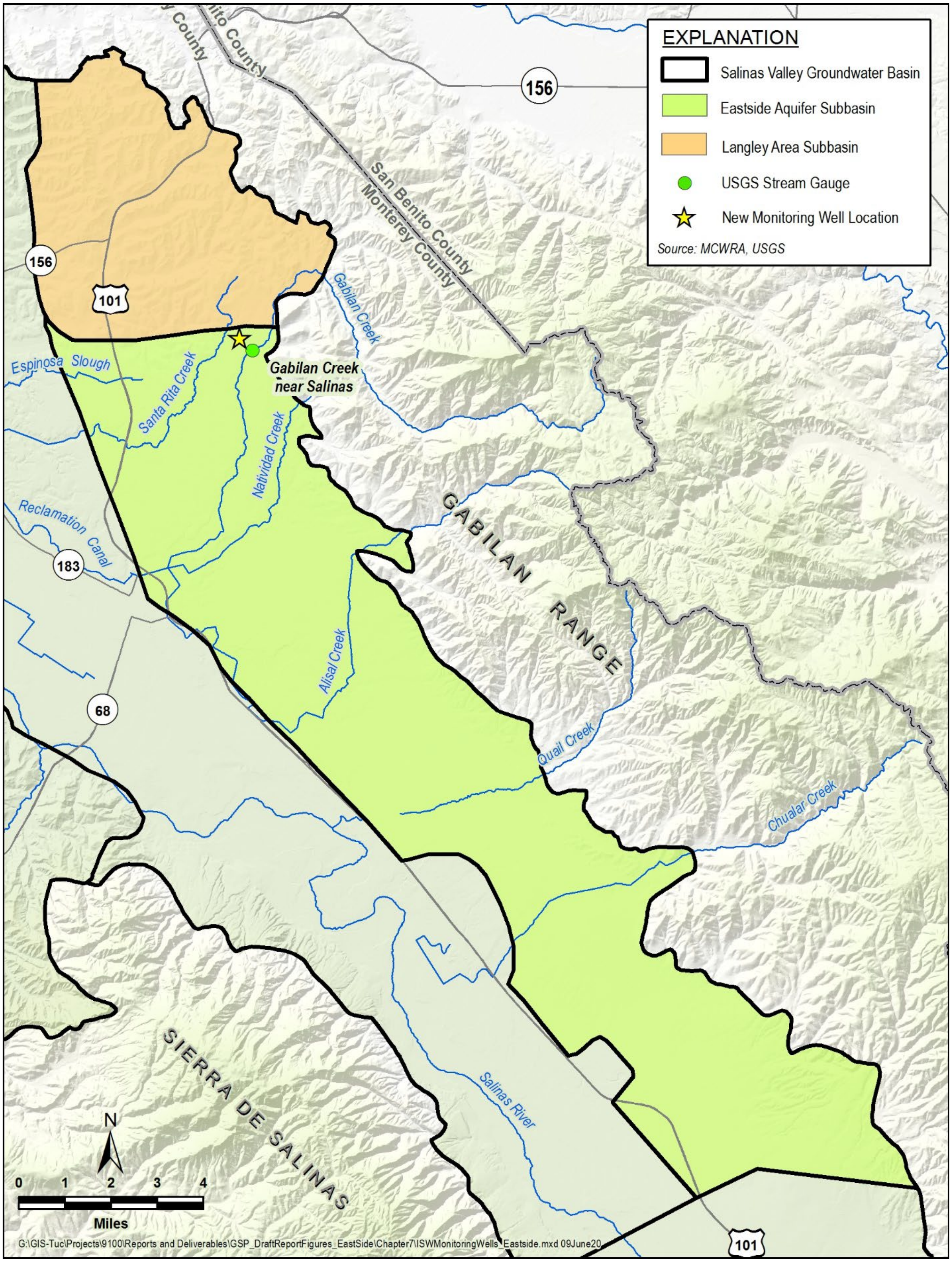


Figure 7-5. Interconnected Surface Water Monitoring Network

7.7.1 Interconnected Surface Water Monitoring Protocols

Monitoring protocols for shallow wells monitoring ISW will be identical to MCWRA's current groundwater elevation monitoring protocols, included in Appendix 7A. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4. Additionally, each well that is added to the monitoring network will be equipped with a data logger that will allow SVBGSA to access if seasonal pumping is resulting in streamflow depletions.

7.7.2 Interconnected Surface Water Data Gaps

As shown on Figure 7-5, the data gap in the ISW monitoring network will be filled with a new well added along the Gabilan Creek, as discussed in Chapter 10. The new shallow well will be added to MCWRA's groundwater elevation monitoring program.

7.8 Other Monitoring Networks

SGMA requires that annual reports include annual groundwater extractions and surface water diversions in order to report total water use for the Subbasin; thus, the following monitoring networks are needed in addition to the monitoring networks outlined above for sustainability indicators.

7.8.1 Groundwater Extraction Monitoring Network

Under Monterey County Ordinance No. 3717 and No. 3718, public water systems and agricultural pumpers using wells with an internal discharge pipe greater than 3 inches within Zones 2, 2A, and 2B report extractions annually to MCWRA's GEMS. Extraction is self-reported by well owners or operators. Agricultural wells report their data based on MCWRA's reporting year that runs from November 1st through October 31st. Urban and industrial wells report extraction on a calendar year basis. When extraction data is summarized annually, MCWRA combines industrial and urban extractions into a single urban water use. However, as depicted on Figure 3-3, these zones do not provide sufficient coverage of the Langley Subbasin. This data gap is further discussed in Section 7.8.1.2.

GEMS data is used where available, and groundwater withdrawn outside of Zones 2, 2A, and 2B is measured in the following ways:

- Municipal pumping is estimated using reported pumping data for public drinking water systems located within the Subbasin. Pumping data for public water systems is reported annually to SWRCB's DDW Electronic Annual Report database, publicly accessible at: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/eardata.html.
- Domestic pumping is estimated by applying a constant rate of 0.3 AF/yr. to all non-vacant residential use parcels in the Langley Subbasin that are not located in the service area of a public drinking water system. Water usage for these water systems ranged from

0.26 to 0.51 AF/yr./dwelling, with values in the upper ranges associated with parcels that were substantially larger than the median parcel size in the Subbasin. A value of 0.3 AF/yr./dwelling was associated with lots similar to the median parcel size of 1.25 acres and was selected as the representative annual rate for domestic pumping. Based on a review of available data, there are approximately 2,016 non-vacant residential use parcels units located outside the service areas of public drinking water systems in the subbasin. This factor may be revised in the future if SVBGSA obtains information to justify a change.

- Agricultural pumping in the Subbasin is estimated using monthly precipitation and ET data and crop specific variables. Appendix 7G details the data and methods used.

7.8.1.1 Groundwater Extraction Monitoring Protocols

Groundwater extraction monitoring uses existing monitoring programs performed by other agencies. This includes MCWRA's GEMS program and the annual public drinking water system pumping reported to SWRCB. These monitoring protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.8.1.2 Groundwater Extraction Monitoring Data Gaps

Accurate assessment of the amount of pumping requires an accurate count of the number of municipal, agricultural, and domestic wells in the GSP area. As proposed in Chapter 9, SVBGSA will undertake well registration during implementation to develop a database of existing and active groundwater wells. This database will draw from the existing MCWRA database, DWR's OSWCR database, and the Monterey County Health Department database of state small and local small water systems. As part of the assessment, the SVBGSA will verify well completion information and location and whether the well is active, abandoned, or destroyed, as is discussed further in Chapter 9.

SVBGSA will also expand and enhance the GEMS program to address groundwater extraction monitoring data gaps. The current GEMS program only covers a small southern portion of the Subbasin resulting in a data gap. In addition, the accuracy and reliability of groundwater pumping reported through GEMS is constantly being updated. SVBGSA will work with MCWRA to address these data gaps during GSP implementation by expanding the GEMS program and considering other potential enhancements as described in Chapter 9.

7.8.2 Salinas River Watershed Diversions

Salinas River watershed monthly diversion data are collected annually in the SWRCB's eWRIMS, used to track information of water rights in the state, publicly accessible at: https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/reportingDiversionDownloadPublicSetup.do. These data also include diversions from tributaries of the Salinas River.

7.8.2.1 Salinas River Watershed Diversions Monitoring Protocols

Salinas River watershed diversion monitoring protocols are those that the SWRCB has established for the collection of water right information. These protocols are consistent with data and reporting standards described in GSP Regulations § 352.4.

7.8.2.2 Salinas River Watershed Diversions Monitoring Data Gaps

These data are lagged by a year because the reporting period does not begin until February of the following year.

7.9 Data Management System and Data Reporting

The SVBGSA has developed a DMS in adherence to GSP Regulations § 352.6 and § 354.40 that is used to store, review, and upload data collected as part of the GSP development and implementation.

The SVBGSA DMS consists of 2 SQL databases. The HydroSQL database stores information about each well and time-series data for water level and extraction. Fields in the HydroSQL database include:

- Subbasin
- Cadastral coordinates
- Planar coordinates
- Well owner
- Well name
- Well status
- Well depth
- Screened interval top and bottom
- Well type
- Water level elevation
- Annual pumping volume

Well owner and annual pumping information will be stored in HydroSQL; however, neither will be publicly accessible due to confidentiality requirements. Streamflow gauge data from the USGS is stored in the HydroSQL database similarly to the well water level information.

Water quality data are stored in the EnviroSQL database, which is linked to the HydroSQL database for data management purposes. Fields in the EnviroSQL database include:

- Station
- Parameter
- Sample Date
- Detection (detect or non-detect)
- Value
- Unit

The data used to populate the SVBGSA DMS are listed in Table 7-2. Categories marked with an X indicate datasets that were used in populating the DMS, including data that are publicly accessible or that are available to SVBGSA from MCWRA . Some data, such as groundwater extraction is confidential, and cannot be made publicly accessible by SVBGSA unless aggregated. Additional datasets will be added in the future as appropriate, such as recharge or diversion data.

Table 7-2. Datasets Available for Use in Populating the DMS

	Data Category					
Data Sets	Well and Site Information	Well Construction	Water Level	Groundwater Extraction [1]	Streamflow	Water Quality
DWR (CASGEM)	X	X				
MCWRA	X	X	X	X		
GAMA Groundwater Information System	X					X
USGS Gauge Stations					X	

[1]Pumping data not publicly accessible

Data are compiled and reviewed to comply with data quality objectives. The review included the following checks:

- Removing or flagging questionable data being uploaded in the DMS. This includes identifying outliers that may have been introduced during the original data entry process and plotting each well hydrograph to identify and remove anomalous data points.
- Loading into the database and checking for errors and missing data.

In the future, well log information will be entered for selected wells and other information will be added as needed to satisfy the requirements of the GSP Regulations.

The DMS also includes a publicly accessible web map hosted on the SVBGSA website; accessible at https://svbgsa.org/gsp-web-map-and-data/. This web-map gives interested parties access to non-confidential technical information used in the development of the GSP and annual reports, and includes public well data and analysis such as water level contour maps and seawater intrusion, as well as various local administrative boundaries. In addition, the web-map has functionalities to graph time series of water levels and search for specific wells in the database. This web-map will be regularly updated as new information is made available to the SVBGSA.

8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management; and establishes minimum thresholds, measurable objectives, and undesirable results for each sustainability indicator. The minimum thresholds, measurable objectives, and undesirable results detailed in this chapter define the Subbasin's future conditions and commit the GSA to actions that will meet these criteria. This chapter includes adequate data to explain how SMC were developed and how they influence all beneficial uses and users. The chapter is structured to address all the GSP Regulations § 354.22 *et. seq.* regarding SMC. To retain an organized approach, the SMC are grouped by sustainability indicator. The discussion of each sustainability indicator follows a consistent format that contains all the information required by the GSP Regulations, and as further clarified in the SMC BMP (23 California Code of Regulations § 354.22 *et. seq*; DWR, 2017).

8.1 Definitions

The SGMA legislation and GSP Regulations contain terms relevant to the SMC. The definitions included in the GSP Regulations are repeated below. Where appropriate, additional explanatory text is added in italics. This explanatory text is not part of the official definitions of these terms.

- **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 California Water Code § 10721(x).

  The 6 sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; seawater intrusion; and depletion of ISW.

- **Significant and Unreasonable**

  Significant and unreasonable is not defined in the Regulations. However, the definition of undesirable results states, "Undesirable results occur when significant and unreasonable effects … are caused by groundwater conditions…". This GSP adopts the phrase significant and unreasonable to be the qualitative description of undesirable conditions due to inadequate groundwater management. Minimum thresholds are the quantitative measurement of the significant and unreasonable conditions.

- **Minimum threshold** refers to a numeric value for each sustainability indicator used to define undesirable results.

  Minimum thresholds are indicators of an unreasonable condition.

- **Measurable objective** refers to a specific, quantifiable goal for the maintenance or improvement of specified groundwater conditions that has been included in an adopted Plan to achieve the sustainability goal for the basin.

Measurable objectives are goals that the GSP is designed to achieve.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of 5 years, set by an Agency as part of a Plan.

  Interim milestones are targets such as groundwater elevations that will be achieved every 5 years to demonstrate progress towards sustainability.

  - Undesirable Result

    Undesirable Result is not defined in the Regulations. However, the description of undesirable result states that it should be a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the subbasin. An example undesirable result is more than 10% of the measured groundwater elevations being lower than the minimum thresholds. Undesirable results should not be confused with significant and unreasonable conditions. Significant and unreasonable conditions are qualitative descriptions of conditions to be avoided; an undesirable result is a quantitative assessment based on minimum thresholds.

8.2 Sustainability Goal

The sustainability goal of the Langley Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies while maintaining the unique cultural, community, and business aspects of the Subbasin. It is the express goal of this GSP to balance the needs of all water users in the Subbasin.

Several projects and management actions that will allow the SVBGSA to attain sustainability are included in this GSP and detailed in Chapter 9. It is not necessary to implement all projects and actions listed in this GSP to attain sustainability. However, some combination of these will be implemented to ensure the Subbasin is operated within its sustainable yield and meets the sustainability goal throughout the planning and implementation horizon. These projects include 4 recharge projects that range from decentralized household-level projects to large recharge basins. Pumping allocations and controls provide the option for demand management, if needed. There are also 2 cross-boundary projects that may reduce the need for projects within the Langley Subbasin but would primarily be implemented in adjacent subbasins. Finally, Chapter 9 includes implementation actions that do not directly help meet the SMC, but contribute to GSP implementation through data collection, assistance to groundwater users, and collaboration with partner agencies. This suite of projects and management actions provide sufficient options to attain sustainability in the Langley Subbasin throughout GSP implementation. The management actions and projects are designed to attain sustainability within the next 20 years by one or more of the following means:

- Educating stakeholders and prompting changes in behavior to improve chances of achieving sustainability.
- Increasing awareness of groundwater pumping impacts to promote voluntary reductions in groundwater use through improved water use practices or fallowing crop land.
- Increasing basin recharge.
- Developing new alternative water supplies for use in the Subbasin to offset groundwater pumping.

8.3 Achieving Long-Term Sustainability

The GSP addresses long-term groundwater sustainability. Correspondingly, the SVBGSA intends to develop SMC to avoid undesirable results under future hydrologic conditions. The understanding of future conditions is based on historical precipitation, ET, streamflow, and reasonable anticipated climate change, which have been estimated on the basis of the best available climate science (DWR, 2018). These parameters underpin the estimated future water budget over the planning horizon (see Section 6.4). The average hydrologic conditions include reasonably anticipated wet and dry periods. Groundwater conditions that are the result of extreme climatic conditions and are worse than those anticipated do not constitute an undesirable result. However, SMC may be modified in the future to reflect observed future climate conditions.

The GSA will track hydrologic conditions during GSP implementation. These observed hydrologic conditions will be used to develop a value for average hydrologic conditions, which will be compared to predicted future hydrologic conditions. This information will be used to interpret the Subbasin's performance against SMC. Year-by-year micro-management is not the intent of this GSP; this GSP is developed to avoid undesirable results with long-term, deliberate groundwater management. For example, groundwater extractions may experience variations caused by reasonably anticipated hydrologic fluctuations. However, under average hydrologic conditions, there will be no chronic depletion of groundwater storage.

Further, since the GSP addresses long-term groundwater sustainability, exceedance of some SMC during an individual year does not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code § 10721(w)(1)), "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." Therefore, groundwater levels may temporarily exceed minimum thresholds during prolonged droughts, which could be more extreme than those that have been anticipated based on historical data and anticipated climate change conditions. Such temporary exceedances do not constitute an undesirable result.

The SMC presented in this chapter are developed on the basis of historically observed hydrologic conditions and, in most cases, reasonably anticipated climate change. These SMC may be updated in future drafts to reflect changes in anticipated climate conditions and climate change based upon groundwater modeling results.

8.4 General Process for Establishing Sustainable Management Criteria

The SMC presented in this chapter were developed using publicly available information, feedback gathered during public meetings including subbasin committee meetings, hydrogeologic analysis, and meetings with SVBGSA staff and Advisory Committee members. The general process included:

- Presenting to subbasin committees on the general SMC requirements and implications. These presentations outlined the approach to developing SMC and discussed initial SMC ideas.
- Providing supplemental data to the subbasin committees to guide the approach to setting SMC.
- Polling and receiving feedback from the subbasin committees to establish preferences for establishing SMC.
- Obtaining additional input on SMC from with GSA staff and GSA Board Members.
- Modifying minimum thresholds and measurable objectives based on input from the public, GSA staff, and GSA Board Members, if needed.

8.5 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the SMC for each of the 6 sustainability indicators. Measurable objectives are the goals that reflect the subbasin's desired groundwater conditions for each sustainability indicator. These provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. The undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole. This GSP is designed to not only avoid undesirable results, but to achieve the sustainability goals within 20 years, along with interim milestones every 5 years that show progress. The management actions and projects provide sufficient options for reaching the measurable objectives within 20 years and maintaining those conditions for 30 years for all 6 sustainability indicators. The rationale and background for developing these criteria are described in detail in the following sections.

The SMC are individual criteria that will each be met simultaneously, rather than in an integrated manner. For example, the groundwater elevation and seawater intrusion SMC are 2 independent

SMC that will be achieved simultaneously. The groundwater elevation SMC do not hinder the seawater intrusion SMC, but also, they do not ensure the halting of seawater intrusion by themselves. The SMC presented in Table 8-1 are part of the GSA's 50-year management plan: SGMA allows for 20 years to reach sustainability and requires the Subbasin have no undesirable results for the subsequent 30 years.

Table 8-1. Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Chronic lowering of groundwater levels	Measured through groundwater level representative monitoring well network.	Minimum thresholds are set to 2019 groundwater elevations, adjusted based on well-specific elevation assessments. See Table 8-2.	Measurable objectives are set to 2010 groundwater elevations adjusted based on well-specific elevation assessments.	More than 15% of groundwater elevation minimum thresholds are exceeded. Allows 2 exceedances in the Langley Subbasin.
Reduction in groundwater storage	Measured by proxy through groundwater level representative monitoring well network.	Minimum thresholds are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.	Measurable objectives are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives are identical to the chronic lowering of groundwater levels measurable objectives.	More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.
Seawater intrusion	Seawater intrusion maps developed by MCWRA.	Minimum threshold is the 500 mg/L chloride isocontour at the Subbasin boundary.	Measurable objective is identical to the minimum threshold, resulting in no seawater intrusion in the Langley Subbasin.	Any exceedance of the minimum threshold, resulting in mapped seawater intrusion within the Subbasin boundary.
Degraded groundwater quality	Groundwater quality data downloaded annually from GeoTracker GAMA groundwater information system.	Minimum thresholds are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or the Basin Plan objectives (irrigation supply wells) beyond those observed in 2019 for groundwater quality COC. Exceedances are only measured in public water system supply wells and ILRP on-farm domestic and irrigation supply wells. See Table 8-4.	Measurable objectives are identical to the minimum thresholds.	Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.
Land Subsidence	Measured using DWR provided InSAR data.	Minimum threshold is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors.	Measurable objective is identical to the minimum threshold, resulting in zero net long-term subsidence.	There is an exceedance of the minimum threshold for subsidence due to lowered groundwater elevations.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result
Depletion of Interconnected Surface Water	Groundwater elevations in shallow wells adjacent to locations of ISW identified using the SVIHM.	Minimum thresholds are established by proxy using shallow groundwater elevations observed in 2019 near locations of ISW, adjusted based on well-specific elevation assessments.	Measurable objectives are established by proxy using shallow groundwater elevations observed in 2010 near locations of ISW, adjusted based on well-specific elevation assessments.	There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

8.6 Chronic Lowering of Groundwater Levels SMC

8.6.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable groundwater elevations in the Subbasin are those that:

- Are at or below the observed groundwater elevations in 2019. Public and stakeholder input identified these historical groundwater elevations as significant and unreasonable.
- Cause low groundwater elevations in a significant number of domestic and small water system wells that lead to inadequate water production.
- Interfere with other sustainability indicators.

These significant and unreasonable conditions were determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

8.6.2 Minimum Thresholds

The minimum thresholds for chronic lowering of groundwater levels are set to 2019 groundwater elevations, adjusted based on well-specific elevation assessments.

The minimum threshold values for each well within the groundwater level representative monitoring network are provided in Table 8-2. The minimum threshold contour maps, along with the RMS well locations for the single principal aquifer in the Langley Subbasin, are shown on Figure 8-1.

Table 8-2. Chronic Lowering of Groundwater Levels Minimum Thresholds and Measurable Objectives

Monitoring Site	Minimum Threshold (ft)	Measurable Objective (ft)
13S/03E-08D01	170.0*	175.0*
13S/03E-10N01	273.2*	278.8
13S/03E-10Q01	435.9*	440.9*
13S/03E-14M01	356.0	366.9
13S/03E-15P01	80.9	90.6
13S/03E-16J01	41.3*	48.1
13S/03E-17B01	163.4*	168.4*
13S/03E-17F02	-41.4	-31.4*
13S/03E-19H01	-0.8*	4.2*
13S/03E-20B02	100.1*	105.1*
13S/03E-20P01	71.1*	77.3
13S/03E-22F01	84.4	100.6
13S/03E-29A01	-61.2	-51.2*
13S/03E-29K01	58.8	68.8*
13S/03E-32H01	-47.0	-38.0
13S/03E-33T50	-50.0	-45.0

*Groundwater elevation was adjusted.

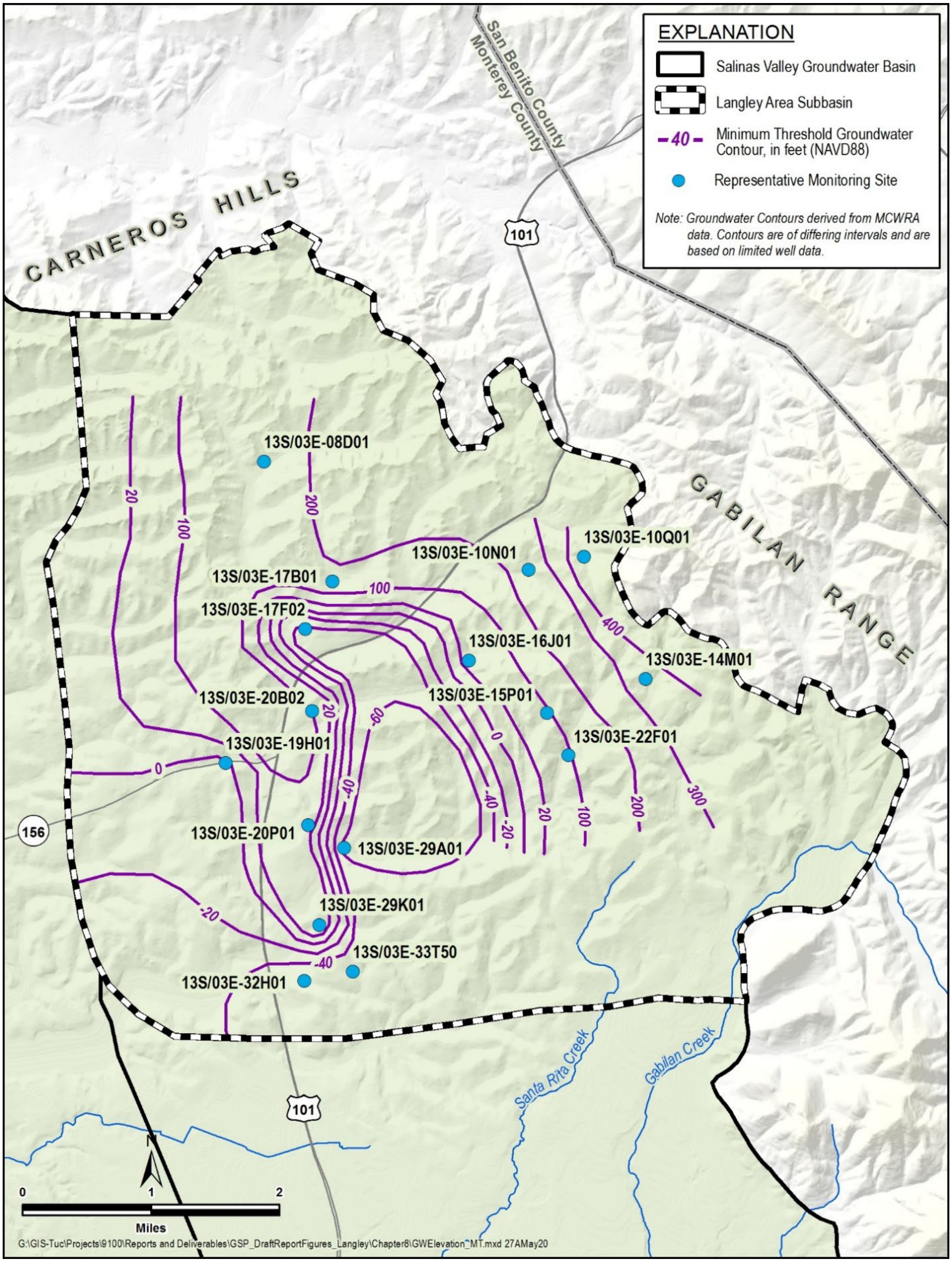


Figure 8-1. Groundwater Level Minimum Threshold Contour Map

8.6.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The development of minimum thresholds and measurable objectives followed similar processes and are described concurrently in this section. The information used includes:

- Feedback from discussions with the Subbasin Committee on challenges and goals
- Historical groundwater elevation data and hydrographs from wells monitored by the MCWRA
- Maps of current and historical groundwater elevation data
- Analysis of the impact of groundwater elevations on domestic wells

The general steps for developing minimum thresholds and measurable objectives were:

1. The Subbasin Planning Committee selected an approach and criteria for to setting the groundwater level minimum thresholds and measurable objectives.
2. SVBGSA used MCWRA's average groundwater elevation change hydrographs to select representative years that could define minimum thresholds and measurable objectives for the Subbasin. Groundwater elevations like those experienced during the representative climatic cycle between 1967 and 1998 were used to identify minimum thresholds and measurable objectives to ensure that they were achievable under reasonably expected climatic conditions. This representative period corresponds to important water management milestones for the Salinas Valley Groundwater Basin; water year 1967 marks the beginning of operations at San Antonio Reservoir, with first water releases in November 1966. The CSIP began operating in 1998.
3. The average groundwater elevation change hydrograph with minimum threshold and measurable objective lines for the Langley Subbasin are shown on Figure 8-2. The average 2019 groundwater elevations in the Langley Subbasin are considered significant and unreasonable. When looking at the groundwater elevation changes within the representative climatic cycle, the historical lowest elevations occurred in 1981, at approximately 2 feet lower than 2019 elevations. The minimum thresholds were therefore set to the 2019 groundwater elevations. The measurable objectives were set to 2010 groundwater elevations, which is an achievable goal for the Subbasin under reasonably expected climatic conditions.
4. SVBGSA identified the appropriate minimum thresholds and measurable objectives on the respective monitoring well hydrographs. Each hydrograph was visually inspected to check if the minimum threshold and measurable objective was reasonable. If the minimum threshold seemed unreasonable, it was adjusted to be more reflective of recently low groundwater elevations and changes in groundwater elevations experienced

due to climatic cycles. Additionally, measurable objectives were revised in order to set a more realistically achievable goal based on historic water levels. Moreover, the SMC were adjusted to have a difference of at least 5 feet between the 2 levels. The adjusted minimum thresholds and measurable objectives are indicated by an asterisk in Table 8-2.

Hydrographs with well completion information showing minimum thresholds for each RMS are included in Appendix 8A.

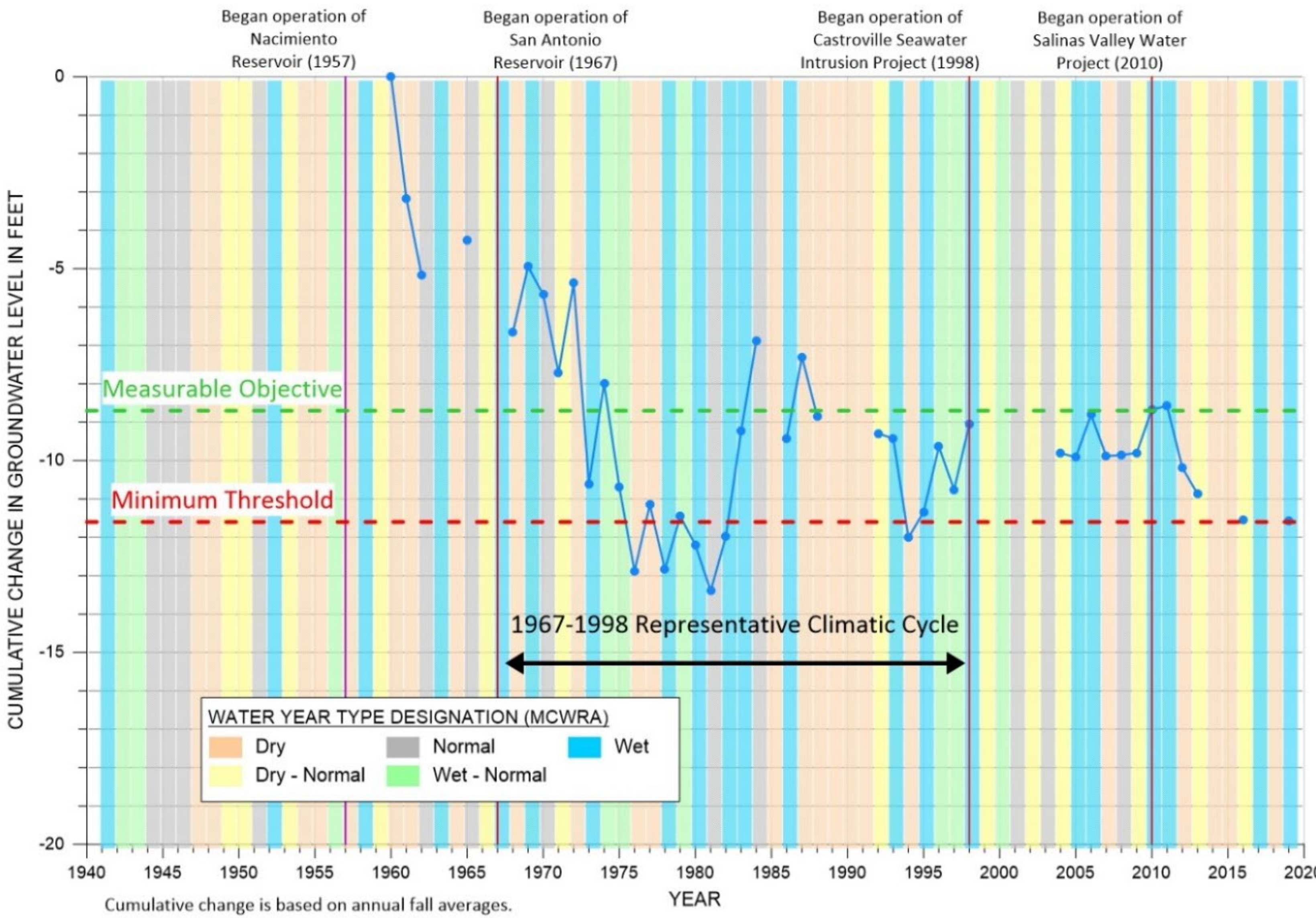


Figure 8-2. Cumulative Groundwater Elevation Change Hydrograph with Selected Minimum Threshold and Measurable Objective for the Langley Area Subbasin

8.6.2.2 Minimum Thresholds Impact on Domestic Wells

To address the human right to water, minimum thresholds for groundwater levels are compared to the range of domestic well depths in the Subbasin using DWR's OSWCR database. This check was done to assure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater levels do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. The average computed depth of domestic wells in the Subbasin is 307 feet using the Public Land Survey System sections data in the OSWCR database.

While this approach is reasonable, there are some adjustments that had to be made to improve the accuracy of the analysis. These include:

- The OSWCR database does not eliminate wells that have been abandoned or destroyed, such as if the user switched to a water system and abandoned or destroyed wells would have no detrimental impacts from lowered groundwater levels.
- Only wells likely to be in the principal aquifer were considered, based on geologic logs, since some domestic wells are drilled in the granite underlying the principal aquifer or the shallow, perched groundwater that is not managed under this GSP.
- Only wells that had accurate locations were included, since the estimated depth to water may not be accurate in those listed as the centroid, particularly in this hilly region. In addition, the groundwater elevation contours may not be accurate in steep terrain.

Given the limitations listed above, the analysis included 41 wells out of the total 823 domestic wells in the OSWCR database. In the Langley Subbasin, 85% of the domestic wells will have at least 25 feet of water in them as long as groundwater elevations remain above minimum thresholds and measurable objectives. These percentages were considered reasonable despite the limitations of this analysis. Since data for the analysis is limited, further assessment may be done when more data becomes available.

8.6.2.3 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The SVBGSA compared minimum thresholds between RMSs to understand the relationship between RMSs (i.e., describe why or how a water level minimum threshold set at a particular RMS is similar to or different from water level thresholds in RMS). The minimum thresholds are unique at every well, but when combined represent a reasonable and potentially realistic groundwater elevation map. Because the underlying groundwater elevation map is a reasonably achievable condition, the individual minimum thresholds at RMSs do not conflict with each other.

Groundwater level minimum thresholds can influence other sustainability indicators. SVBGSA reviewed the groundwater level minimum thresholds' relationship with each of the other sustainability indicators' minimum thresholds to ensure a groundwater level minimum threshold would not trigger an undesirable result for any of the other sustainability indicators. The groundwater level minimum thresholds are selected to avoid undesirable results for other sustainability indicators.

- **Reduction in groundwater storage.** The chronic lowering of groundwater levels' minimum thresholds are identical to the groundwater storage minimum thresholds. Thus, the groundwater level minimum thresholds will not result in an undesirable loss of groundwater storage.
- **Seawater intrusion.** The chronic lowering of groundwater level minimum thresholds are set above historical lows. Therefore, the groundwater elevation minimum thresholds are intended to not exacerbate, and may help control, the rate of seawater intrusion.
- **Degraded water quality.** The chronic lowering of groundwater levels minimum could affect groundwater quality through 2 processes:
    1. Changes in groundwater elevation could change groundwater gradients, which could cause poor quality groundwater to flow toward production and domestic wells that would not have otherwise been impacted. These groundwater gradients, however, are only dependent on differences between groundwater elevations, not on the groundwater elevations themselves. Therefore, the minimum threshold groundwater levels do not directly lead to a significant and unreasonable degradation of groundwater quality in production and domestic wells.
    2. Decreasing groundwater elevations can mobilize COC that are concentrated at depth, such as arsenic. The groundwater level minimum thresholds are near or above historical lows. Therefore, any depth dependent constituents have previously been mobilized by historical groundwater levels. Maintaining groundwater elevations above the minimum thresholds assures that no new depth dependent COC are mobilized and are therefore protective of beneficial uses and users.
- **Land subsidence.** The chronic lowering of groundwater levels' minimum thresholds are set at or above recent low groundwater elevations. Thus, avoiding the dewatering and compaction of clay-rich sediments that causes subsidence in response to lowering groundwater elevations.
- **Depletion of ISW.** The chronic lowering of groundwater levels' minimum thresholds are identical to the ISW minimum thresholds. Therefore, the groundwater level minimum thresholds will not result in a significant or unreasonable depletion of ISW, including GDEs.

8.6.2.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Aquifer Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the Langley Subbasin are above historical low groundwater elevations and the basins are separated by thick clay layers, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency to ensure that the basins do not prevent each other from achieving sustainability.

8.6.2.5 Effects on Beneficial Users and Land Uses

The groundwater level minimum thresholds may have several effects on beneficial users and land uses in the Subbasin.

Agricultural land uses and users. The groundwater level minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. Unless sufficient recharge projects are undertaken, this may have the effect of limiting the amount of groundwater pumping in the Subbasin. Limiting the amount of groundwater pumping may limit the amount and type of crops that can be grown in the Subbasin. The groundwater level minimum thresholds could therefore limit expansion of the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land currently under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not currently under irrigation may become less valuable because it may be too difficult and expensive to irrigate.

Urban land uses and users. The groundwater level minimum thresholds may reduce the amount of groundwater pumping in the Subbasin. This may limit urban growth or result in urban areas obtaining alternative sources of water. This may result in higher water costs for public drinking water system users.

Domestic land uses and users. The groundwater level minimum thresholds are intended to protect most domestic wells, including small state and small local system wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells. However, extremely shallow domestic wells may become dry, requiring owners to drill deeper wells. Additionally, the groundwater elevation minimum thresholds may limit the number of new domestic wells or small state and small local system wells that can be drilled to limit future declines in groundwater elevations.

Ecological land uses and users. The groundwater level minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This outcome may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations.

8.6.2.6 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater levels.

8.6.2.7 Method for Quantitative Measurement of Minimum Thresholds

Groundwater level minimum thresholds will be directly measured from the representative monitoring well network. The groundwater elevation monitoring will be conducted according to the monitoring plan outlined in Chapter 7. Furthermore, the groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Regulations.

As noted in Chapter 7, the current groundwater level monitoring network in the Subbasin across aquifers includes 14 wells. Data gaps were identified in Chapter 7 and will be resolved during implementation of this GSP.

8.6.3 Measurable Objectives

The measurable objectives for chronic lowering of groundwater levels represent target groundwater elevations that are higher than the minimum thresholds. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability.

The measurable objectives for the chronic lowering of groundwater levels are set to 2010 groundwater elevations, adjusted based on well-specific elevation assessments.

The measurable objectives are summarized in Table 8-2 and are also shown on the hydrographs for each RMS in Appendix 8A.

8.6.3.1 Methodology for Setting Measurable Objectives

The methodology for establishing measurable objectives is described in detail in Section 8.6.2.1. A year from the relatively recent past was selected for setting measurable objectives to ensure that objectives are achievable. Groundwater elevations from 2010 were selected as representative of the measurable objectives for the Langley Subbasin. The measurable objective contour maps along with the representative monitoring network wells are shown on Figure 8-3 for the Langley Subbasin.

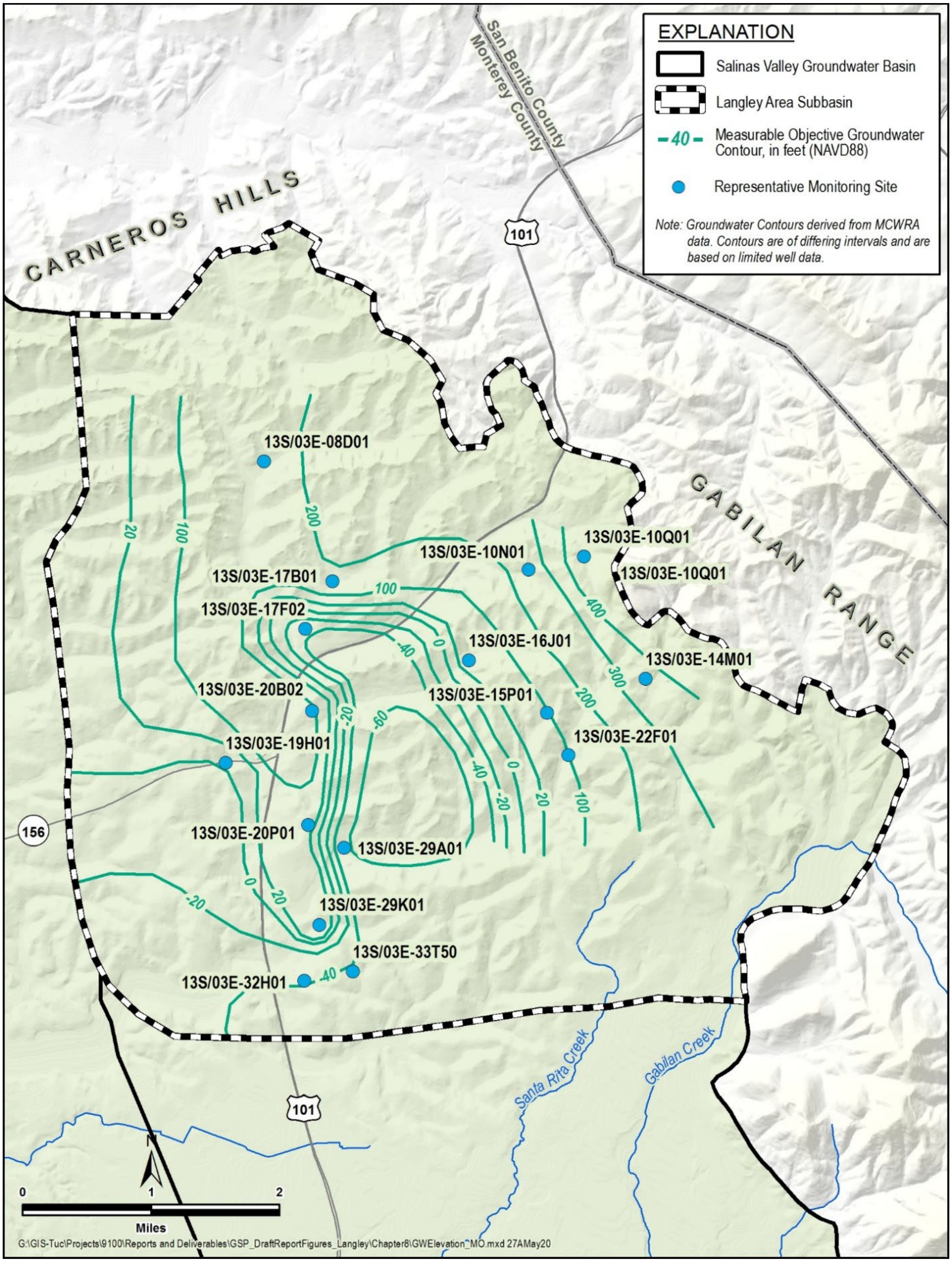


Figure 8-3. Groundwater Level Measurable Objective Contour Map

8.6.3.2 Interim Milestones

Interim milestones for groundwater levels are shown in Table 8-3. These are only initial estimates of interim milestones. Interim milestones for groundwater levels will be modified as better data, analyses, and project designs become available.

Table 8-3. Chronic Lowering of Groundwater Levels Interim Milestones

Monitoring Site	Current Groundwater Elevation (ft)	Interim Milestone at Year 2027 (ft)	Interim Milestone at Year 2032 (ft)	Interim Milestone at Year 2037 (ft)	Measurable Objective (ft) (goal to reach at 2042)
13S/03E-08D01	173.3	171.3	172.5	173.8	175.0*
13S/03E-10N01	278.2	274.6	276.0	277.4	278.8
13S/03E-10Q01	439.0	437.2	438.4	439.7	440.9*
13S/03E-14M01	356.0	358.7	361.5	364.2	366.9
13S/03E-15P01	80.9*	83.3	85.8	88.2	90.6
13S/03E-16J01	46.3	43.0	44.7	46.4	48.1
13S/03E-17B01	173.2	164.7	165.9	167.2	168.4*
13S/03E-17F02	-41.4	-38.9	-36.4	-33.9	-31.4*
13S/03E-19H01	1.9	0.5	1.7	3.0	4.2*
13S/03E-20B02	104.4	101.4	102.6	103.9	105.1*
13S/03E-20P01	76.7*	72.7	74.2	75.8	77.3
13S/03E-22F01	84.4	88.5	92.5	96.6	100.6
13S/03E-29A01	-61.2	-58.7	-56.2	-53.7	-51.2*
13S/03E-29K01	58.8	61.3	63.8	66.3	68.8*
13S/03E-32H01	-47.0	-44.8	-42.5	-40.3	-38.0
13S/03E-33T50	-50.0	-48.8	-47.5	-46.3	-45.0

*Groundwater elevation was adjusted.

8.6.4 Undesirable Results

8.6.4.1 Criteria for Defining Chronic Lowering of Groundwater Levels Undesirable Results

The chronic lowering of groundwater levels undesirable result is a quantitative combination of groundwater level minimum threshold exceedances. The undesirable result is:

More than 15% of the groundwater elevation minimum thresholds are exceeded.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater levels minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code §10721(w)(1)), “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." Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

Undesirable results provide flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances provides more flexibility but may lead to significant and unreasonable conditions for some beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces flexibility due to unanticipated hydrologic conditions. The undesirable result was set at 15% to balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty.

The 15% limit on minimum threshold exceedances in the undesirable result allows for 2 exceedances in the 16 existing monitoring wells. This was considered a reasonable number of exceedances given the hydrogeologic uncertainty of aquifer characteristics of the Subbasin. As the monitoring system grows, additional exceedances will be allowed. One additional exceedance will be allowed for approximately every 7 new monitoring wells.

8.6.4.2 Potential Causes of Undesirable Results

An undesirable result for chronic lowering of groundwater levels does not currently exist, since groundwater elevations in all 16 existing representative monitoring wells in the Subbasin were at the minimum threshold since they are set to fall 2019 groundwater elevation measurements. Conditions that may lead to an undesirable result include the following:

- **Localized pumping clusters.** Even if regional pumping occurs within the sustainable yield, clusters of high-capacity wells may cause excessive localized drawdowns that lead to undesirable results.
- **Expansion of *de minimis* pumping.** Individual *de minimis* pumpers do not have a significant impact on groundwater elevations. However, many *de minimis* pumpers are often clustered in specific residential areas. Pumping by these *de minimis* users is not regulated under this GSP. Adding additional domestic *de minimis* pumpers in these areas may result in excessive localized drawdowns and undesirable results.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought.** Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations and undesirable results.

8.6.4.3 Effects on Beneficial Users and Land Uses

The primary detrimental effect on beneficial users from allowing multiple exceedances occurs if more than 1 exceedance take place in a small geographic area. Allowing 15% exceedances is reasonable if the exceedances are spread out across the Subbasin, and as long as any 1 well does not regularly exceed its minimum threshold. If the exceedances are clustered in a small area, it will indicate that significant and unreasonable effects are being borne by a localized group of landowners.

8.7 Reduction in Groundwater Storage SMC

8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions in groundwater storage in the Subbasin are those that:

- Lead to chronic, long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

8.7.2 Minimum Thresholds

> *The minimum thresholds for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage minimum thresholds are identical to the chronic lowering of groundwater levels minimum thresholds.*

Although not the metric for establishing change in groundwater storage, the GSAs are committed to pumping at or less than the Subbasin's long-term sustainable yield. SGMA allows 20 years to reach sustainability.

8.7.2.1 Information and Methodology Used to Establish Minimum Thresholds

Since groundwater storage and groundwater elevation minimum thresholds are identical, the methodology used to the establish minimum thresholds for reduction in groundwater storage are detailed in Section 8.6.2.1.

The general relationship between groundwater storage and groundwater elevations is described in greater detail in Chapter 4, Section 4.4.2. The Subbasin-specific data analysis to establish the proxy relationship between groundwater storage and groundwater elevations is discussed below.

The GSP Regulations § 354.28(d) states that: "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."

Figure 8-4 compares the Subbasin's cumulative change in storage, plotted on the black line, with the average annual change in groundwater elevation, plotted on the blue line. The groundwater elevation change data are derived from the groundwater elevation network; the cumulative change in groundwater storage is derived from the SVIHM. Although the data come from 2 sources, the data show similar patterns between 1998 and 2016. The decrease in storage modeled by the SVIHM from 1983 to 1998 is not reflected in the change in groundwater elevations blue line, because the modeled storage is dependent on the simulated groundwater elevations in the SVIHM.

Figure 8-5 shows a scatter plot of cumulative change in storage and average change in groundwater elevation. The blue data points show data for the entire model period from 1980 to 2016 and the orange data points show data from 1998 to 2016. Although, the data for the entire model period demonstrate a weak correlation (R^2=0.2911), a more significant positive correlation exists between groundwater elevations and the amount of groundwater in storage between 1998 and 2016 (R^2=0.7263). The correlation for the 1998 to 2016 period is sufficient to show that groundwater elevations are an adequate proxy for groundwater storage. However, this highlights that the monitoring system needs to be expanded and refined to make groundwater elevations a better proxy for groundwater storage.

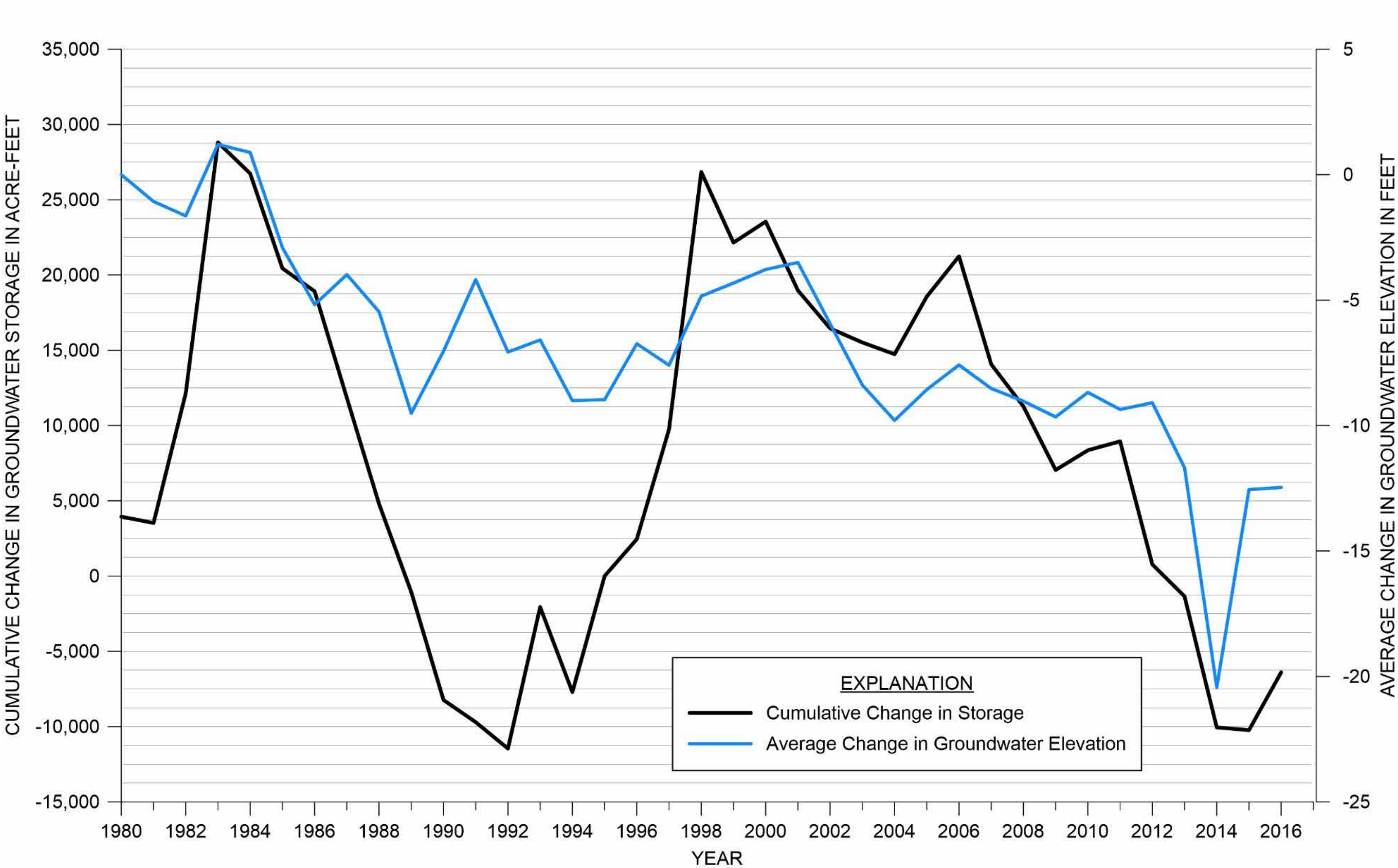


Figure 8-4. Cumulative Change in Storage and Average Change in Groundwater Elevation in the Langley Area Subbasin

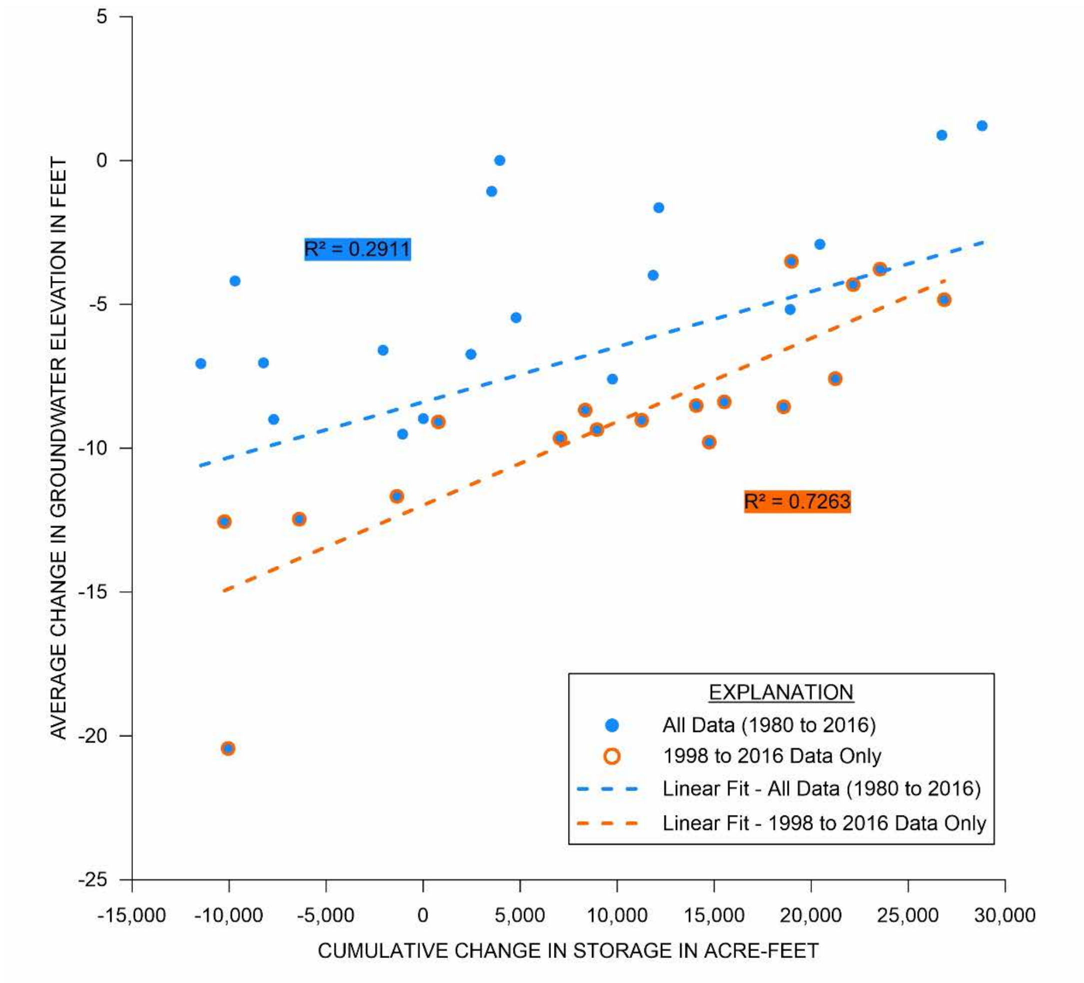


Figure 8-5. Correlation Between Cumulative Change in Storage and Average Change in Groundwater Elevation

8.7.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The groundwater storage minimum thresholds are identical to groundwater level minimum thresholds, which are consistent with other sustainability indicators, as described in Section 8.6.2.3.

8.7.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin occurs directly to the north. Because the minimum thresholds in the Langley Subbasin are set to avoid dropping below recent storage levels, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.7.2.4 Effect on Beneficial Uses and Users

Because the groundwater storage minimum thresholds are defined based on groundwater level minimum thresholds, the effects of groundwater storage minimum threshold on beneficial uses and users are identical to those described in Section 8.6.2.5.

8.7.2.5 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

8.7.2.6 Method for Quantitative Measurement of Minimum Threshold

The groundwater level minimum thresholds will be used as proxies for reduction of groundwater storage, therefore, the measurement of change in groundwater storage will be measured as outlined in Section 8.6.2.7 using the groundwater level monitoring network described in Chapter 7.

8.7.3 Measurable Objectives

> *The measurable objectives for reduction in groundwater storage are established by proxy using groundwater elevations. The reduction in groundwater storage measurable objectives is identical to the chronic lowering of groundwater levels measurable objectives.*

8.7.3.1 Methodology for Setting Measurable Objectives

As stated in Section 8.6.3, the groundwater level measurable objectives for chronic lowering of groundwater levels provide an adequate margin of operational flexibility for managing the Subbasin. Therefore, the change in storage measurable objectives were set to be identical to the groundwater level measurable objectives: providing the same margin of operation flexibility.

8.7.3.2 Interim Milestones

The groundwater level interim milestones described in Table 8-3 and Section 8.6.3.2 will serve as proxies for the reduction of groundwater storage interim milestones.

8.7.4 Undesirable Results

8.7.4.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The criteria used to define undesirable results for reduction of groundwater storage are based on minimum thresholds established for chronic lowering of groundwater levels. The reduction of storage undesirable result is:

> *More than 15% of groundwater elevation minimum thresholds are exceeded. The undesirable result for reduction in groundwater storage is established by proxy using groundwater elevations.*

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater storage minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code §10721(w)(1)), "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." Therefore, groundwater storage may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

8.7.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the reduction in groundwater storage sustainability indicator include the following:

- **Expansion of agricultural or municipal pumping**. Additional agricultural or municipal pumping may result in exceedance of the long-term sustainable yield, an undesirable result.
- **Expansion of *de minimis* pumping**. Pumping by *de minimis* users is not regulated under

this GSP. Adding domestic *de minimis* pumpers in the Subbasin may result in excessive pumping and exceedance of the long-term sustainable yield, an undesirable result.

- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought**. Minimum thresholds are established based on reasonable anticipated future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater recharge and unanticipated high pumping rates that could cause an exceedance of the long-term sustainable yield.

8.7.4.3 Effects on Beneficial Users and Land Use

The practical effect of the reduction in groundwater storage undesirable result is no chronic, long-term net change in groundwater storage. Therefore, beneficial uses and users will have access to a similar amount of water in storage, and the undesirable result will not have an additional negative effect on the beneficial users and uses of groundwater. However, pumping at the long-term sustainable yield during dry years will temporarily reduce the amount of groundwater in storage. If this occurs, there could be short-term impacts from a reduction in groundwater in storage on all beneficial users and uses of groundwater.

8.8 Seawater Intrusion SMC

8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable seawater intrusion in the Subbasin is defined as follows:

- Any seawater intrusion in the Subbasin is significant and unreasonable.

This significant and unreasonable condition was determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

8.8.2 Minimum Thresholds

> *The minimum threshold for seawater intrusion is defined as the 500 mg/L chloride concentration isocontour at the Subbasin boundary.*

Figure 8-6 presents the minimum threshold, shown in red, for seawater intrusion in the Langley Subbasin as represented by the 500 mg/L chloride concentration isocontour. The purple line shows the current extent of seawater intrusion in the 180-Foot Aquifer. This minimum threshold isocontour is the likely extent of seawater intrusion if it were to continue toward the Subbasin based on analysis of the stratigraphy, groundwater elevations, and hydraulic gradients. The minimum threshold in this GSP applies to any seawater intrusion into the Subbasin and does not apply to seawater intrusion outside of the Subbasin.

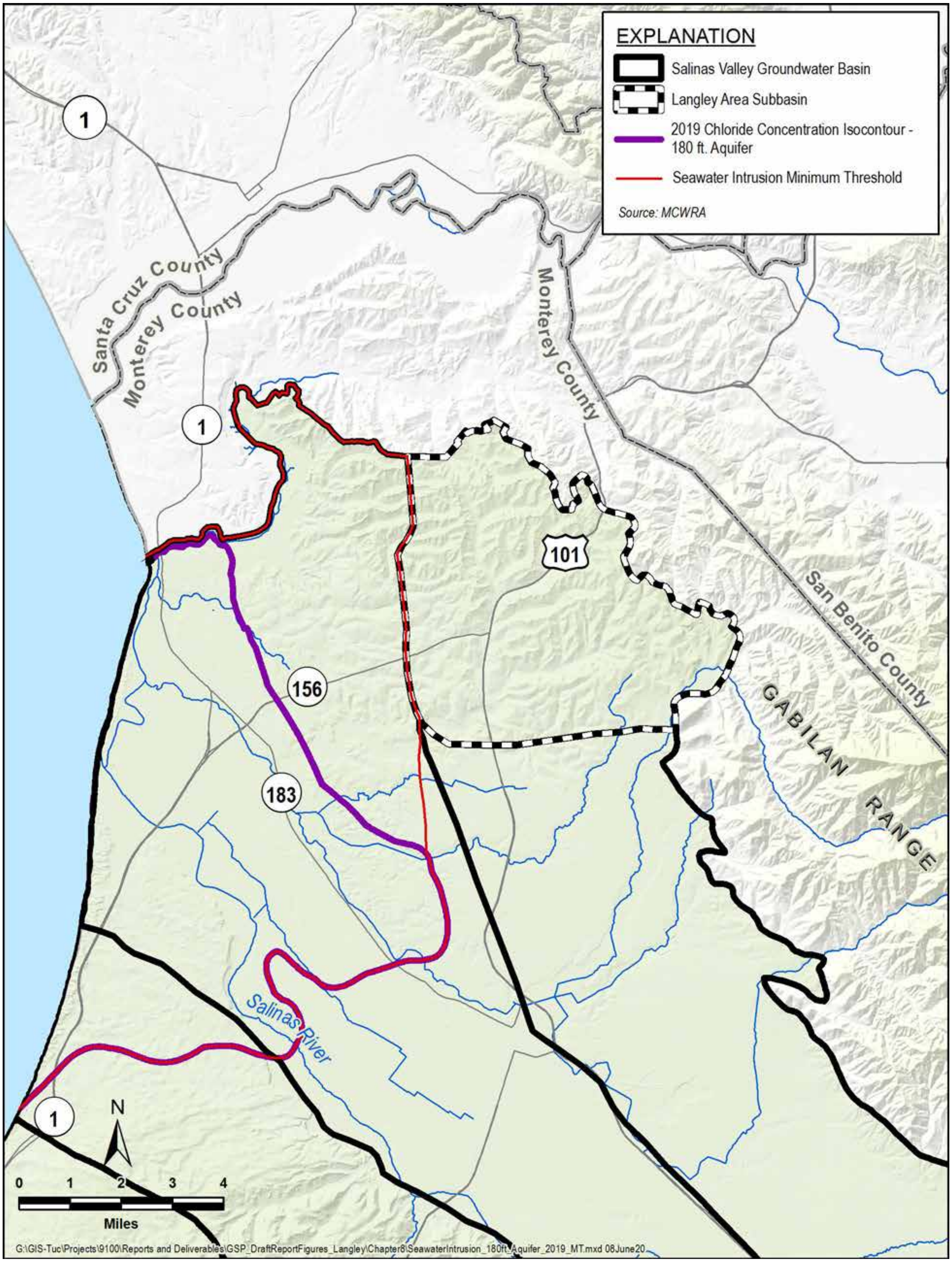


Figure 8-6. Minimum Threshold for Seawater Intrusion in the Langley Area Subbasin

8.8.2.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

The seawater intrusion minimum threshold is based on seawater intrusion maps developed by MCWRA. MCWRA publishes estimates of the extent of seawater intrusion every year. The MCWRA maps define the extent of seawater intrusion as the inferred location of the 500 mg/L chloride isocontour. These maps are developed through analysis and contouring of the values measured at privately-owned wells and dedicated monitoring wells near the coast. The map of seawater intrusion used to develop the minimum threshold is included in Chapter 5.

The groundwater model that will be used to assess the effectiveness of projects and management actions on seawater intrusion specifically incorporates assumptions for future sea level rise. Therefore, the actions to avoid undesirable results will address sea level rise.

8.8.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The relationship between the seawater intrusion minimum threshold and other sustainability indicators are as follows:

- **Chronic lowering of groundwater levels.** The seawater intrusion minimum threshold does not promote additional pumping that could cause groundwater elevations to decrease in the Subbasin. Therefore, the seawater intrusion minimum threshold will not result in significant or undesirable groundwater elevations.
- **Reduction in groundwater storage.** The seawater intrusion minimum threshold does not promote additional pumping in excess of the sustainable yield. Therefore, the seawater intrusion minimum threshold will not result in an exceedance of the groundwater storage minimum threshold. Groundwater storage, as measured by pumping, will not be affected by the seawater intrusion minimum thresholds.
- **Degraded water quality.** The seawater intrusion minimum threshold does not promote decreasing groundwater elevations that could lead to exceedances of groundwater quality minimum thresholds. In fact, the seawater intrusion minimum threshold may have a beneficial impact on groundwater quality by preventing increases in chloride concentrations in supply wells.
- **Land subsidence.** The seawater intrusion minimum threshold does not promote additional pumping that could cause subsidence. Therefore, the seawater intrusion minimum threshold will not result in an exceedance of the subsidence minimum threshold.

- **Depletion of ISW.** The seawater intrusion minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the seawater intrusion minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.8.2.3 Effect of Minimum Threshold on Neighboring Basins and Subbasin

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs and to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin has submitted an alternative submittal. Because the minimum threshold in the Langley Subbasin is to prevent seawater intrusion from advancing into the Subbasin and there are thick clay layers between the basins, it is likely that the minimum threshold will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.8.2.4 Effects on Beneficial Users and Land Uses

Agricultural land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin's agricultural water users. Preventing seawater intrusion into the Subbasin ensures that a supply of usable groundwater will exist for agricultural use.

Urban land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin's urban water users. Preventing seawater intrusion into the Subbasin will help ensure an adequate supply of groundwater for drinking water supplies.

Domestic land uses and users. The seawater intrusion minimum threshold generally provides positive benefits to the Subbasin's domestic water users. Preventing seawater intrusion into the Subbasin will help ensure an adequate supply of groundwater for domestic supplies.

Ecological land uses and users. Although the seawater intrusion minimum threshold does not directly benefit ecological uses, it can be inferred that the seawater intrusion minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. Preventing seawater intrusion into the Subbasin will help prevent unwanted high salinity levels from impacting ecological groundwater uses.

8.8.2.5 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for seawater intrusion.

8.8.2.6 Method for Quantitative Measurement of Minimum Threshold

Chloride concentrations are measured in groundwater samples collected from the MCWRA's seawater intrusion monitoring network. These samples are used to develop the inferred location of the 500 mg/L chloride isocontour. The methodology and protocols for collecting samples and developing the 500 mg/L chloride isocontour are detailed in Appendix 7B and Appendix 7C.

8.8.3 Measurable Objectives

The measurable objective for seawater intrusion is identical to the minimum threshold that is shown on Figure 8-6.

> *The measurable objective for seawater intrusion is defined as the 500 mg/L chloride concentration isocontour at the Subbasin boundary.*

8.8.3.1 Methodology for Setting Measurable Objectives

In the Langley Subbasin, the measurable objective for the seawater intrusion SMC is the same as the minimum threshold: preventing the 500 mg/L chloride isocontour from entering the Subbasin. The methodology used to set measurable objectives is discussed in Section 8.8.2.1.

8.8.3.2 Interim Milestones

The interim milestones for seawater intrusion are the same as the measurable objective, which is setting the 500 mg/L chloride isocontour at the subbasin boundary.

8.8.4 Undesirable Results

8.8.4.1 Criteria for Defining Seawater Intrusion Undesirable Results

The seawater intrusion undesirable result is a quantitative combination of chloride concentrations minimum threshold exceedances. Because even localized seawater intrusion is not acceptable, the subbasin-wide undesirable result is zero exceedances of the minimum threshold. The seawater intrusion undesirable result is:

> *Any exceedance of the minimum threshold, resulting in mapped seawater intrusion within the Subbasin boundary.*

8.8.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- Increased pumping in the Langley Subbasin
- Increased coastal pumping in the adjacent 180/400-Foot Aquifer Subbasin that could draw seawater more inland
- Unanticipated high sea level rise

8.8.4.3 Effects on Beneficial Users and Land Use

The primary detrimental effect on beneficial users and land uses from allowing seawater intrusion to occur in the Subbasin is that the pumped groundwater may become saltier. Thus, preventing seawater intrusion into the Subbasin prevents impacts to domestic and municipal wells and associated land uses. Preventing seawater intrusion in the Subbasin may also protect agriculture.

8.9 Degraded Water Quality SMC

8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable changes in groundwater quality in the Subbasin are increases in a COC caused by a direct result of a GSA groundwater management action that either:

- Result in groundwater concentrations in a potable water supply well above an established MCL or SMCL, or
- Lead to significantly reduced crop production.

These significant and unreasonable conditions were determined based on input from the Subbasin Committee and discussions with GSA staff.

8.9.2 Minimum Thresholds

The minimum thresholds for degraded water quality are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or Basin Plan objectives (irrigation supply wells) beyond those observed in 2019 for groundwater quality constituents of concern.

The minimum thresholds for DDW public water system supply wells and ILRP on-farm domestic wells reflect California's Title 22 drinking water standards. The minimum thresholds for irrigation supply wells are based on the water quality objectives listed in the Basin Plan (CCRWQCB, 2019). The minimum threshold values for the COC for all 3 sets of wells are provided in Table 8-4 and are based on data up to 2019. Full discussion of these current conditions is included in Chapter 5. Because the minimum thresholds reflect no additional exceedances, the minimum thresholds are set to the number of existing exceedances. Surpassing the number of existing exceedances for any of the listed constituents will lead to an undesirable result. Not all wells in the monitoring network are sampled for every COC.

Table 8-4. Degradation of Groundwater Quality Minimum Thresholds

Constituent of Concern (COC)	Minimum Threshold/ Measurable Objective – Number of Wells Exceeding Regulatory Standard from latest sample (August 1986 to December 2019)
DDW Wells	
Arsenic	3
Di(2-ethylhexyl) phthalate	1
Benzo(a)Pyrene	1
Chloride	2
1,2 Dibromo-3-chloropropane	6
Dinoseb	8
Iron	17
Hexachlorobenzene	1
Heptachlor	2
Manganese	15
Methyl-tert-butyl ether (MTBE)	1
Nitrate (as nitrogen)	14
Specific Conductance	2
1,2,4-Trichlorobenzene	1
1,2,3-Trichloropropane	6

Constituent of Concern (COC)	Minimum Threshold/ Measurable Objective – Number of Wells Exceeding Regulatory Standard from latest sample (August 1986 to December 2019)
Total Dissolved Solids	2
Vinyl Chloride	88
ILRP On-Farm Domestic Wells	
Iron	1
Manganese	1
ILRP Irrigation Supply Wells	
Manganese	1

8.9.2.1 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

As noted in the GSP Regulations, minimum thresholds are based on a degradation of groundwater quality, not an improvement of groundwater quality (23 CCR § 354.28 (c)(4)). Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents already in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. COC must meet 2 criteria:

1. They must have an established level of concern such as an MCL or SMCL for drinking water, or a level known to affect crop production.
2. They must have been found in the Subbasin at levels above the level of concern.

Based on the review of groundwater quality in Chapter 5, the COC that may affect drinking water supply wells include those for DDW and ILRP on-farm domestic wells listed in Table 8-4. The COC that are known to cause reductions in crop production are those for ILRP irrigation supply wells listed in Table 8-4.

As discussed in Chapter 7, 3 existing water quality monitoring networks were reviewed and used for developing SMC:

- Public water system supply wells regulated by the SWRCB DDW.
- On-farm domestic wells monitored as part of CCRWQCB ILRP. This dataset was obtained from the SWRCB through the GAMA groundwater information system. The ILRP data were separated into 2 data sets, one for on-farm domestic wells and the other for irrigation supply wells (discussed below) for purposes of developing initial draft minimum thresholds and measurable objectives for each type of well. The monitoring well network for the ILRP will change when the monitoring network for Ag Order 4.0 is finalized. At that time, the new ILRP domestic monitoring network will be incorporated into this GSP, replacing the current network, for water quality monitoring.

- Irrigation supply wells monitored as part of ILRP. As mentioned above, this dataset was obtained from the SWRCB through the GAMA groundwater information system. Like the on-farm domestic well dataset, the IRLP irrigation supply monitoring network will change when Ag Order 4.0 is finalized.

Each of these well networks are monitored for a different set of water quality parameters. Furthermore, some groundwater quality impacts are detrimental to only certain networks. For example, high nitrates are detrimental to public water system supply wells and on-farm domestic wells but are not detrimental to irrigation supply wells. The constituents monitored in each well network are indicated by an X in Table 8-5. An X does not necessarily indicate that the constituents have been found above the regulatory standard in that monitoring network.

Table 8-5. Summary of Constituents Monitored in Each Well Network

Constituent	Public Water System Supply	On-Farm Domestic[1]	Irrigation Supply
Boron	X	X	X
Chloride	X	X	X
Iron	X	X	X
Manganese	X	X	X
Nitrite	X	X	X
Nitrate (as nitrogen)	X	X	X
Specific Conductance	X	X	X
Sulfate	X	X	X
Total Dissolved Solids	X	X	X
Silver	X		
Aluminum	X		
Alachlor	X		
Arsenic	X		
Atrazine	X		
Barium	X		
Beryllium	X		
Lindane	X		
Di(2-ethylhexyl) phthalate	X		
Bentazon	X		
Benzene	X		
Benzo(a)Pyrene	X		
Toluene	X		
Cadmium	X		
Chlordane	X		
Chlorobenzene	X		
Cyanide	X		
Chromium	X		
Carbofuran	X		
Carbon Tetrachloride	X		
Copper	X		
Dalapon	X		
1,2 Dibromo-3-chloropropane	X		
1,1-Dichloroethane	X		
1,2-Dichloroethane	X		
1,2-Dichlorobenzene	X		

Constituent	Public Water System Supply	On-Farm Domestic[1]	Irrigation Supply
1,4-Dichlorobenzene	X		
1,1-Dichloroethylene	X		
cis-1,2-Dichloroethylene	X		
trans-1,2-Dichloroethylene	X		
Dichloromethane (a.k.a. methylene chloride)	X		
1,2-Dichloropropane	X		
Dinoseb	X		
Diquat	X		
Di(2-ethylhexyl) adipate	X		
Ethylbenzene	X		
Endrin	X		
Fluoride	X		
Trichlorofluoromethane	X		
1,1,2-Trichloro-1,2,2-Trifluoroethane	X		
Foaming Agents (MBAS)	X		
Glyphosate	X		
Hexachlorocyclopentadiene	X		
Hexachlorobenzene	X		
Heptachlor	X		
Mercury	X		
Molinate	X		
Methyl-tert-butyl ether (MTBE)	X		
Methoxychlor	X		
Nickel	X		
Oxamyl	X		
1,1,2,2-Tetrachloroethane	X		
Perchlorate	X		
Polychlorinated Biphenyls	X		
Tetrachloroethene	X		
Pentachlorophenol	X		
Picloram	X		
Antimony	X		
Selenium	X		
2,4,5-TP (Silvex)	X		
Simazine	X		
Styrene	X		
1,1,1-Trichloroethane	X		
1,1,2-Trichloroethane	X		
1,2,4-Trichlorobenzene	X		
Trichloroethene	X		
1,2,3-Trichloropropane	X		
Thiobencarb	X		
Thallium	X		
Toxaphene	X		
Vinyl Chloride	X		
Xylenes	X		

[1]Basin plan states domestic wells are monitored for Title 22 constituents; however, GAMA groundwater information system only provides data for the constituents listed above.

8.9.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other

Sustainability Indicators

Preventing degradation of groundwater quality may affect other sustainability or may limit activities needed to achieve minimum thresholds for other sustainability indicators, as described below:

- **Chronic lowering of groundwater levels.** The degradation of groundwater quality minimum thresholds could influence groundwater level minimum thresholds by limiting the types of water that can be used for recharge to maintain or raise groundwater elevations. Water used for recharge cannot exceed any groundwater quality standards.
- **Reduction in groundwater storage.** The degradation of groundwater quality minimum thresholds does not promote lower groundwater elevations. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the groundwater storage minimum threshold.
- **Seawater intrusion.** The degradation of groundwater quality minimum thresholds does not promote additional pumping that could exacerbate seawater intrusion. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the seawater intrusion minimum threshold.
- **Land subsidence.** The degradation of groundwater quality minimum thresholds does not promote additional pumping that could cause subsidence. Therefore, the groundwater quality minimum thresholds will not result in an exceedance of the subsidence minimum threshold.
- **Depletion of ISW.** The degradation of groundwater quality minimum thresholds does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the groundwater quality minimum thresholds will not result in a significant or unreasonable depletion of ISW.

8.9.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Aquifer Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum thresholds in the Langley Subbasin are to prevent degradation of water quality, it is likely that the minimum thresholds will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum thresholds to ensure that the basins do not prevent each other from achieving sustainability.

8.9.2.4 Effect on Beneficial Uses and Users

Agricultural land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. Preventing any GSA actions that would result in additional agricultural supply wells exceeding levels that could reduce crop production ensures that a supply of usable groundwater will exist for beneficial agricultural use.

Urban land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's urban water users. Preventing any GSA actions that would result in COC in additional drinking water supply wells exceeding MCLs or SMCLs ensures adequate groundwater quality for public water system supplies.

Domestic land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's domestic water users. Preventing any GSA actions that would result in COC in additional drinking water supply wells exceeding MCLs or SMCLs ensures adequate groundwater quality for domestic supplies.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. Preventing any GSA actions that would result in COC migrating will prevent unwanted contaminants from impacting ecological groundwater uses.

8.9.2.5 Relation to State, Federal, or Local Standards

The groundwater quality minimum thresholds specifically incorporate state and federal standards for drinking water and basin plan objectives.

8.9.2.6 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from existing public water system supply wells, on-farm domestic wells, and irrigation supply wells. Groundwater quality will be measured with SWRCB GAMA groundwater information system data submitted through existing monitoring programs—DDW and ILRP—as discussed in Chapter 7.

- Exceedances of MCLs and SMCLs in public water system supply wells will be monitored with annual water quality data submitted to the DDW.
- Exceedances of MCLs and SMCLs in on-farm domestic wells will be monitored with ILRP data.
- Exceedances of water quality objectives for crop production will be monitored with ILRP data.

Initially, the review of drinking water MCLs, SMCLs, and water quality objectives that maintain adequate crop production will be centered around the COC identified above. If during review of the water quality data additional constituents appear to exceed MCLs and SMCLs, minimum thresholds and measurable objectives will be developed for these additional constituents.

8.9.3 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, the measurable objectives are based on no groundwater quality degradation and are identical to the minimum thresholds, as defined in Table 8-4.

> *The measurable objectives for degraded water quality are zero additional exceedances of the regulatory drinking water standards (potable supply wells) or Basin Plan objectives (irrigation supply wells) beyond those observed in 2019 for groundwater quality constituents of concern.*

8.9.3.1 Methodology for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.9.2.1.

8.9.3.2 Interim Milestones

There is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to current conditions.

8.9.4 Undesirable Results

8.9.4.1 Criteria for Defining Undesirable Results

The degradation of groundwater quality becomes an undesirable result when a quantitative combination of groundwater quality minimum thresholds is exceeded. For the Subbasin, the exceedance of minimum thresholds is unacceptable as a direct result of GSP implementation. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities, nor GSA management, they do not constitute an undesirable result. Additionally, SGMA states that GSAs are not responsible for addressing water quality degradation that was present before January 1, 2015 (California Water Code § 10727.2(b)(4)). Therefore, the degradation of groundwater quality reaches an undesirable result when:

> *Future or new minimum thresholds exceedances are caused by a direct result of GSA groundwater management action(s), including projects or management actions and regulation of groundwater extraction.*

The groundwater level SMC is designed and intended to help protect groundwater quality. Setting the groundwater level minimum thresholds at or above historical lows assures that no new depth dependent constituents of water quality concern are mobilized. The GSA may pursue projects or management actions to ensure that groundwater levels do not fall below groundwater level minimum thresholds.

This undesirable result recognizes there is an existing regulatory framework in the form of the California Porter Cologne Act and the federal Clean Water Act that addresses water quality management; and considers existing federal, state, and local groundwater quality standards, which were used in the development of minimum thresholds in the GSP. SVBGSA is not responsible for enforcing drinking water requirements or for remediating violations of those requirements that were caused by others (Moran and Belin, 2019). The existing regulatory regime does not require nor obligate the SVBGSA to take any affirmative actions to manage or control existing groundwater quality. However, SVBGSA is committed to monitoring and disclosing changes in groundwater quality and ensuring its groundwater management actions do not cause drinking water or irrigation water to be unusable.

SVBGSA will work closely with the Central Coast Regional Water Quality Control Board and other entities that have regulatory authority over water quality. SVBGSA will lead the Water Quality Coordination Group, as described in Chapter 9, which includes meeting annually with these partner agencies to review the status of water quality data and discuss any action needed to address water quality degradation.

If the GSA has not implemented any groundwater management actions in the Subbasin, including projects, management actions, or pumping management, no such management actions constitute an undesirable result. If minimum thresholds are exceeded after the GSA has implemented actions in the Subbasin, the GSA will review groundwater quality and groundwater gradients in and around the project areas to assess if the exceedance resulted from GSA actions to address sustainability indicators, or was independent of GSA activities. Both the implementation of actions and assessment of exceedances will occur throughout the GSP timeframe of 50 years as required by SGMA. The general approach to assess if a minimum threshold exceedance is due to GSA action will include:

- If no projects, management actions, or other GSP implementation actions have been initiated in a subbasin, or near the groundwater quality impact, then the impact was not caused by any GSA action.
- Many projects will likely include a new monitoring network. If data from the project-specific monitoring network do not show groundwater quality impacts, this will suggest that the impact was not caused by any GSA actions.
- If a GSA undertakes a project that changes groundwater gradients, moves existing constituents, or results in the exceedance of minimum thresholds, SVBGSA will undertake a more rigorous technical study to assess local, historical groundwater quality distributions, and the impact of the GSA activity on that distribution.

For SGMA compliance, undesirable results for groundwater quality are not caused by (1) lack of action; (2) GSA required reductions in pumping; (3) exceedances in groundwater quality minimum thresholds that occur, if there are fewer exceedances than if there had been a lack of management; (4) exceedances in groundwater quality minimum thresholds that would have occurred independent of projects or management actions implemented by the GSA; (5) past harm.

8.9.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Required Changes to Subbasin Pumping.** If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of one of the COC towards a supply well at concentrations that exceed relevant standards.
- **Groundwater Recharge.** Active recharge of imported water or captured runoff could modify groundwater gradients and move one of the COC towards a supply well in concentrations that exceed relevant limits.
- **Recharge of Poor-Quality Water.** Recharging the Subbasin with water that exceeds an

MCL, SMCL, or level that reduces crop production will lead to an undesirable result.

8.9.4.3 Effects on Beneficial Users and Land Use

The undesirable result for degradation of groundwater quality is avoiding groundwater degradation caused by a direct result of GSA groundwater management action. Therefore, the undesirable result will not impact the use of groundwater and will not have a negative effect on the beneficial users and uses of groundwater. This undesirable result does not apply to groundwater quality changes that occur due to other causes.

8.10 Land Subsidence SMC

8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that is caused by lowering of groundwater elevations occurring in the Subbasin or
- Any inelastic subsidence that causes an increase of flood risk.

These significant and unreasonable conditions were determined based on input collected during Subbasin Committee meetings and discussions with GSA staff.

Subsidence can be elastic or inelastic. Elastic subsidence is the small, reversible lowering and rising of the ground surface. Inelastic subsidence is generally irreversible. This SMC only concerns inelastic subsidence.

8.10.2 Minimum Thresholds

The minimum threshold for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors.

8.10.2.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

The minimum threshold was established using InSAR data available from DWR. The general minimum threshold is for no long-term irreversible subsidence in the Subbasin. The InSAR data provided by DWR, however, is subject to measurement error. DWR stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2019, the errors are as follows (DWR, 2019, personal communication):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 feet) with a 95% confidence level.
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level.

By adding errors 1 and 2, the combined error is 0.1 foot. While this is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggest that elastic subsidence is largely seasonal. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

8.10.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The subsidence minimum threshold has little or no impact on other minimum thresholds, as described below:

- **Chronic lowering of groundwater levels.** The land subsidence minimum threshold will not decrease groundwater elevations and therefore will not result in significant or unreasonable groundwater elevations.
- **Reduction in groundwater storage.** The land subsidence minimum threshold will not change the amount of pumping and therefore will not result in a significant or unreasonable change in groundwater storage.
- **Seawater intrusion.** The land subsidence minimum threshold does not promote additional pumping that could exacerbate seawater intrusion. Therefore, the subsidence minimum threshold will not induce additional advancement of seawater intrusion along the coast.
- **Degraded water quality.** The land subsidence minimum threshold does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds and therefore will not result in significant of unreasonable degradation of water quality.
- **Depletion of ISW.** The land subsidence minimum threshold does not promote additional pumping or lower groundwater elevations adjacent to ISW. Therefore, the subsidence minimum threshold will not result in a significant or unreasonable depletion of ISW.

8.10.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Aquifer Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin lies directly to the north of the Subbasin. Because the minimum threshold in the Langley Subbasin is zero subsidence, it is likely that the minimum threshold will not prevent the Pajaro Basin from achieving and maintaining sustainability. The SVBGSA will coordinate closely with the Pajaro Valley Water Management Agency as it sets minimum threshold to ensure that the basins do not prevent each other from achieving sustainability.

8.10.2.4 Effects on Beneficial Uses and Users

The subsidence minimum threshold is set to prevent any long-term inelastic subsidence. Available data indicate that there is currently no long-term subsidence occurring in the Subbasin, and therefore the minimum threshold has no impact on current pumping rates. The subsidence minimum threshold does not require any additional reductions in pumping and there is no negative impact on any beneficial user. Increased pumping, however, could initiate subsidence and require pumping restrictions.

8.10.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

8.10.2.6 Method for Quantitative Measurement of Minimum Threshold

The minimum threshold will be assessed using DWR-supplied InSAR data.

8.10.3 Measurable Objectives

The measurable objective for ground surface subsidence represents a target annual subsidence rate in the Subbasin. Because the minimum threshold of zero net long-term subsidence is the best achievable outcome, the measurable objective is identical to the minimum threshold.

> *The measurable objective for land subsidence is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement measured subsidence to account for InSAR measurement errors.*

8.10.3.1 Methodology for Setting Measurable Objectives

The measurable objective will be assessed using DWR-supplied InSAR data.

8.10.3.2 Interim Milestones

The subsidence measurable objective is set at current conditions of no long-term subsidence. There is no change between current conditions and sustainable conditions. Therefore, the interim milestones are identical to current conditions of zero long-term subsidence with annual measurements of no more than 0.1 foot of subsidence per year to account for measurement error.

8.10.4 Undesirable Results

8.10.4.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the Subbasin, no long-term subsidence is acceptable. Therefore, the land subsidence undesirable result is:

> *There is an exceedance of the minimum threshold for land subsidence due to lowered groundwater elevations.*

Should potential subsidence be observed, the SVBGSA will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the SVBGSA will undertake a program to assess whether the subsidence is caused by lowered groundwater elevations. The first step in the assessment will be to check if groundwater elevations have dropped below historical lows. If groundwater elevations remain above historical lows, the GSA shall assume that any observed subsidence was not caused by lowered groundwater levels. If groundwater levels have dropped below historical lows, the GSA will attempt to correlate the observed subsidence with measured groundwater elevations. Additionally, if the Subbasin experiences subsidence in multiple consecutive years that are due to InSAR measurement error, the GSAs will confirm if the error is not actually net long-term subsidence.

8.10.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include a shift in pumping locations. Shifting a significant amount of pumping to an area that is susceptible to subsidence could trigger subsidence that has not been observed before.

8.10.4.3 Effects on Beneficial Users and Land Use

The undesirable result for subsidence does not allow any subsidence to occur in the Subbasin. Therefore, there is no negative effect on any beneficial uses and users.

8.11 Depletion of Interconnected Surface Water SMC

Areas with ISW occur where shallow groundwater may be connected to the surface water system. This SMC applies only to locations of ISW, as shown on Figure 4-9.

The SVIHM is used to identify the locations of ISW and to develop an estimate of the quantity and timing of stream depletions due to pumping during current and historical groundwater conditions. Shallow groundwater and surface water levels simulated by the SVIHM are used to identify the location of interconnection and evaluate the frequency with which different stream reaches are connected with groundwater in the underlying aquifer. The magnitude of stream depletions in relation to shallow groundwater elevations in interconnected reaches are evaluated in Chapter 5.

8.11.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable depletion of ISW in the Subbasin is defined as:

- Depletions from groundwater extraction that would result in a significant and unreasonable impact on other beneficial uses and users such as riparian water rights holders, appropriative surface water rights holders, ecological surface water users, and recreational surface water uses.
- Depletion from groundwater extraction more than observed in 2019, as measured by shallow groundwater elevations near locations of ISW. While a documented determination of whether past depletions was significant is not available, staying above 2019 depletions was determined to be a reasonable balance for all the beneficial uses and users.

These significant and unreasonable conditions were determined based on input collected Subbasin Committee meetings and discussions with GSA staff. There is currently no data that determines what level of depletion from groundwater extraction has a significant adverse effect on a beneficial use or user of ISW. Should there be a determination regarding what level of depletion from groundwater extraction is significant, SVBGSA will take that into consideration as it reviews how it locally defines significant and unreasonable conditions for the SMC in the 5-year update.

8.11.2 Minimum Thresholds

The minimum thresholds are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

> *The minimum thresholds for depletion of interconnected surface water are established by proxy using shallow groundwater elevations observed in 2019 near locations of interconnected surface water, adjusted based on well-specific elevation assessments.*

The locations of ISW identified with the SVIHM are based on best available data but contain uncertainty, which is discussed in Chapters 4, 5, and 6. Additional stream and groundwater level data are needed to reduce uncertainty, verify with observed conditions, and track changes over time. The shallow groundwater monitoring wells and USGS stream gauges will be used to supplement the analysis of locations of connectivity provided by the SVIHM. These monitoring points will also become part of the ISW monitoring network that is discussed in Chapter 7. Data from the ISW monitoring network will be used to monitor and evaluate the interconnection through time.

As discussed in Chapter 7, a monitoring network for ISW composed of shallow groundwater monitoring wells is in the process of development. Existing shallow wells will be added to the monitoring network where possible and will be supplemented with new shallow wells if needed. The monitoring network is dependent on the location and magnitude of stream reaches determined by the SVIHM. Once the monitoring network is fully established, SMC will be determined using the wells' groundwater elevations during the minimum threshold and measurable objective years, or interpolated values from the groundwater elevation contour maps for wells that do not have shallow groundwater elevation measurements for those years.

8.11.2.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds and Measurable Objectives

8.11.2.1.1 Establishing Groundwater Elevations As Proxies

The GSP Regulations § 354.28(d) states that: "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 evaluation of ISW in the Salinas Valley Groundwater Basin is based on an approach recommended by the

Environmental Defense Fund (EDF, 2018) that uses groundwater elevations as surrogates for streamflow depletion rates caused by groundwater use. Basic hydraulic principles state that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream, or conversely seepage from a stream to the underlying aquifer, is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Assuming the elevation in the stream is relatively stable, changes in interconnectivity between the stream and the underlying aquifer is determined by changes in groundwater levels in the aquifer. Thus, the change in hydraulic gradient between stream elevation and surrounding groundwater elevations is representative of change in interconnection between surface water and groundwater. Monitoring the hydraulic gradient in the aquifer adjacent to the stream monitors the interconnectivity between stream and aquifer. Therefore, the gradient can be monitored by measuring and evaluating groundwater elevations at selected shallow monitoring wells near streams. No existing estimations of the quantity and timing of depletions of ISW exist, nor data available to make estimations, so the hydraulic principles provide the best available information.

8.11.2.1.2 Review of Beneficial Uses and Users of Surface Water

The various beneficial uses and users of surface waters were addressed when setting the ISW depletion minimum thresholds. The classes of beneficial uses and users that were reviewed include riparian rights holders, appropriative rights holders, ecological surface water users, and recreational surface water users. This is not a formal analysis of public trust doctrine, but it is a reasonable review of all uses and users in an attempt to balance all interests. This was not an assessment about what constitutes a reasonable beneficial use under Article X, Section 2 of the California Constitution. The minimum thresholds for depletion of ISWs are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, locations of ISW derived from the SVIHM, and public information about water rights described below.

Riparian water rights holders. Table 8-6 provides a summary of water diversions reported to the SWRCB by water rights holders on the Salinas River and its tributaries within the Langley Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system and represent all surface water diversions as self-reported by water-rights holders with points of diversion located within the Subbasin boundaries. Table 8-6 shows that there are no riparian rights holders in the Langley Subbasin.

Table 8-6. Reported Annual Surface Water Diversions in the Langley Area Subbasin

Diversions (Acre-Feet)	2011	2012	2013	2014	2015	2016	2017	2018	2019
Appropriative	16	16	16	16	16	16	16	16	11
Stock pond	0	0	0	0	0	0	9	3	0
Total	16	16	16	16	16	16	25	19	11

Appropriative water rights holders. One appropriative water right holder is shown in Table 8-6. In addition, there are stock ponds that divert water for storage, rather than direct use. The SVBGSA is not aware of any current water rights litigation or water rights enforcement complaints by any appropriative rights holders in the Subbasin. Therefore, SVBGSA assumes that the current level of depletion has not injured any appropriative water rights holders in the Subbasin.

Ecological surface water users. There are no known flow prescriptions on any surface water bodies in the Subbasin. Therefore, the current level of depletion has not violated any ecological flow requirements. This is not meant to imply that depletions do not impact potential species living in or near surface water bodies in the Subbasin. However, any impacts that may be occurring have not risen to the level that triggers regulatory intervention. Therefore, the impacts from current rates of depletion on ecological surface water users is not unreasonable.

Recreational surface water users. No recreational activities such as boating regularly occur on surface water bodies in the Subbasin.

As shown by the analysis above, the current rate of surface water depletion is not having an unreasonable impact on the various surface water uses and users in the Subbasin. Therefore, the minimum thresholds are set based on 2019 groundwater elevations.

8.11.2.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum thresholds for depletion of ISW are set to 2019 groundwater elevations in the shallow monitoring wells within the Subbasin. The minimum thresholds all reference the same historical year and have existed simultaneously in the past. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

The depletion of ISW minimum thresholds could influence other sustainability indicators as follows:

- **Chronic lowering of groundwater levels.** The depletion of ISW minimum thresholds is identical to the groundwater level minimum thresholds. Therefore, the ISW minimum thresholds will not result in chronic lowering of groundwater elevations.
- **Reduction in groundwater storage.** The depletion of ISW minimum threshold is identical to the change in storage minimum thresholds, which are the same as the groundwater level minimum thresholds. Therefore, the depletion of ISW interconnected minimum thresholds will not result in an undesirable loss of groundwater storage.
- **Seawater intrusion.** The depletion of ISW minimum thresholds does not promote additional pumping that could exacerbate seawater intrusion. Therefore, seawater intrusion will not be affected by the ISW minimum thresholds.
- **Degraded water quality.** The depletion of ISW minimum thresholds does not promote decreasing groundwater elevations that lead to exceedance of groundwater quality minimum thresholds. Therefore, groundwater quality will not be affected by the ISW minimum thresholds.
- **Land subsidence.** The depletion of ISW minimum thresholds does not promote additional pumping that could cause subsidence. Therefore, subsidence will not be affected by the ISW minimum thresholds.

8.11.2.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Langley Subbasin has 2 neighboring subbasins within the Salinas Valley Groundwater Basin:

- The Eastside Aquifer Subbasin to the south
- The 180/400-Foot Aquifer Subbasin to the west

The SVBGSA is either the exclusive GSA or is one of the coordinating GSAs for the adjacent Subbasins. Because the SVBGSA covers all these subbasins, the SVBGSA is coordinating the development of the minimum thresholds and measurable objectives for all these subbasins. The 180/400-Foot Aquifer Subbasin submitted a GSP in 2020 and the Eastside Aquifer Subbasin is in the process of GSP development for submittal in January 2022. Minimum thresholds for the Langley Subbasin will be reviewed relative to information developed for the neighboring subbasins' GSPs to ensure that these minimum thresholds will not prevent the neighboring subbasins from achieving sustainability.

The Pajaro Valley Basin occurs directly to the north of the Langley Subbasin. Although a small portion of the Langley Subbasin does drain to the north there are no significant surface water features or streams in this area. Therefore, the minimum thresholds for depletion of ISW does not influence the ability of Pajaro Valley to achieve sustainability.

8.11.2.4 Effect on Beneficial Uses and Users

The depletion of ISW minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin. Creeks in the Langley Subbasin are ephemeral, so uses and users of any ISW are seasonal.

Agricultural land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams beyond historical lows. While the measurable objectives are higher, this leaves flexibility for needed groundwater extraction during droughts. If the minimum thresholds were higher than these historical levels, it might affect the quantity and type of crops that can be grown in the land adjacent to streams and the ability of crops to withstand droughts.

Urban land uses and users. The depletion of ISW minimum thresholds prevent lowering of groundwater elevations adjacent to certain parts of streams beyond historical lows. While the measurable objective is higher, this leaves flexibility for needed groundwater extraction during droughts. If the minimum thresholds were higher than these historical levels, it may limit the amount of urban pumping near streams, which could limit urban growth in these areas to historical levels. Also, if pumping is limited beyond historical levels, municipalities may have to obtain alternative sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

Domestic land uses and users. The depletion of ISW minimum thresholds protects existing domestic land users and uses near locations of ISW from groundwater elevation declines below historical lows by maintaining shallow groundwater elevations near streams and protecting the operability of relatively shallow domestic wells.

Ecological land uses and users. The depletion of ISW minimum thresholds addresses ecological uses and users by preventing depletion of ISW from groundwater pumping beyond what was historically experienced. Additionally, by setting future groundwater levels at or above recent lows, there should be less impact to ecological users than has been seen to date.

8.11.2.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to depletion of ISW. However, both state and federal provisions call for the protection and restoration of conditions necessary for endangered and threatened species.

8.11.2.6 Method for Quantitative Measurement of Minimum Threshold

The SVIHM is used to preliminarily identify areas of ISW. Groundwater elevations measured in shallow wells adjacent to these areas of ISW will serve as the primary approach for monitoring depletion of ISW. As discussed in Chapter 7, existing shallow wells will be added, or new shallow wells will be installed to monitor groundwater elevations adjacent to surface water bodies during GSP implementation.

New shallow monitoring wells installed pursuant to the GSP will not have data from 2019. Minimum thresholds for those wells will be estimated by either correlation with nearby deeper wells with water level records that include 2019, or from groundwater model results.

8.11.3 Measurable Objectives

The measurable objectives for depletion of ISW target groundwater elevations that are higher than the minimum thresholds. The measurable objectives are established to maintain consistency with the chronic lowering of groundwater elevation and reduction in groundwater storage minimum thresholds, which are also established based on groundwater elevations.

> *The measurable objectives for depletion of interconnected surface water are established by proxy using shallow groundwater elevations observed in 2010 near locations of interconnected surface water, adjusted based on well-specific elevation assessments.*

8.11.3.1 Methodology for Setting Measurable Objectives

The depletion of ISW measurable objectives is set to be identical to the groundwater level measurable objectives. The methodology for establishing measurable objectives is outlined in Section 8.6.2.1. Groundwater elevations from 2010 were selected as representative of the measurable objectives for the Langley Subbasin.

8.11.3.2 Interim Milestones

The interim milestones leading to the depletion of ISW measurable objectives will be added when the monitoring network is established.

8.11.4 Undesirable Results

8.11.4.1 Criteria for Defining Undesirable Results

By regulation, the depletion of ISW undesirable result is a quantitative combination of minimum threshold exceedances. The undesirable result for depletion of ISW is:

> *There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor interconnected surface water.*

Streamflow depletion in the Subbasin is complicated by many factors such as recharge of the aquifer from streamflow, losses to vegetation, and ET. The ISW SMC applies to depletion of ISW from groundwater use. For SGMA compliance purposes, the default assumption is that any depletions of surface water beyond the level of depletion that occurred prior to 2019, as evidenced by reduction in groundwater levels, represent depletions that are significant and unreasonable. Any additional depletions of surface water flows caused by groundwater conditions in excess of conditions as they were in 2019 would likely be an undesirable result that must be addressed under SGMA.

8.11.4.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for the depletion of ISW include the following:

- **Localized pumping increases**. Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping near ISW bodies could reduce shallow groundwater elevations.
- **Expansion of riparian water rights**. Riparian water rights holders often pump from wells adjacent to streams. Pumping by these riparian water rights holder users is not regulated under this GSP. Additional riparian pumpers near interconnected reaches of rivers and streams may result in excessive localized surface water depletion.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought**. Minimum thresholds were established based on anticipated future climatic conditions. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations that increase surface water depletion rates.

8.11.4.3 Effects on Beneficial Users and Land Use

The depletion of ISW undesirable result is to have no net increase in surface water depletion due to groundwater use beyond 2019 levels, as determined by shallow groundwater elevations. The effects of undesirable results on beneficial users and land use are the same as the effects of minimum thresholds on beneficial uses and users, as described in Section 8.11.2.4.

SVBGSA will collaborate with partner agencies and organizations to further evaluate the effects of the ISW measurable objectives, minimum thresholds, and undesirable results on surface water flows and beneficial users

9 PROJECTS AND MANAGEMENT ACTIONS

9.1 Introduction

This chapter describes the projects and management actions that will allow the Langley Subbasin to reach sustainability in accordance with GSP Regulations § 354.42 and § 354.44. This chapter includes a description of proposed projects and proposed groundwater management actions. The set of projects and management actions included provide sufficient options for maintaining sustainability throughout the planning horizon, but they do not all need to be implemented. In this GSP, projects are activities supporting groundwater sustainability that require infrastructure or physical change to the environment. Projects include green infrastructure projects that achieve benefits through alteration of vegetation or soils, such as removal of invasive species and floodplain restoration. The term groundwater management actions generally refers to activities that support groundwater sustainability without infrastructure.

The projects and management actions adopted in this GSP are designed to achieve a number of outcomes including:

- Attaining groundwater sustainability through 2042 by meeting Subbasin-specific SMC
- Providing equity between who benefits from projects and who pays for projects
- Providing incentives to constrain groundwater pumping within the sustainable yield

The projects and management actions included in this chapter outline a framework for reaching sustainability; however, many details must be developed before any of the projects and management actions can be implemented. Costs will be additional to the agreed-upon funding to sustain the operational costs of the SVBGSA and funding needed for monitoring and reporting.

This GSP is developed as part of an integrated effort by the SVBGSA to achieve groundwater sustainability in all 6 subbasins of the Salinas Valley under its authority. Therefore, the projects and actions included in this GSP are part of a larger set of integrated projects and actions for the entire Valley, all of which account for the uncertainty associated with the basin setting.

The projects and management actions are based on existing infrastructure and assumes continued operation of that infrastructure at current capacity. If current infrastructure is operated differently or other projects are implemented within the Valley that affect groundwater conditions, SVBGSA will consider the effect of any such changes in meeting sustainability goals and will act in furtherance of reaching such goals.

Discussions and decisions regarding specific projects will continue throughout GSP implementation and be part of the adaptive management of the Subbasin. Members of the GSA and stakeholders in the Subbasin should view these projects and management actions as a starting point for more detailed discussions. Where appropriate, details that must be agreed upon are identified for each project or management action.

As a means to compare projects, this chapter estimates the cost per acre-foot of water. The cost per acre-foot is the amortized cost of the project divided by the annual yield. It is not the cost of water for irrigation or the domestic cost of drinking water for households on water systems. It is included to help compare projects; however, more refined cost analyses and future benefit analyses will be completed during GSP implementation.

The specific design for implementing management actions and projects will provide landowners and public entities flexibility in how they manage water and how the Subbasin attains groundwater sustainability. Not all projects and management actions need to be implemented. Langley stakeholders will work collaboratively to determine which projects and management actions to implement in order to reach sustainability of the Langley Subbasin and will pursue adaptive management if conditions change.

9.2 General Process for Developing Projects and Management Actions

9.2.1 Process for Developing Projects and Management Actions

The general process for developing the projects and management actions presented in this chapter included a combination of reviewing publicly available information, gathering feedback during public meetings including Subbasin Committee meetings, conducting hydrogeologic analysis, consulting with SVBGSA staff, and meeting with Advisory Committee and Board members.

Developing projects and management actions for this GSP involved building on, revising, and adding to, the projects and management actions developed for the entire Valley as part of the 180/400-Foot Aquifer Subbasin GSP. This initial list of projects in the 180/400-Foot Aquifer Subbasin GSP was developed with stakeholder input, including a brainstorming workshop for stakeholders to propose and discuss their ideas. The list of projects and actions developed in this workshop were then narrowed down based on feasibility, likelihood of stakeholder acceptance, and ability to address groundwater conditions. These projects were included in the 180/400-Foot Aquifer Subbasin GSP. The projects that could benefit the Langley Subbasin were provided to the Subbasin Committee for consideration and refined for this GSP.

Building off the previously identified projects, SVBGSA undertook an iterative process at the subbasin level to develop the projects and management actions in this GSP. An overview of the purpose and types of projects and management actions was presented to the Subbasin Committee, and initial ideas were solicited. Subbasin Committee members completed a survey for feedback and further solicitation of ideas. After these ideas were gathered, a list of potential projects and management actions was presented to the Subbasin Committee and discussed. Special workshops and meetings were held with the purpose of considering pumping reductions. Potential projects and management actions were also discussed in terms of meeting the SMC outlined in Chapter 8.

9.2.2 Cost Assumptions Used in Developing Projects

Assumptions used to develop projects and cost estimates are provided in Appendix 9A. Assumptions and issues for each project need to be carefully reviewed and revised during the pre-design phase of each project. Project designs, and therefore costs, could change considerably as more information is gathered.

The cost estimates included for each SVBGSA project are order of magnitude estimates. These estimates were made with little to no detailed engineering data. The expected accuracy range for such an estimate is within +50% or -30%. The cost estimates are based on perceptions of current conditions at the project location and reflect professional opinions of costs at this time and are subject to change as project designs mature.

For infrastructure projects capital costs include major infrastructure components, such as pipelines, pump stations, customer connections, turnouts, injection wells, recharge basins, and storage tanks. Capital costs also include 30% contingency for plumbing appurtenances, 15% increase for general conditions, 15% for contractor overhead and profit, and 9.25% for sales tax. Engineering, legal, administrative, and project contingencies was assumed as 30% of the total construction cost and included within the capital cost. Land acquisition at $45,000/acre was also included within capital costs.

Annual operations and maintenance (O&M) fees include the costs to operate and maintain new project infrastructure. O&M costs also include any pumping costs associated with new infrastructure. O&M costs do not include O&M or pumping costs associated with existing infrastructure, such as existing Salinas Valley Reclamation Plant (SVRP) costs, because these are assumed to be part of water purchase costs. Water purchase costs are assumed to include repayment of loans for existing infrastructure; however, these purchase costs will need to be negotiated. The terms of such a negotiation could vary widely.

Capital costs were annualized over 25 years and added with annual O&M costs and water purchase costs to determine an annualized $/AF cost for each project.

9.3 Overview of Projects and Management Actions

This GSP is part of an integrated plan for managing groundwater in all 6 subbasins of the Salinas Valley that are managed by the SVBGSA. This GSP focuses on the projects that directly help the Langley Subbasin reach its sustainability goals, but also includes multi-subbasin projects outside the Subbasin that will likely benefit the Subbasin and reduce the need for additional projects and management actions.

The following are the major types of projects and management actions that can be developed to supplement the Langley Subbasin's groundwater supplies:

- Decentralized recharge through dispersed infiltration
- In-lieu recharge through direct delivery of water to replace groundwater pumping
- Direct recharge through recharge basins or injection/dry wells
- Demand management

The projects and management actions for this GSP are listed in Table 9-1.

Table 9-1. Projects and Management Actions

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
A - RECHARGE PROJECTS					
A1	Decentralized Residential In-Lieu Recharge Projects	Small-scale projects initiated by homeowners and business owners, including rooftop rainwater harvesting, rain gardens, and graywater systems	Less domestic groundwater use	If 75 households install 5000-gallon rain barrels, up to 4 AF/yr. rainwater harvested, and 1.6 AF/yr. from graywater systems installed by 75 houses	Cost to GSA (not for homeowner implementation or incentives): $50,000 for 5 workshops on rainwater harvesting and $50,000 for 5 workshops on graywater reuse
A2	Decentralized Stormwater Recharge	Medium scale bioswales and recharge basins on non-agricultural land	Groundwater recharge, less flooding,	If 1% of the Subbasin is converted from an area of runoff to an area of recharge, 279 AF/yr.	Cost to GSA (not for implementation or incentives): $150,000 - $200,000 to encourage projects through outreach, site assessments, and assistance with planning
A3	MAR with Overland Flow	Construct 4 recharge basins for MAR of overland flow before it reaches streams	Groundwater recharge, less stormwater and erosion, more regular surface temperature	400 AF/yr. in groundwater recharge	Capital Cost: $4,128,000 Unit Cost: $870/AF
A4	Surface Water Diversion from Gabilan Creek	Build a new facility on Gabilan Creek that would be allowed to divert water when streamflow is high	Collects streamflow that would otherwise be lost to the ocean	On average, 350 AF/yr. of excess streamflow is recharged	Capital Cost: $5,477,000 Unit Cost: $1,800/AF
B - DEMAND MANAGEMENT					
B1	Pumping Allocations and Controls	Proactively determines how extraction should be fairly divided and controlled if needed	Decreases extraction if needed	Range of potential project benefits	Approximately $300,000 for establishment of pumping allocations and pumping controls
B2	Fallowing, Fallow Bank, and Agricultural Land Retirement	Includes voluntary fallowing, a fallow bank whereby anybody fallowing land could draw against the bank to offset lost profit from fallowing, and retirement of agricultural land	Decreased groundwater extraction for irrigated agriculture	Dependent on program participation	$590-$1,730/AF if land is fallowed $1,140-$2,820/AF if land is retired

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
C - CROSS BOUNDARY PROJECTS					
C1	Floodplain Enhancement and Recharge	Restore creeks and floodplains to slow the flow of water	Groundwater recharge, less erosion, less flooding	Regional: 2,300 AF/yr. in surface water recharged for a groundwater benefit of 1,000 AF/yr.	Regional Capital Cost: $12,596,000 Unit Cost: $1,050/AF
C2	Castroville Seawater Intrusion Project (CSIP) Expansion	Expand CSIP into the southwest corner of the Langley Subbasin	Less groundwater pumping	Regional benefit for 3,500-acre expansion: 9,900 AF/yr. of recycled and river water provided for irrigation	Regional Capital Cost for 3,500-acre expansion: $73,366,000 Unit Cost: $630/AF
D - IMPLEMENTATION ACTIONS					
D1	Well Registration	Register all production wells, including domestic wells.	Better informed decisions, more management options	N/A – Implementation Action	Not estimated at this time
D2	Groundwater Extraction Management System (GEMS) Expansion and Enhancement	Update current GEMS program, by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection	Better informed decisions	N/A – Implementation Action	Not estimated at this time
D3	Dry Well Notification System	Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.	Support affected well owners with analysis of groundwater elevation decline	N/A – Implementation Action	Not estimated at this time
D4	Water Quality Coordination Group	Form a working group for agencies and organizations to collaborate on addressing water quality concerns.	Better access to quality drinking water	N/A – Implementation Action	Not estimated at this time
D5	Land Use Jurisdiction Coordination Program	Coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.	Better aligned land use and water use planning	N/A – Implementation Action	Not estimated at this time

9.4 Projects and Management Actions Planned to Reach Sustainability

The projects and management actions that are planned to reach sustainability were the most reliable, implementable, cost-effective, and acceptable to stakeholders. Descriptions of these project and management actions are included below and are not in order of priority. Generalized costs are also included for planning purposes. Components of these projects and actions may change in future analyses, including facility locations, recharge mechanisms, and other details. Therefore, each of the projects and management actions described in this GSP should be treated as a generalized project representative of a range of potential project configurations.

9.5 Recharge Projects

9.5.1 Project A1: Decentralized Residential In-Lieu Recharge Projects

This project is a set of initiatives that incentivize homeowners to install decentralized in lieu recharge projects, such as rainwater harvesting, graywater reuse, and recharge features on their properties. Harvested rainwater can be used for residential landscaping and domestic animal water purposes and reduce groundwater pumping, thereby functioning as in-lieu recharge. The 2 main types of in-lieu recharge are rooftop rainwater harvesting and graywater reuse. Decentralized rainwater projects capture at the residential scale, or graywater use from a laundry-to-landscape system, can assist property owners with outdoor landscaping watering needs, which is typically a significant portion of an individual household’s water use. By substituting rainwater or graywater for outdoor irrigation, less groundwater will be pumped and the Subbasin benefits from in-lieu recharge. Water used for landscaping is mostly lost to ET and not available to be returned to the groundwater system. Alternatively, rain gardens designed to capture rainwater can use rainwater instead of pumped groundwater.

This project will engage property owners through outreach, help identify opportunities for residential-scale rainwater harvesting or graywater reuse systems. This project primarily includes workshops to do outreach and education for homeowners but could also help install or incentivize them. For example, it could also include the development of a fund to provide financial incentives to help bring down individual costs associated with rainwater harvesting or graywater systems. This could also be expanded to include other residential-scale conservation efforts, such as xeriscaping or lawn buy-back efforts.

Rain barrels and cisterns

Residential rainwater harvesting in rain barrels or cisterns can provide water for outdoor irrigation, and offset the pumping, treatment of, and delivery of groundwater. Appropriately sized cisterns for 1,500-square foot rooftops range from approximately 600 gallons up to 5,000 gallons. Since more of the rain falls in the winter months, having enough storage to last over the summer months is an important factor in sizing cisterns for outdoor irrigation purposes. Use of rainwater for landscaping typically does not require pumping, treatment, or complex delivery systems. Rainwater harvesting at the residential level could be further enhanced with drip-irrigation systems and timers included with the cistern installations.

Rain Gardens

Rainwater could be captured in small, residential rain gardens to enhance use of rainwater to irrigate landscapes rather than groundwater. Rain gardens are vegetated basins installed at residences to capture and detain rainfall runoff while providing an aesthetic landscaping benefit to landowners. The rain garden temporarily holds water, thereby allowing it to infiltrate in the soil and provide moisture for plant roots. Rain gardens include grassed swales, rock lined swales (dry creek beds), and bioswales. Bioswales are typically sized for larger catchments than residential scale. Grassed and rock-lined swales, which are shallow channels designed to convey, filter, and infiltrate runoff, are more often used at the residential scale.

Rain gardens are installed at natural low points on the property and are typically planted with native, water tolerant plants that are able to thrive in saturated soil conditions. They can be installed in a variety of soils, from clays to sands, but are best suited for soils with high infiltration capacities.

Graywater Systems

Graywater reuse systems can provide additional residential in-lieu water use. These systems direct gently used water from showers or laundry onto landscapes to water plants instead of extracted groundwater. For example, Laundry to Landscape systems are often installed with dual drainage plumbing that enables the water to be directed to either the landscape or wastewater system. Monterey County has developed and approved its own set of graywater guidelines for discharging graywater onto landscapes.

9.5.1.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective.** Rainwater harvesting, rain gardens, and graywater reuse will increase rainwater used for irrigation in lieu of pumped groundwater, thereby decreasing groundwater extraction. By pumping less water, it has a similar effect of adding water to the principal aquifer. Adding water into the principal aquifer, it will raise groundwater elevations over time.
- **Groundwater storage measurable objective.** Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage.

- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Increasing groundwater storage will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.1.2 Expected Benefits and Evaluation of Benefits

The primary benefit from this project is increased use of rainwater in lieu of groundwater. The Langley Subbasin is generally characterized by low density or rural density development. The Subbasin covers an area of approximately 17,600 acres. A very simplified calculation of potential benefits is applied to the number of dwellings based on a parcel analysis: there are roughly 1,500 square feet per rooftop and 19 inches of rain per year, which yields approximately 62,200,000 gallons or 190 AF/yr. of water potentially available for capture and use. If 75 households implemented rooftop rainwater harvesting, this would yield approximately 4 AF/yr. of in-lieu recharge. However, this quantity may be less if rain barrels fill up only once per year in the rainy season. Expected benefits resulting from rain garden installations would be in addition to those described above for rooftop rainwater harvesting. More detailed analyses of land cover and runoff generation are required for refining the evaluation of both rooftop rainwater harvesting systems and rain gardens. During the implementation period, these numbers will be refined that will demonstrate the variation between dry, wet, and normal years. Additionally, these numbers will be refined as more residents implement rainwater capture infrastructure over time.

Increased capture of rainwater will potentially increase groundwater storage and groundwater elevations by reducing the amount of residential demand for water for outdoor irrigation. This in-lieu use will yield dividends over a longer period as more residents install rainwater harvesting features, and subsequently use less groundwater for landscaping purposes.

Implementing a laundry-to-landscape program has an expected annual benefit of 0.94 AF/yr if 75 households in this Subbasin installed systems. This is based on an expected water availability of approximately 4,100 gallons per household per April through October season. These values come from assuming a 4-person household, a high efficiency washer producing 15 gallons per load, and that laundry to landscape water replaces all irrigation water used. Since water for outdoor irrigation takes up a large portion of a household’s water use, this would present a significant in-lieu water savings during the hottest and driest months. If the laundry to landscape system was used year-round, the benefits would be higher.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater levels will be measured with a network of wells that is monitored by MCWRA. A direct correlation between groundwater recharge and changes in groundwater levels is unlikely to be observed unless many individual projects are implemented in the same area; however, the program will ask workshop participants about the projects they have implemented and will use that information to estimate reduced extraction.

9.5.1.3 Circumstances for Implementation

Decentralized residential recharge projects can be initiated at any time. Agencies and organizations in the region are already engaged in efforts to promote rainwater harvesting, rain gardens, and graywater reuse systems, and their efforts could be leveraged to expand these projects throughout the Subbasin.

9.5.1.4 Permitting and Regulatory Process

Individuals implementing residential recharge projects are responsible for any required permitting. Due to the small-scale and decentralized nature of these projects, it is not anticipated that these projects are of a magnitude capable of having a demonstrable impact on the environment that would require a California Environmental Quality Assurance (CEQA) review process; however, an applicable permit process will make that determination. Any storage tank sized 5,000 gallons or more will require a permit (WAC, 2021).

For the installation of greywater systems, California Code allows for greywater use from showers, bathtubs, and washing machines, but not from kitchen sinks or dishwashers.
The California Plumbing Code Chapter 15 facilitates water conservation, relieves stress on private septic systems, makes legal compliance easily achievable, and provides guidelines for avoiding potentially unhealthful conditions. The Code requires a construction permit for greywater systems that make changes to a home’s drain/waste plumbing connected to clothes washers, showers, bathtubs, and bathroom sinks. The Code allows residential greywater landscape irrigation from washing machines to be installed without a construction permit if the system meets all performance guidelines in the Code. For such systems in the unincorporated area of Monterey County on properties containing wells and/or septic systems, residents should apply at the Monterey County Planning Department using the graywater permit template. Applications will be routed to the Monterey County Environmental Health Bureau’s Environmental Health Review Services (EHRS) for review to ensure that the graywater system observes required setbacks from onsite wastewater treatment system and wells if present. City and unincorporated County residents that do not use a well or septic system should contact their Building Department to apply for a graywater permit using the graywater permit template (Central Coast Greywater Alliance, 2020).

9.5.1.5 Implementation Schedule

If this project is selected, the implementation schedule is presented on Figure 9-1. It is anticipated that Phase I will take 2 years. Phase II will overlap with Phase I and take 2 years and be extendable if the project is expanded. Phase III and IV, implementation and ongoing maintenance by residents, will begin in Year 2 and continue into the future.

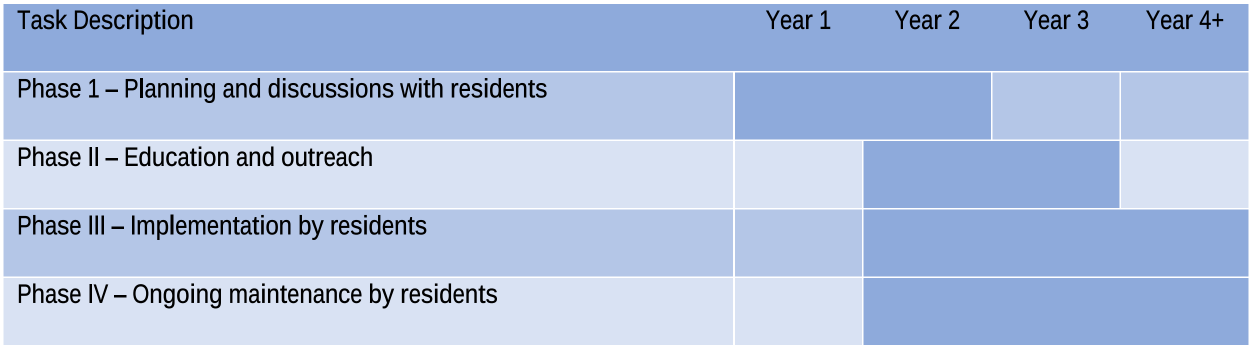


Figure 9-1. Implementation Schedule for Recharge of Rainwater Initiatives

9.5.1.6 Legal Authority

No legal authority is needed to promote decentralized residential in-lieu recharge projects.

9.5.1.7 Estimated Cost

The success of this project depends on homeowner participation. An important first step is education and outreach. This project includes the GSA hosting 5 workshops on rainwater harvesting and 5 workshops on graywater reuse for a total cost of $50,000.

Construction costs will be the responsibility of the homeowners with possible incentives from the GSA. A complete rainwater harvesting system for a typical single-family home will generally cost between $4,000 and $10,000, with the largest cost being the storage tank (WAC, 2021). Many of the other costs are the gutters, downspouts, and irrigation distribution systems. At $10,000 for a 5,000-gallon tank and respective system, that equates to an annual cost of $800 and a unit cost of $15,000/AF.

For laundry-to-landscape systems, the costs include dual drainage plumbing, labor, materials, and the irrigation distribution system. These costs are shown in Table 9-2. If each household system costs $2,100 and yields 4,100 gallons from April to October, this equates to an annual cost of $200 and a unit cost of $9,180/AF.

Table 9-2. Costs of a Laundry to Landscape System for 1 Household

Item	Cost
Dual drainage plumbing	$500
2-3 hours of labor	$400
Materials	$200
Irrigation distribution system	$1,000
Total	$2,100

9.5.1.8 Public Noticing

As part of the approval of the program, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on it. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
  - A description of the undesirable result(s) that may occur if action is not taken
  - A description of the proposed project
  - An estimated cost and schedule for the proposed project
  - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.5.2 Project A2: Decentralized Stormwater Recharge

This project entails promoting the installation stormwater collection and recharge features in neighborhood locations downstream of typical flooding spots for the purposes of groundwater recharge. These projects are typically larger than the household-scale projects and have greater potential for the water to reach the local principal aquifer because as more water is captured, it is better able to harness the power of gravity to saturate the subsurface all the way to the aquifer. Secondary benefits are potentially improving surface water quality and flood hazard mitigation.

Anticipated climate change may bring more frequent and extreme precipitation events to this subbasin. When rainfall is concentrated in a short time period rather than spread out, more stormwater runs off rather than infiltrates, which reduces recharge to the principal aquifer. Runoff flows out of the Subbasin, but recharge features can capture and recharge a portion of the stormwater. By using proactive stormwater diversion, collection, and infiltration management techniques, groundwater conditions can improve in this Subbasin.

For this project, SVBGSA will engage in outreach, identify opportunities for neighborhood-scale stormwater routing and collection features, and potentially establish a fund to provide financial incentives to encourage their installation in residential areas. For new urban developments, Monterey County has adopted Post-Construction Requirements that require projects to implement low impact development techniques to better enable water infiltration before it becomes runoff. SVBGSA's efforts could be done in conjunction with other rainwater and floodwater efforts scaled to and applied at different locations for a variety of benefits and recharge impacts.

These decentralized stormwater recharge projects include a range of types of applications, such as bioswales, small surface recharge basins, drywells, or to other specific capture structures for enhanced infiltration and recharge purposes. Site selection for any such application will partly depend on soil quality and surrounding groundwater quality. Runoff can also be captured and used for irrigation in lieu of groundwater. Projects may require additional infrastructure and/or maintenance costs.

Bioswales

The routed stormwater could be collected in a series of swales, or into a small recharge basin, or a combination of both depending on land availability and permissions from landowners and neighborhood groups. The 3 primary types of swales are grassed swales, rock lined swales (dry creek beds), and bioswales. Vegetation in the swales slows stormwater, allows sediments to filter out, and can help remove nutrients. Bioswales are vegetated swales that use engineered media beneath the swale to reduce runoff volume and peak runoff rates. Bioswales have a greater capacity for water retention nutrient removal and pollutant removal.

Small Surface Recharge Basins

Stormwater could be diverted and captured in small, surface retention basins where it can infiltrate and provide decentralized, indirect recharge opportunities. These small basins can help reduce peak flooding on streets and prevent erosion or damage to the roadways from storms.

Soil analyses greatly influence the extent of groundwater recharge and where recharge projects would be most beneficial. Infiltration of precipitation into the subsurface is dependent on a number of factors such as texture, organic content, slope, root zone depth, and salinity. High slopes through much of the Subbasin increase run-off and decrease infiltration; however, the soils generally have high infiltration capacity, except in the southern part of the Subbasin where infiltration capacity of the soil is highly variable.

Dry Wells

Recharge basins can be coupled with dry wells that direct water into the subsurface, thus helping water infiltrate into the unsaturated region above the water table. Dry wells can also help circumvent locations with a lot of clay near the surface by providing screens in more permeable sediments. Site-specific analyses would be required to properly design and install these features for maximum benefit to the regional aquifer.

In Lieu Reuse

Stormwater can also be routed for retention and reuse to irrigate common areas within residential communities, medians, parks, and large building landscaping. This functions as in-lieu recharge, as it reduces the amount of groundwater needed for irrigation.

9.5.2.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective.** Using decentralized stormwater projects will increase water that recharges the principal aquifer, or if used in lieu of pumped groundwater for irrigation will decrease groundwater extraction. By pumping less water, it has a similar effect of adding water to the principal aquifer. Adding water into the principal aquifer through direct recharge or in-lieu use will raise groundwater elevations over time.
- **Groundwater storage measurable objective.** Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Increasing groundwater recharge will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.2.2 Expected Benefits and Evaluation of Benefits

The primary benefit from this project is increased groundwater recharge. The Subbasin covers an area of approximately 17,600 acres, with multiple small drainages interspersed throughout the subbasin which all generally drain southward to the Salinas River. The number of small drainages is unknown, however if 5% of the acreage is utilized for stormwater capture, it would allow for 880 acres receiving roughly 19 inches of precipitation annually. This has the potential to generate 1,390 AF/yr. of stormwater runoff to be routed and captured in small neighborhood bioswales, basins, drywells, or even sent directly to agricultural lands. If only 1% of the acreage of the Subbasin is utilized for stormwater capture, that would allow for 176 acres receiving roughly 19 inches of precipitation annually to generate 279 AF/yr. of stormwater runoff to be routed and captured. During the implementation period, these numbers will be refined with flood studies that are more location specific and accurate; that will demonstrate the variation between dry, wet, and normal years. Additionally, these numbers will be refined as various neighborhoods implement stormwater capture infrastructure over time.

Increased storage of runoff will potentially increase groundwater elevations in the vicinity of the stormwater capture facilities. This typically will be seen as groundwater mounding. However, as more water is emplaced in the subsurface, more water will flow laterally, thereby expanding the zone of influence from each stormwater capture basin outward and raise groundwater elevations laterally. Additionally, water stored underground is not subject to ET in the same way water stored above ground is. This increases the return on investment by reducing recharge system losses. With these stormwater capture basins, proper maintenance can minimize recharge system losses and maximize potential infiltration and subsequent storage.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. A direct correlation between stormwater recharge and changes in groundwater elevations may not be noticeable for smaller projects. Larger projects may include monitoring wells if they are not close enough to the existing monitoring network for the impacts to be measured. Various volumetric measurement methods may be installed along with either recharge basins or dry wells to assist in calculating increases to groundwater storage.

9.5.2.3 Circumstances for Implementation

Decentralized stormwater recharge projects can be initiated at any time. Agencies and organizations in the region are already engaged in efforts to promote stormwater recharge, and their efforts could be leveraged. Among other organizations, the Monterey County Public Works Department (MCPWD) are both engaged in efforts to manage runoff and have set the stage for consideration integrated solutions of runoff and infiltration in these watersheds. Site specific analyses are required to determine the potential recharge benefit.

9.5.2.4 Permitting and Regulatory Process

Projects described in this section may require a CEQA review process and may require an Environmental Impact Report (EIR) or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require National Environmental Policy Act (NEPA) documentation.

There may be a number of local, county, and state permits, rights of way, and easements required depending on bioswale or conveyance alignments and retention basins. Projects with wells will require a well construction permit.

9.5.2.5 Implementation Schedule

If selected, the implementation schedule is presented on Figure 9-2. It is anticipated that Phase I will take 2 years. Phase II will overlap with Phase I and take 2 years. Phase III, site selection and construction will occur in years 3 and 4. Ongoing maintenance will continue in Year 4 and beyond. This implementation schedule may be adjusted based on the number and ambition of stormwater recharge projects pursued, as well as potential grants and opportunities available.

Task Description	Year 1	Year 2	Year 3	Year 4	Years 5+
Phase I - Planning and discussions with neighborhoods					
Phase II - Surveying of top selected sites					
Phase III - Site selection and construction					
Phase IV - Ongoing maintenance					

Figure 9-2. Implementation Schedule for Recharge of Stormwater Capture Initiatives

9.5.2.6 Legal Authority

No legal authority is needed to promote decentralized stormwater recharge projects. For the implementation of projects, pursuant to California Water Code § 10726.2 (a) and (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some right in real property (whether fee title, easement, license, leasehold or other) may be required to implement a recharge project. A permit to appropriate water may not needed to infiltrate stormwater if constructed on a parcel without a USGS blue line stream. If a blue line stream crosses the parcel, SVBGSA will evaluate whether a permit is needed. SVBGSA recognizes that this process takes several years to complete. If a permit is needed, SVBGSA will pursue a SWRCB 5-year temporary permit under the Streamlined Permit Process while it applies for the diversion permit.

9.5.2.7 Estimated Cost

The construction cost for the decentralized stormwater recharge projects is unable to be estimated until specific projects are scoped. This project is designed as a program that encourages developers, municipalities, homeowners' associations, and landowners to install stormwater recharge projects and assists with initial planning costs. The program costs approximately $150,000-$200,000 for strategic outreach, assistance with site assessments, assessment of recharge potential, and help securing grant funds. This amount would fund cone penetration tests to assess recharge potential for 4 to 6 sites. If needed to increase implementation of stormwater recharge projects, SVBGSA could provide monetary incentives or fund and implement the projects themselves. Each site-specific project will have its own associated costs based on the level of complexity of the stormwater capture technique. These span from non-vegetated basin to capture and infiltrate stormwater to recharge basins coupled with dry wells. The project-specific construction costs will be estimated based on initial site assessments and feasibility studies.

9.5.2.8 Public Noticing

Before SVBGSA initiates construction on any project, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
  - A description of the undesirable result(s) that may occur if action is not taken
  - A description of the proposed project
  - An estimated cost and schedule for the proposed project
  - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA. If projects are undertaken by other public agencies or private entities or persons, the implementing agency or private entity or person will be responsible for obtaining the appropriate permit (if any) and undertaking required public noticing.

9.5.3 Project A3: Managed Aquifer Recharge of Overland Flow (Overland Flow MAR)

This program incentivizes development of groundwater recharge basins that recharge overland flow and stormwater runoff from the Gabilan Range. This program is structured similar to the program instituted in Pajaro Valley, whereby agricultural landowners dedicate a portion of their land to recharge ponds and direct overland flood flows into the ponds. This could include some type of incentive for recharge basins would be situated to collect runoff before it enters a local stream and allowed to infiltrate.

This program will require additional analysis on actual available runoff from each of the watersheds. It assumes that the stormwater is not being diverted upstream; however, mountain ranges may have diversion operations already occurring upstream in the watershed. Rain gauges and studies will be required to determine the true estimate of water available from each subwatershed.

This project currently plans for 4 recharge basins, each with a recharge capacity of about 100 AF/yr. Their locations will be chosen based on site availability and suitability. The most suitable sites have clean soil and high recharge potential. Soil tests will guide site selection so that contaminants do not leach into groundwater and contaminate drinking water. Aquifer recharge potential is highest where there are areas of highly permeable soils, good connection to underlying aquifers, and topography that directs surface runoff toward retention/catchment areas. The SVBGSA will investigate where recharge ponds would yield the greatest amount of groundwater recharge, combining data on soil permeability, stratigraphy, and land use to map areas of high potential recharge.

The program would reach out to landowners to increase awareness of the benefits of recharge basins and work with local stakeholders to identify lands with high recharge capacity. It could also work with interested landowners to identify sites, undertake potential site analyses with cone penetration tests (push tests), and design recharge basins. This program will involve monitoring water quality and could potentially improve stormwater quality and reduce stormwater volume which is regulated under the ILRP. Water recharged will comply with regulatory standards. The project could potentially include development of a permit coordination program for recharge projects. The program could also work with various organizations and government agencies to connect existing incentivization programs and funding to landowners interested in collaborative recharge projects that require land and access.

9.5.3.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective**. By routing stormwater and runoff from streams into recharge facilities and restored floodplains, there will be more water added to the principal aquifer. This water will be slowed down and allowed to infiltrate, which has the effect of addition water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.
- **Groundwater storage measurable objective**. Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.
- **Land subsidence measurable objective**. Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Maintaining and adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.

- **Seawater intrusion measurable objective**. Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Increasing groundwater storage will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.3.2 Expected Benefits and Evaluation of Benefits

This project will increase sustainable yield and groundwater elevations through enhanced infiltration of runoff. Runoff occurs when the rate of rainfall exceeds the soil infiltration rate. This runoff then flows over the land surface before accumulating into washes and streams as measurable stream flow. In the initial phases of overland flow, this water often infiltrates into the soils, which enhances soil moisture and can recharge the aquifer. This project will build 4 recharge basins to collect runoff. Each recharge basin is expected to add 100 AF/yr. to groundwater storage. The benefits to increased soil moisture go beyond increased opportunity for recharge. Enhanced soil moisture contributes to erosion protection as well as near-surface temperature regulating processes (Rivas, 2006; Mittelbach *et al.*, 2011).

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Projects may include monitoring wells if they are not close enough to the existing monitoring network for the impacts to be measured. Various volumetric measurement methods may be installed along with either recharge basins or dry wells to assist in calculating increases to groundwater storage. Land subsidence will be measured using InSAR data provided by DWR.

9.5.3.3 Circumstances for Implementation

If selected, the overland flow MAR project will be implemented if stakeholders determine it is necessary to reach sustainability. A number of agreements and rights must be secured before the project is implemented. Primarily, a more formal cost/benefit analysis must be completed to determine if the on-farm modifications will provide quantifiable benefits to the principal aquifer. Site specific analyses will help determine the potential recharge benefit. Recharge basins installed as part of this project could be directly funded by the SVBGSA or grant funding, or SVBGSA could develop an incentive program.

9.5.3.4 Permitting and Regulatory Process

Projects described in this section may require a CEQA review process and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require NEPA documentation.

In addition, permits from the following government organizations that may be required for overland flow MAR projects include:

- ***United States Army Corps of Engineers (USACE)*** **–** A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States.
- ***California Department of Fish and Wildlife (CDFW)*** **–** A Standard Agreement is required if the project could impact a species of concern.
- ***Environmental Protection Agency (EPA) Region 9*** **–**NEPA documentation must be submitted for any project that coordinates with federal facilities or agencies. Additional permits may be required if there is an outlet or connection to waters of the United States.
- ***National Marine Fisheries Service (NMFS)*** **–** A project may require authorization for incidental take, or another protected resources permit or authorization from NMFS.
- ***State Water Board Stormwater Pollution Prevention Plan (SWPPP)*** **–** A General Permit to Discharge Stormwater may be required depending on how stormwater is rerouted.
- ***California Department of Transportation (Caltrans)*** **–** An Encroachment Permit is required if any state highway will be obstructed.
- ***Monterey County*** – A Use Permit may be required. A Grading Permit is required if 100 cubic yards or more of soil materials are imported, moved, or exported. An Encroachment Permit is required if objects will be placed in, on, under, or over any County highway.

9.5.3.5 Implementation Schedule

If selected for implementation, a proposed implementation schedule for this project is presented on Figure 9-3. The schedule will depend on whether programmatic permitting can be obtained or whether each individual project needs its own feasibility, permitting, and design.

Task Description	Year 1	Year 2	Year 3	Year 4	Year 5
Studies/Preliminary Engineering Analysis					
Agreements/ROW					
CEQA					
Permitting					
Design					
Bid/Construct					

Figure 9-3. Implementation Schedule for Overland Flow MAR

9.5.3.6 Legal Authority

Pursuant to California Water Code §10726.2 (a) and (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some rights in real property (whether fee title, easement, license, leasehold or other) may be required to implement a recharge project. A permit to appropriate water may not needed to infiltrate overland flow if constructed on a parcel without a USGS blue line stream. If a blue line stream crosses the parcel, SVBGSA will evaluate whether a permit is needed. SVBGSA recognizes that this process takes several years to complete. If a permit is needed, SVBGSA will pursue a SWRCB 5-year temporary permit under the Streamlined Permit Process while it applies for the diversion permit.

9.5.3.7 Estimated Cost

This project proposes the construction of 4 recharge basins, each with an expected benefit of 100 AF/yr. and a capital cost of $1,032,000 for a total of $4,128,000. Spread over 25 years and assuming a 6% discount rate, the annualized cost is $86,700 per recharge basin, including annual maintenance. The unit cost is $870/AF. These costs were estimated assuming that only 1 recharge basin would be built, but there may be economies of scale that lower the cost if more are built. These costs are approximate; exact costs will depend on site specifics.

9.5.3.8 Public Noticing

Before any project initiates construction as part of GSP implementation, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- GSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
    - A description of the undesirable result(s) that may occur if action is not taken
    - A description of the proposed project
    - An estimated cost and schedule for the proposed project
    - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.5.4 Project A4: Surface Water Diversion from Gabilan Creek

This project entails diverting flood flows from Gabilan Creek and recharging this water at a nearby location in either recharge basins or dry wells.

Gabilan Creek drains north from the Gabilan Range and briefly runs through the Langley Subbasin where it turns south before entering the Eastside Subbasin. A stream gage on the Creek recorded an average flow of 20 cubic feet per second (cfs) from 1971 to 2014. Flows are highly variable depending on whether it is a dry or wet year, as shown on Figure 9-4.

Historical data from the Gabilan Creek stream gage indicates that it receives the highest flows in the winter, and that it is highly variable between years, with some years receiving little to no flow. Given the potential for state permits to divert stream water, flows over the historical 90th percentile for that day of the year were calculated, and during those days, no more than 20% of the total flow for that day were diverted. With current permitting, the resulting water that could have been available for diversion under historical conditions is shown on Figure 9-4. This figure shows that water for recharge is highly variable. Based on historical data, the mean annual diversion is about 450 AF, but with a standard deviation of more than 1,000 AF. The median is 200 AF/yr.

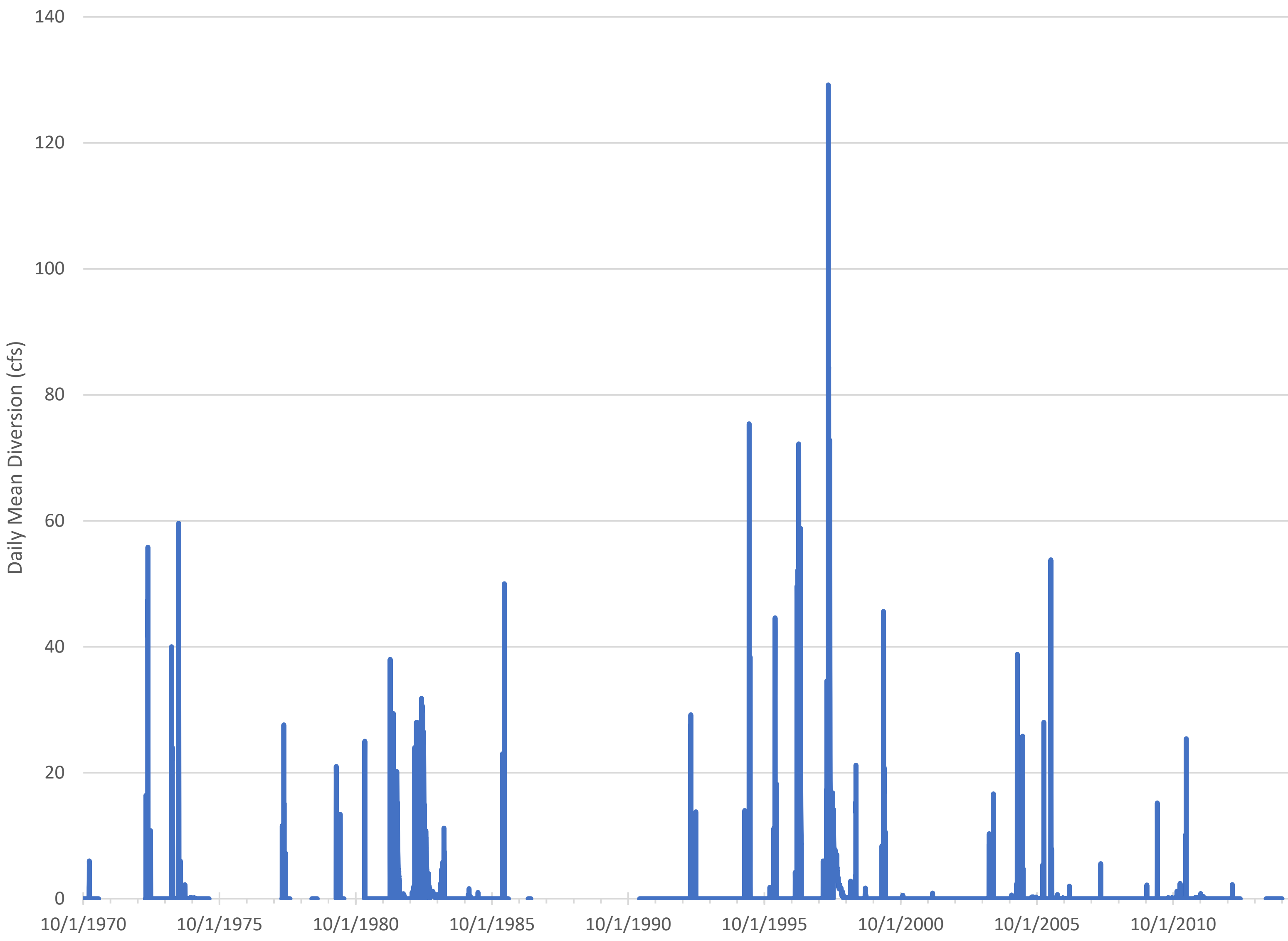


Figure 9-4. Gabilan Creek Streamflow Analysis Results by Water Year

Based on this analysis, mean annual diversions were calculated to determine the potential diversion amounts for diversion structures ranging from capacities of 5 cfs to 50 cfs. A diversion capacity of 20 cfs would be expected to potentially capture a mean of 350 AF/yr. For each 5 cfs of capacity added beyond that to a diversion structure, the expected diversion grows by less than 10%.

Water must be able to permeate the subsurface sediments for dry wells and recharge basins to be effective. The analysis of the permeability of subsurface sediments looked at which zones are good to site a recharge basin or screen a dry well in for recharge purposes. An initial analysis of the subsurface conditions in the vicinity of Gabilan Creek show frequent occurrences of clay and granite gravel from the Gabilan Range. Well construction logs analyzed show coarser sediments from approximately 30 feet below land surface to 130 feet below land surface. However, these sediments include a mix of decomposed granite, clay, gravel, sand, and fractured granite. Well construction logs show depth to water from approximately 80 feet to 100 feet below land surface as recorded at the time of well installation, which ranges from 20 to 80 years ago. The actual siting would require a more detailed subsurface analysis of sediments and more thorough analysis of depth to water for all seasonal conditions, such that the bottom of the dry well would remain above the water table for groundwater quality protection purposes. Sites with contaminated soils will be avoided, and water recharged will comply with regulatory standards.

Given the challenge of finding a good recharge location, along with the potentially low water yield benefit of a diversion structure, a preliminary cost analysis was not pursued at this stage. Multiple pilot holes would likely need to be drilled to identify a good recharge pond and/or dry well location. A diversion structure of 20 cfs would be costly for the quantity of water that would be diverted since only flows over the 90th percentile would be diverted. Based on the historical record, there may not be flows for several years, and other flows may be very unreliable. This would negate both the investment in the diversion structure and the recharge infrastructure.

Under the current State permitting process, SVBGSA would likely only be able to divert flood flows that are over the 90th percentile on any given day. SVBGSA performed a preliminary analysis of the streamflow that would meet the 90th percentile threshold and be diverted. Additionally, SVBGSA looked at the potential for recharge through a recharge basin or dry well. If pursued, a more detailed analysis of diversion and recharge locations would need to occur, along with discussions with landowners.

9.5.4.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective**. By routing stormwater and runoff from streams into recharge facilities and restored floodplains, there will be more water added to the principal aquifer. This water will be slowed down and allowed to infiltrate, which has the effect of addition water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.

- **Groundwater storage measurable objective**. Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.
- **Seawater intrusion measurable objective**. Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Increasing groundwater recharge will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.4.2 Expected Benefits and Evaluation of Benefits

The primary benefit from this project is increased groundwater recharge due to recharged 90th percentile flood flows diversion.

Based on analysis of historical data, a diversion structure with a capacity of 20 cfs will capture about 350 AF/yr., on average. However, annual variation is high. Diversions were simulated over a 44-year historical period and the median diversion was only 9 AF/yr., because there were many years when no water was diverted and a couple of years when thousands of AF were diverted. During the implementation period, these numbers will be refined with flood studies that are more regionally specific and accurate.

The benefit is greatest at the location of the recharge facilities, which will likely be sited relatively close to the stream due to anticipated infrastructure costs and subsurface sediments.

Increased storage of flood waters can also increase groundwater elevations in the vicinity of the recharge facilities. This typically will be seen as groundwater mounding. However, as more water is emplaced in the subsurface, more water will flow laterally, thereby expanding the zone of influence from the recharge facility outward and raise groundwater elevations laterally. Additionally, water stored underground is not subject to ET in the same way water stored above ground is. This increases the return on the investment, by reducing recharge system losses. Even with recharge basins, proper maintenance can minimize recharge system losses and maximize potential storage.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations and storage will be measured with a network of wells that is monitored by MCWRA. A direct correlation between flood water recharge and changes in groundwater elevations is mostly possible because this project will likely include monitoring wells or will be close enough to the existing monitoring network for the impacts to be measured. Various volumetric measurement methods will be installed along with either recharge basins or dry wells to assist in calculating increases to groundwater storage. Seawater intrusion will be measured using select RMS wells.

9.5.4.3 Circumstances for Implementation

If selected, this streamflow diversion and recharge project will decrease flood flows along Gabilan Creek, which could detract from projects other stakeholders are undertaking, such as the Gabilan Floodplain Enhancement Project being undertaken by the RWMG and Central Coast Wetlands Group (CCWG). Prior to implementation, the effect on other potential projects under consideration by SVBGSA or other entities must be considered. Site specific analyses are required to determine the potential recharge benefit. Land access and water diversion rights must be secured, which may take a significant number of years. A diversion permit or SWRCB 5-year temporary permit must be obtained prior to diversion.

9.5.4.4 Permitting and Regulatory Process

A diversion permit is needed to divert water from the Gabilan Creek. SVBGSA recognizes that this process takes several years to complete. SVBGSA will pursue a SWRCB 5-year temporary permit under the Streamlined Permit Process while it applies for the diversion permit.

The project described in this section will require a CEQA environmental review process and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). In addition, permits from the following government organizations may be required:

- ***United States Army Corps of Engineers (USACE) –*** A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States.
- ***California Department of Fish and Wildlife (CDFW) –*** A Standard Agreement is required if the project could impact a species of concern.
- ***Environmental Protection Agency (EPA) Region 9 –***NEPA documentation must be submitted for any project that coordinates with federal facilities or agencies. Additional permits may be required if there is an outlet or connection to waters of the United States.
- ***National Marine Fisheries Service (NMFS) –*** A project may require authorization for incidental take, or another protected resources permit or authorization from NMFS.
- ***Monterey County –*** A Use Permit may be required. A Grading Permit is required if 100 cubic yards or more of soil materials are imported, moved, or exported. An Encroachment Permit is required if objects will be placed in, on, under, or over any County highway.

9.5.4.5 Implementation Schedule

If this project is selected for implementation, the implementation schedule is presented on Figure 9-5. This schedule will begin after a SWRCB temporary permit for diversion and recharge of high flows is secured.

Task Description	Year 1	Year 2	Year 3	Year 4	Years 5+
Phase I - Planning and discussions with stakeholders					
Phase II - Surveying and pilot holes of top selected sites					
Phase III - Final site selection and construction					
Phase IV - Ongoing monitoring and maintenance					

Figure 9-5. Implementation Schedule for Gabilan Creek Stream Diversion

9.5.4.6 Legal Authority

Pursuant to California Water Code § 10726.2 (a) and (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some right in real property (whether fee title, easement, license, leasehold or other) may be required to implement a recharge project. A diversion permit or a SWRCB 5-year temporary permit is required for the authority to divert water.

9.5.4.7 Estimated Cost

Capital costs were estimated at $10,074,000. On an annualized basis, assuming a 6% discount rate, and 25-year term, this amounts to $788,100. Including an annual O&M cost of $34,000 generates a total annualized cost of $822,100. Assuming a yield of 350 AF/yr., based on operation 40 days of the year the unit cost for water stored is estimated at $2,350/AF.

9.5.4.8 Public Noticing

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
  - A description of the undesirable result(s) that may occur if action is not taken
  - A description of the proposed project
  - An estimated cost and schedule for the proposed project
  - Any alternatives to the proposed project

- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.6 Demand Management

9.6.1 Management Action B1: Pumping Allocations and Controls

Pumping allocations are one approach to managing and controlling pumping. Given limited supply-side options in the Langley Subbasin, pumping management provides a management action to proactively determine how extraction should be fairly divided and controlled if needed.

Pumping allocations divide up the sustainable yield among beneficial users. Pumping allocations are not water rights and cannot determine water rights. Instead, they are a way to determine each extractor's pro-rata share of groundwater extraction and regulate groundwater extraction. They can be used to:

- Underpin management actions that manage pumping
- Generate funding for projects and management actions
- Incentivize water conservation and/or recharge projects

Pumping allocations and control can take many forms if it is needed now or in the future. Allocations can be developed based on various criteria. After a Valley-wide workshop on pumping allocations, Subbasin committee members and other stakeholders completed a survey on their preferences for a pumping allocation structure. At the January and March 2021 Langley Subbasin Planning Committee meetings, members discussed whether and what type of pumping allocation structure would be appropriate in the Langley Area. At the March meeting, the Subbasin Planning Committee took a motion to state their preference for a hybrid allocation structure based on a per connection basis for small parcels and a per acreage basis for large parcels. This provides a starting point for the development of an allocation structure within GSP implementation; however, a different allocation structure could be selected at that point.

The hybrid per connection/per acreage allocation structure estimates *de minimis* extraction, and subtracts it from the overall sustainable yield, along with set asides for urban and agricultural growth. Under this allocation structure, extractors with parcels larger than 5 acres receive an allocation based on acreage, and extractors with parcels smaller than 5 acres receive an allocation on a per connection basis, assuming one connection per parcel. There are no municipal water systems within the Langley Subbasin; however, should there be one in the future, they would receive an allocation on a per connection basis.

If pumping needs to be reduced to meet the sustainable yield, all users would reduce water usage by the same percentage, except for *de minimis* users. Unless *de minimis* users are incorporated into the allocation structure, the total amount estimated for *de minimis* use would be preset and remain the same, thus increasing the portion of the sustainable yield used by *de minimis* users.

Including pumping allocations in the GSP shows that allocations are a potential management tool that can be developed, but it will not establish pumping allocations nor pumping controls. During the GSP implementation period, a full stakeholder engagement process and in-depth analysis will be undertaken to collect additional data and establish pumping allocations. Stakeholder engagement will include outreach to water systems, homeowners, and landowners so that those interested can participate in the development of the allocation structure.

Once the allocation structure is established, pumping controls may be put in place immediately or there could be a trigger after which they will be put in place, such as pumping beyond the sustainable yield. Given the lack of data in the Langley Subbasin, Well Registration (Implementation Action D3) and GEMS Expansion and Enhancement (Implementation Action D2) are important steps to gather data needed for implementing pumping allocations.

Pumping allocations can be used as the basis for pumping fees, which could raise funds for projects and management actions. For example, a fee structure could be defined such that each extractor has a pumping allowance that is based on their allocation, and a penalty or disincentive fee is charged for extraction over that amount. If the sustainable yield is lower than current extraction, a transitional pumping allowance could be developed to transition from a groundwater user's actual historical pumping amounts (estimated or measured) to their allowance based on the sustainable yield. The purpose of this transitional allowance is to ensure that no pumper is required to immediately reduce their pumping, but rather pumpers have an opportunity to reduce their pumping over a set period. Transitional pumping allowances could then be phased out until total pumping allowances in each subbasin are less than or equal to the calculated sustainable yield.

9.6.1.1 Relevant Measurable Objectives

The measurable objectives benefiting from pumping allowance and controls include:

- **Groundwater elevation measurable objective.** This measurable objective will benefit from pumping allocations and controls that promote less pumping that will result in higher groundwater levels.

- **Groundwater storage measurable objective.** This measurable objective is based on the amount of groundwater in storage when groundwater elevations are held at their measurable objective, therefore pumping allocations and controls that reduce pumping contribute to increasing groundwater elevations. In turn, groundwater in storage will also increase and will help achieve long-term sustainable yield.
- **Land subsidence measurable objective.** This measurable objective will benefit from pumping allocations and controls that reduce the pumping stress on the local aquifer and thereby reduce any potential for subsidence.
- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Conserving groundwater will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.6.1.2 Expected Benefits and Evaluation of Benefits

The primary benefits expected for this management action is that it is another demand-side management tool and would enhance sustainable yield and groundwater elevations. Working within a groundwater budget allows the subbasin to meet its sustainable yield volume.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Groundwater storage will be monitored using groundwater pumping measurements and estimates. Land subsidence will be measured using InSAR data provided by DWR.

9.6.1.3 Circumstances for Implementation

SVBGSA will work with the Subbasin stakeholders to collect data needed to establish pumping allocations and undertake stakeholder outreach prior to establishing pumping allocations. As part of establishing pumping allocations, SVBGSA will determine whether to implement pumping controls immediately or to establish a trigger based on groundwater conditions, after which controls are implemented.

9.6.1.4 Permitting and Regulatory Process

The GSA Board of Directors will need to authorize the establishment of pumping allocations and controls. The development and implementation of pumping controls is a regulatory activity and would be embodied in a GSA regulation. The regulation could be established to provide for automatic implementation upon existence of specific criteria or to require the vote of the Board to implement.

9.6.1.5 Legal Authority

The California Water Code § 10726.4 (a)(2) provides GSAs the authorities to control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate. Imposition of pumping allocations and controls will require a supermajority plus vote of the SVBGSA Board of Directors.

9.6.1.6 Implementation Schedule

After selection of this management action to be implemented, initial data collection and stakeholder outreach will occur within the first 2 years. In years 3 and 4, the pumping allocations structure for the Langley Subbasin will be established, as shown in Figure 9-6. The establishment of the allocation structure will include identification of the conditions that warrant implementation of pumping controls. After that point, pumping controls will be implemented only when needed.

	Year 1	Year 2	Year 3	Year 4	Years 5+
Phase I – Data collection and stakeholder outreach					
Phase II – Establishment of allocation structure					
Phase III – Pumping controls, when needed					

Figure 9-6 Implementation Schedule for Pumping Allocations and Controls

9.6.1.7 Estimated Cost

Development of a pumping allocation structure and pumping controls is approximately $300,000. This includes outreach meetings to engage stakeholders, analysis of potential allocation structures, facilitation of stakeholder dialogues, refinement according to specific situations, and legal analysis. When pumping controls are enacted, there will be additional administrative costs associated with implementation.

9.6.1.8 Public Noticing

As part of the approval of the establishment of Langley Pumping Allocations, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on it. The general steps in the public notice process will include the following:

- GSA staff will bring an assessment of the need for allocations to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
    - A description of the undesirable result(s) that may occur if action is not taken

- A description of the proposed management action
- An estimated cost and schedule for the proposed management action
- Any alternatives to the proposed management action

- The SVBGSA Board will notify stakeholders in the area of the proposed project/management action and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether to approve the implementation of the management action and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

Imposition of pumping allocations and controls may also require a CEQA review process and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). All projects will follow the public noticing requirements per CEQA or NEPA.

9.6.2 Management Action B2: Fallowing, Fallow Bank, and Agricultural Land Retirement

To reduce groundwater extraction temporarily or permanently, this management action includes 3 actions that could be implemented on an as-needed basis to reduce irrigated land. These actions provide options for voluntary fallowing and land retirement that can be targeted to specific locations that have declining groundwater elevations or high recharge potential, such as floodplains. Water quality and access to drinking water wells will also be considered when deciding where to incentivize fallowing or land retirement. The following could be included under an overarching program, even if implemented independently:

- **Rotational fallowing.** Participating growers fallow some percentage of land or fallow on a rotating basis. This could be modified to include partial fallowing, such as growing fewer crops per year instead of completely fallowing land.
- **Fallow bank.** Growers could contribute to a fallow bank whereby anybody fallowing land could draw against the bank to offset the lost income from fallowing. This could be combined with other fallowing plans. The specific design of a fallow bank will be developed during GSP implementation, including options such as exempting growers from rotational fallowing if they contribute a certain amount of money to the fallow bank.
- **Agricultural land retirement.** SVBGSA could develop a system for voluntary agricultural land retirement or pay to retire agricultural land, effectively reducing the amount of groundwater used in the Subbasin. Payment would likely be limited without pumping allocations. The benefit from this program depends on identifying willing participants.

This management action could work together with pumping allocations. If stakeholders develop pumping allocations into a water market, payments could be developed as a part of the market.

9.6.2.1 Relevant Measurable Objectives

The measurable objectives benefiting from fallowing, fallow, bank, or agricultural land retirement include:

- **Groundwater elevation measurable objective.** Depending on the location of fallowing or land retirement, this measurable objective will benefit from decreased pumping that will result in higher groundwater levels.
- **Groundwater storage measurable objective.** Depending on the location of fallowing or land retirement, reducing pumping from the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Land subsidence measurable objective.** Depending on the location of fallowing or land retirement, this measurable objective will benefit from pumping allowances and controls that reduce the pumping stress on the local aquifer and thereby reduce any potential for subsidence.
- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where seawater has advanced inland to within a few miles of the Langley Subbasin. Conserving groundwater will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.6.2.2 Expected Benefits and Evaluation of Benefits

The primary benefits expected for this management action is reduced Subbasin pumping. This management action is costed for saving 1,000 AF/yr.; however, it could be scaled to any size. The less water that is extracted from the principal aquifer, the more water is in storage. Depending on the location of fallowing and land retirement, benefits may include halting the decline of or raising groundwater elevations and avoiding subsidence in specific areas. Because it is unknown how many landowners will willingly enter the land retirement program, it is difficult to quantify the expected benefits at this time.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. A direct correlation between agricultural land retirement and changes in groundwater elevations is likely not possible because this is only one among many management actions and projects that may be implemented in the Subbasin. Groundwater storage will be monitored using groundwater pumping measurements and estimates. Land subsidence will be measured using InSAR data provided by the DWR. Seawater intrusion will be measured using select RMS wells.

9.6.2.3 Circumstances for implementation

Agricultural land retirement relies on willing participants, be it for participation or land sale. No other triggers are necessary or required. The circumstance for implementation is for SVBGSA to identify the need for the management action and identify willing participants and secure their participation.

9.6.2.4 Permitting and Regulatory Process

While no permitting or regulatory processes are necessary for buying land or securing agreements with landowners for fallowing or land retirement, the SVBGSA will secure and record as appropriate, the necessary agreements or deed restrictions to implement the management action.

9.6.2.5 Legal Authority

California Water Code § 10726.2 provides GSAs the authority to purchase, among other things, land, water rights, and privileges.

9.6.2.6 Implementation Schedule

If selected, the process and GSA incentives for fallowing and/or land retirement will be developed over 2 years. The development of a fallow bank may take additional time. Although the program will be ongoing, it is reliant on willing participants and may be implemented intermittently or on an as-needed basis.

9.6.2.7 Estimated Cost

The cost for voluntary fallowing and land retirement depends on extent of fallowing and land retirement. These cost estimates are based on average rent and land value, and they do not capture the additional economic benefits associated with agriculture. The average cost of land and rent was derived from a source that had county-specific estimates. It is understandable that even within a county the cost of land acquisition is highly variable; however, this was the best available information on the average cost of land.

The costs of fallowing land sufficient to reach 1,000 AF/yr. water conserved are shown in Table 9-3, which could be scaled to the amount desired. Fallowed land would be planted with cover crops to maintain soil quality. Vegetables are the most common crop type in MCWRA's Eastside Subarea, which includes most of the Langley Subbasin's agricultural land (MCWRA, 2019). Since vegetables in the Eastside Subarea use 2.5 AF/acre/yr. (MCWRA, 2019) and cover crops use only 0.3 AF/acre/yr. (RCDSCC, 2018), each acre of vegetables fallowed would save 2.2 AF/yr. Therefore, conserving 1,000 AF/yr. would require fallowing about 455 acres of vegetables. The average rent between the low and high estimates is $2,250/acre/yr. (ASFMRA,

2020) and the cost to plant and maintain cover crops is $300/acre/yr. (Highland Economics, 2017), which would result in a unit cost of $1,160/AF water conserved when fallowing.

Table 9-3. Estimated Cost of Fallowing and Agricultural Land Retirement

Annual Fallowing	Low Estimate	High Estimate	Description
Annual rent (cost/acre)	$1,000	$3,500	Rent for row crops in Monterey County (ASFMRA, 2020)
Annual cover crop cost per acre	$300	$300	Cost for cover crops in nearby Pajaro Valley (Highland Economics, 2017)
Annual rent plus annual cover crop cost per acre	$1,300	$3,800	
Acres fallowed annually to conserve 1,000 AF/yr.	455 acres	455 acres	Based on vegetable water use in the Eastside Subarea (MCWRA, 2019) and cover crop water usage (RCDSCC, 2018)
Annual cost to conserve 1,000 AF/yr. through fallowing	$591,500	$1,729,000	
Unit cost/AF water conserved	$590	$1,730	
Agricultural Land Retirement	**Low Estimate**	**High Estimate**	**Description**
Land value per acre	$27,500	$75,000	Cost per acre row crops in Monterey County (ASFMRA, 2020)
Unit cost/AF water conserved	$1,140	$2,820	Using cover crop value as annual O&M, 6% interest, and annualized over 25 years

9.6.2.8 Public Noticing

All appropriate documentation for any agricultural land retirement achieved through a land sale, agreement or deed restriction will be recorded with the County of Monterey Assessor – Clerk – Recorder’s Office. All agricultural land retirement by any means through the GSA will be recorded and publicly accessible.

9.7 Cross-boundary Projects

Two projects planned for outside, or on the border of, the Langley Subbasin could improve groundwater conditions within the Langley Subbasin. The first project is the Floodplain Enhancement and Stormwater Recharge project in the Eastside Subbasin GSP. This project includes potential recharge locations near the border between the Langley and Eastside

Subbasins. This project may have groundwater elevation benefits for the Langley Area. Additional project sites for floodplain enhancement could be identified within the Langley Subbasin and added to this project. The second project is the CSIP expansion included in the 180/400-Foot Aquifer GSP. This project could extend into the Langley Subbasin; however, the majority of the expansion would be in the 180/400-Foot Aquifer Subbasin and the project would unlikely move forward in the Langley Subbasin independently.

9.7.1 Project C1: Floodplain Enhancement and Recharge

This project restores and enhances areas along creeks and floodplains to slow and sink stormwater and encourage streambed and stormwater recharge. SVBGSA could partner with the RWMG, CCWG, and other organizations to support existing creek and floodplain enhancement efforts and encourage inclusion of features that would enhance recharge.

Restored floodplain and riparian habitat along creeks can slow down the velocity of creeks and encourage greater infiltration. Due to agricultural and urban encroachment, streams have become more highly channelized, and flow has increased in velocity, particularly during storm events. This flow has resulted in greater erosion and loss of functional floodplains. Floodplain enhancement efforts could be focused on lands directly adjacent to creeks, so as to not interfere with active farming. In addition, efforts to restore creeks and floodplains could be extended to the foothills to slow water closer to its source.

This project will focus on watersheds along Gabilan Creek and Santa Rita Creek where recharge potential is high and groundwater elevations are low. Initial project locations will be identified for the purpose of estimating project benefits and costs. Final project locations will require more site analysis, project design, and outreach to nearby landowners. Water recharged will comply with regulatory standards and the effect of increased recharge on surrounding groundwater quality will be considered when selecting sites.

One example of floodplain restoration and enhancement is the Gabilan Floodplain Enhancement Project put forth by the CCWG and RWMG. Stormwater generated in the uplands of the Gabilan Creek Watershed is a flood risk to Salinas and other downstream land users. This proposed project includes buying or leasing 80 acres of land in the floodplain above Salinas and implementing floodplain restoration projects. These projects would reduce 20-year maximum flows by 43%, or 326 cfs, and provide benefits such as increased infiltration, water supply reliability, decreased flood volume risk, environmental improvement, and increased urban green space (Greater Monterey County Integrated Regional Water Management Group, 2018).

9.7.1.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective.** By routing stormwater and runoff from streams into recharge facilities and restored floodplains, there will be more water added to the principal aquifer. This water will be slowed down and allowed to infiltrate, which has the effect of addition water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.
- **Groundwater storage measurable objective.** Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.
- **Land subsidence measurable objective.** Increasing both groundwater elevations and groundwater storage will have the added benefit of preventing any potential land subsidence. Maintaining and adding water in the subsurface will keep pore spaces saturated with positive pressure and inhibit land surface collapse associated with groundwater depletion.
- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Increasing groundwater recharge will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.7.1.2 Expected Benefits and Evaluation of Benefits

This project is primarily scoped for the Eastside Subbasin and its respective floodplains. The benefits to the Eastside groundwater system are increased groundwater elevations and increased groundwater storage. Similar benefits can be expected in the Langley Subbasin if floodplain sites are selected for implementation within the Langley Subbasin. Even with current expected benefits scoped for the Eastside Subbasin, the increase in groundwater elevations and storage may have a positive impact on the Langley Subbasin by mitigating any Eastside Subbasin overdraft that impacts the Langley Subbasin.

The current expected groundwater benefit for the whole Salinas Valley is 1,000 AF/yr. of increased groundwater recharge. However, the potential groundwater benefits to the Langley Subbasin are unknown at this point.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Projects may include monitoring wells if they are not close enough to the existing monitoring network for the impacts to be measured. Land subsidence will be measured using InSAR data provided by DWR.

9.7.1.3 Circumstances for Implementation

The floodplain restoration and stormwater recharge project will be implemented if the Eastside Subbasin decides to move forward with the sites within its boundaries or if additional locations are identified within the Langley Subbasin. Site specific analyses are required to determine the potential recharge benefit. Land access and water diversion rights must be secured to divert stormwater, which may take a significant number of years.

9.7.1.4 Permitting and Regulatory Process

This project may require a CEQA review process, which would likely result in either an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, any project that coordinates with federal facilities or agencies may require NEPA documentation.

There will be a number of local, county and state permits, rights of way, and easements required depending on pipeline alignments, stream crossings, and project type. Projects with wells will require a well construction permit from MCWRA. Permits that may be required for floodplain enhancement include:

- ***United States Army Corps of Engineers (USACE) –*** A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States.
- ***California Department of Fish and Wildlife (CDFW) –*** A Standard Agreement is required if the project could impact a species of concern.
- ***Environmental Protection Agency (EPA) Region 9 –***NEPA documentation must be submitted for any project that coordinates with federal facilities or agencies. Additional permits may be required if there is an outlet or connection to waters of the United States.
- ***National Marine Fisheries Service (NMFS) –*** A project may require authorization for incidental take, or another protected resources permit or authorization from NMFS.
- ***California Natural Resources Agency –*** An Initial Study Mitigated Negative Declaration (IS/MND) is required to comply with CEQA.

9.7.1.5 Implementation Schedule

If this project is selected, the implementation schedule for floodplain enhancement and recharge project is presented on Figure 9-7. Components of this project could be implemented separately and may take less time to implement or may be spread out over a longer time horizon.

Task Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Years 7+
Studies/Preliminary Engineering Analysis							
Agreements/ROW							
CEQA							
Permitting							
Design							
Bid/Construct							
Maintenance							

Figure 9-7. Implementation Schedule for Floodplain Enhancement and Recharge

9.7.1.6 Legal Authority

Pursuant to California Water Code § 10726.2 (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some right in real property (whether fee title, easement, license, leasehold or other) may be required to implement the project.

9.7.1.7 Estimated Cost

The cost will depend on the size of the planned enhancement areas in the Subbasin. The current capital cost estimate is $12,596,000, though there may be additional costs for site feasibility studies, such as pilot boreholes to assess recharge capacity, and for dry wells or injection wells if recharge basins lack permeability. If there are no additional costs, the amortized cost of the benefit of additional stored water from this project is estimated at $1,050/AF. This includes only the scoped floodplain enhancement projects and not additional features that may be part of floodplain restoration.

9.7.1.8 Public Noticing

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board in a publicly noticed meeting. This assessment will include:
  - A description of the undesirable result(s) that may occur if action is not taken
  - A description of the proposed project
  - An estimated cost and schedule for the proposed project
  - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.

- After the 30-day public response period, the SVBGSA Board will vote whether to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

In addition to the process detailed above, all projects will follow the public noticing requirements per CEQA or NEPA.

9.7.2 Project C2: CSIP Expansion

This project will increase the size and reach of the CSIP distribution system beyond the current Zone 2B boundary, to provide recycled and diverted river water to additional lands for irrigation and agricultural use. It could expand CSIP into agricultural land in or adjacent to the Langley Subbasin and could reduce the amount of groundwater pumped from the Subbasin.

Enlarging the system’s service area will replace groundwater pumping with recycled or river water in the spring and fall and lessen dependence on existing groundwater wells. The existing CSIP supplies may not be sufficient to meet the summertime demand of the expanded CSIP area without an increase in water supply from the Salinas River Diversion Facility (SRDF) or another source. New water sources other than river water will require additional project costs. If additional water supply sources are available in the summer, the expanded service area could be supplied summer irrigation water. The CSIP Optimization Project (Priority Project 2 in the 180/400-Foot Aquifer Subbasin GSP) must be implemented prior to CSIP expansion due to system constraints.

Two potential CSIP expansion maps have been developed. MCWRA suggested an expansion of approximately 3,500-acre area, proposed in 2011. As proposed, this would not extend into the Langley Subbasin; however, given the lack of a distinct hydraulic barrier between the 180/400-Foot Aquifer Subbasin and the Langley Subbasin, expanding CSIP to land outside of the Langley Subbasin may still have positive impacts on groundwater elevations within the Langley Subbasin. The second expansion map identified approximately 8,500 acres that could be included in the expanded service area and was included in the *Cal-Am Coastal Water Project Draft Environmental Impact Report* (Environmental Science Associates, 2009). The portion of this area that extends into the Langley Area is shown with purple hatching on Figure 9-8. This figure also shows land use and extraction wells over 3 inches in diameter that report pumping to MCWRA. As the land use data on Figure 9-8 shows, there is additional agricultural land in the southwest corner of the Langley Subbasin that could potentially be included if CSIP were expanded into the Subbasin.

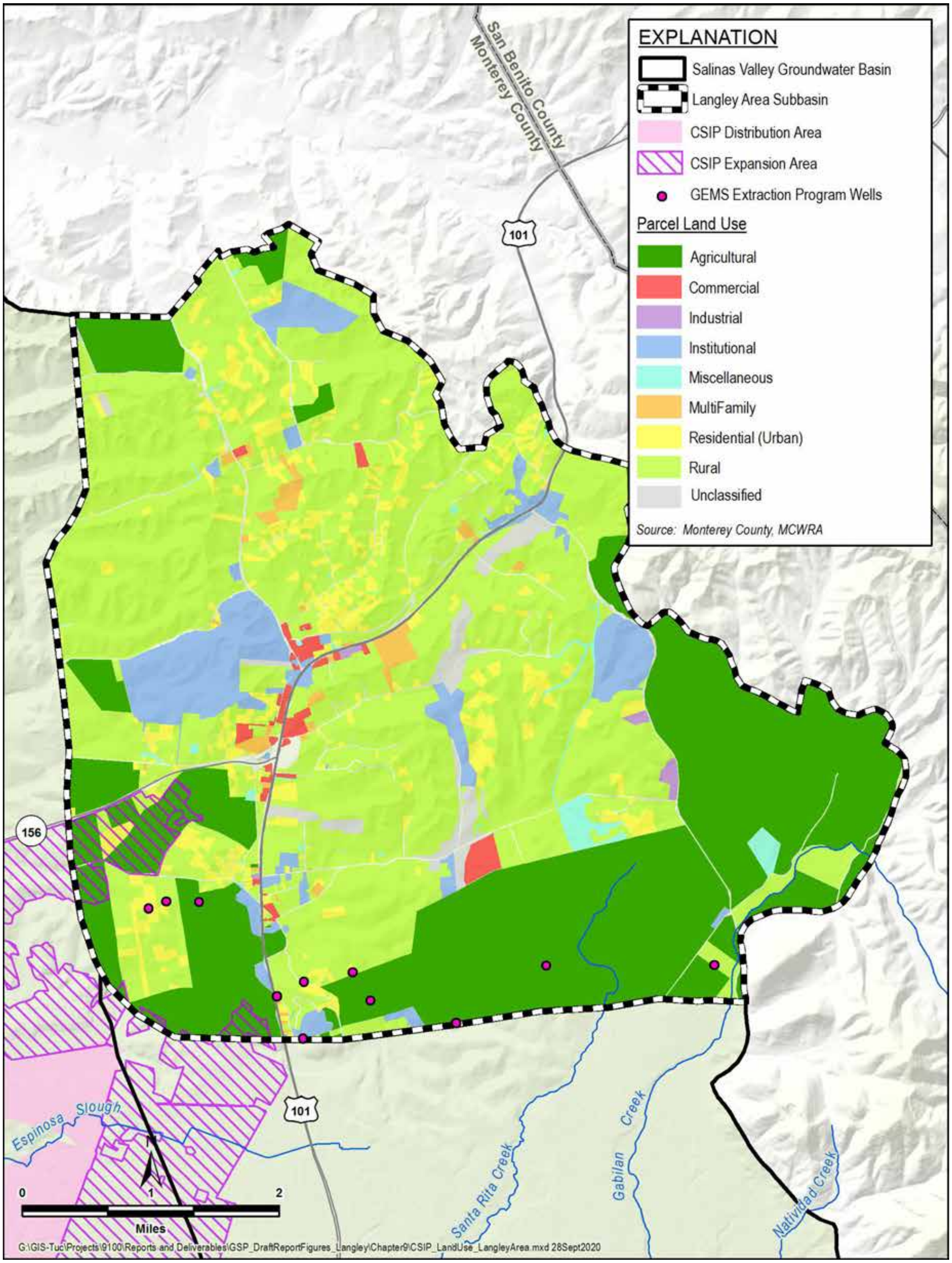


Figure 9-8. Land Use, CSIP Expansion, and GEMS Extraction Wells

9.7.2.1 Relevant Measurable Objectives

The measurable objectives benefiting from outreach and education include:

- **Groundwater elevation measurable objective.** By reducing extraction from the 180-Foot and 400-Foot Aquifers, it will have the effect of more water added to the principal aquifer in the Langley Subbasin as this water will be used in lieu of pumping. Reducing extraction will raise groundwater elevations over time.
- **Groundwater storage measurable objective.** Reducing extraction from the principal aquifer will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective.** Seawater intrusion is occurring in the adjacent 180/400-Foot Aquifer Subbasin where it has advanced inland to within a few miles of the Langley Subbasin. Using recycled water in lieu of groundwater will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.7.2.2 Expected Benefits and Evaluation of Benefits

A 3,500-acre expansion of the CSIP program would be a 29% increase in service area. Assuming 3,500 acres of new farmland are annexed into the system, and with an assumed unit agricultural water demand of 2.8 AF/acre, the expanded area may present an additional demand of 9,900 AF/yr. to offset pumping. The primary benefits from CSIP expansion include the increase in use of recycled water and river diversion water supplies, thus reducing groundwater pumping in the 180/400-Foot Aquifer Subbasin. New water sources other than river water will require additional project costs. This increased demand could be supplied to the new service area during the winter, spring, and fall when excess supply is available to the CSIP system. If additional water supplies are available in the summer, the new service area could also be supplied in the summer. The expanded service area would lessen groundwater pumping in the 180/400-Foot Aquifer Subbasin by an amount equal to the quantity delivered: approximately 9,900 AF/yr. This project will benefit the Langley Subbasin by reducing the impacts of pumping from the neighboring 180/400-Foot Aquifer Subbasin. Model results suggest that this project also reduces seawater intrusion by approximately 2,800 AF/yr. on average.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Groundwater storage will be monitored using groundwater pumping measurements and estimates.

Benefits have not been calculated for the 8,500-acre expansion.

9.7.2.3 Circumstances for Implementation

This project is unlikely to move forward independent of it being implemented in the 180/400-Foot Aquifer Subbasin. If it does move forward, the potential benefits to and expansion into the Langley Subbasin will be evaluated. This project can only be implemented after CSIP optimization, as described in the 180/400-Foot Aquifer Subbasin GSP. After that, source water needs to be identified and the expansion area confirmed through more refined analysis and stakeholder consultation.

For implementation, this project will need an engineer's report, project design, environmental and regulatory compliance (CEQA, EIR), an annexation policy for contiguous versus non-contiguous access lands and rights-of-way, an annexation policy for voluntary versus compulsory inclusion, funding (such as a 218 vote, grants, loans, and assessments), and a review of U.S. Bureau of Reclamation (USBR) loan documents (MCWRA, 2018b). Additionally, there will need to be a negotiation modification of current SVRP and CSIP loan contracts to allow CSIP boundary expansion (MCWRA, 2018b). Throughout all of these major steps, this expansion project will need to work closely with stakeholders to gain consensus (MCWRA, 2018b).

9.7.2.4 Permitting and Regulatory Process

This project will require a CEQA review process, which would likely result in either an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, any project that coordinates with federal facilities or agencies may require NEPA documentation.

There will be a number of local, county, and state permits, rights of way (ROW), and easements required depending on pipeline alignments, stream crossings, and project type. These will depend on the expansion plan, which will be developed during GSP implementation. Projects with wells will require a well construction permit from MCWRA.

Additional permits may be required depending on the source water used.

9.7.2.5 Implementation Schedule

If selected, the annual implementation schedule for CSIP expansion is presented in Figure 9-9.

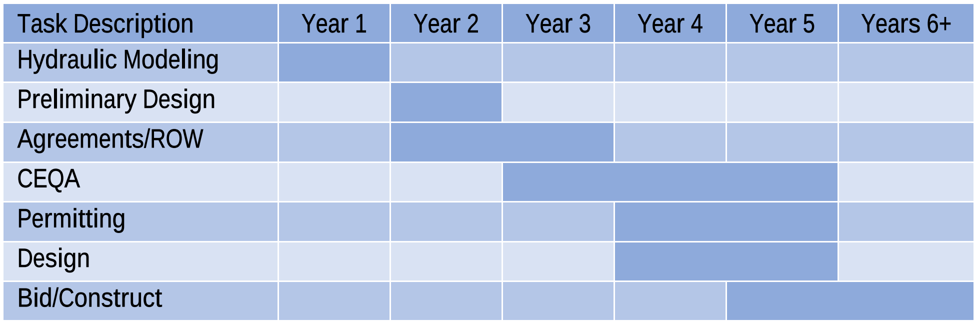


Figure 9-9. Implementation Schedule for CSIP Expansion

9.7.2.6 Legal Authority

The SVBGSA will use the legal authority and partnerships for this modified project contained in existing distribution, irrigation, and partnership programs. Pursuant to California Water Code § 10726.2 (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights.

The MCWRA has the authority, pursuant to the Monterey County Water Resources Act, to levy benefit assessments to fund projects.

The County also has the power to impose charges on a parcel or acreage basis under the County Service Area provisions of the Government Code (beginning with Section 25210). These provisions give the County the authority to provide extended services within a specified area, which may be countywide, and to fix and collect charges for such extended services. Miscellaneous extended service for which county service areas can be established include “water service, including the acquisition, construction, operation, replacement, maintenance, and repair of water supply and distribution systems, including land, easements, rights-ot-way, and water rights.”

9.7.2.7 Estimated Cost

Capital cost for the 3,500-acre CSIP expansion project is estimated at $73,366,000. Annual O&M costs are approximately $480,000. The estimated projected yield for the project is 9,900 AF/yr. The amortized cost of water for this project is estimated at $630/AF.

Cost has not been estimated for 8,500 acres of CSIP expansion. The final size and location of CSIP expansion will be determined through additional hydraulic modeling and engineering that identifies the most cost-effective areas for expansion.

9.7.2.8 Public Noticing

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built. The general steps in the public notice process will include the following:

- SVBGSA staff will bring an assessment of the need for the project to the SVBGSA Board and the MCWRA Board in publicly noticed meetings. This assessment will include:
  - A description of the undesirable result(s) that may occur if action is not taken
  - A description of the proposed project
  - An estimated cost and schedule for the proposed project
  - Any alternatives to the proposed project
- The SVBGSA Board will notify stakeholders in the area of the proposed project and allow at least 30 days for public response.
- After the 30-day public response period, the SVBGSA Board will vote whether or not to approve design and construction of the project and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

The permitting and implementation of the diversion will require notification of stakeholders, beneficiaries, water providers, member lands adjacent to the river, and subbasin committee members. In addition to the public noticing detailed above, all projects will follow the public noticing requirements required by CEQA and other laws or regulations.

9.8 Implementation Actions

Implementation actions include actions that contribute to groundwater management and GSP implementation but do not directly help the Subbasin reach or maintain sustainability. Included here for the Langley Subbasin are well registration, GEMS expansion and enhancement, the dry well notification system, Water Quality Coordination Group, and Land Use Jurisdiction Coordination Program.

9.8.1 Implementation Action D1: Well Registration

All groundwater production wells, including wells used by *de minimis* pumpers, will be required to be registered with the SVBGSA. Well registration is intended to establish a relatively accurate count of all the active wells in the Subbasin. This implementation action will help gain a better understanding of the wells in active use, verses those that have been decommissioned. Well registration will collect information on active wells, such as the type of well meter, depth of well, and screen interval depth. Well metering is intended to improve estimates of the amount of groundwater extracted from the Subbasin. A GSA may not require *de minimis* users (as defined) to meter or otherwise report annual extraction data. Other public agencies such as the County of MCWRA may have such authority. The details of the well registration program, and how it integrates with existing ordinances and requirements, will be developed during the first 2 years of GSP implementation.

9.8.2 Implementation Action D2: GEMS Expansion and Enhancement

SGMA requires GSAs to manage groundwater extractions within a basin's sustainable yield. Accurate extraction data is fundamental to this management. The MCWRA's Groundwater Extraction Monitoring System (GEMS) collects groundwater extraction data from certain areas in the Salinas Valley. The system was enacted in 1993 under Ordinance 3663 and was later modified by Ordinances 3717 and 3718. The MCWRA provides SVBGSA annual GEMS data that can be used for groundwater management.

Most of the Langley Subbasin is outside of MCWRA's GEMS Program, which is only implemented in Zones 2, 2A, and 2B. SVBGSA will work with MCWRA to expand the existing GEMS Program to cover the entire Langley Subbasin, which would capture all wells that have at least a 3-inch internal diameter discharge pipe. Program revisions will consider and not contradict related state regulations. Alternatively, SVBGSA could implement a new groundwater extraction reporting program that collects data outside of Zones 2, 2A, and 2B. The groundwater extraction information will be used to report total annual extractions in the Subbasin and assess progress on the groundwater storage SMC as described in Chapter 8. Additional improvements to the existing MCWRA groundwater extraction reporting system may include some subset of the following:

- Develop a comprehensive database of extraction wells
- Expanding reporting requirements to all areas of the Salinas Valley Groundwater Basin
- Including all wells with a 2-inch discharge or greater
- Requiring automatically reporting flow meters
- Comparing flow meter data to remote sensing data to identify potential errors and irrigation inefficiencies

9.8.3 Implementation Action D3: Dry Well Notification System

The GSA could develop or support the development of a program to assist well owners (domestic or state small and local small water systems) whose wells go dry due to declining groundwater elevations. The program could include a notification system whereby well owners can notify the GSA or relevant partner agency if their well goes dry, such as the Household Water Supply Shortage System (DWR, 2021). The information collected through this portal is intended to inform state and local agencies on drought impacts on household water supplies. It could also include referral to assistance with short-term supply solutions, technical assistance to assess why it went dry, and/or long-term supply solutions. For example, the GSA could set up a trigger system whereby it would convene a working group to assess the groundwater situation if the number of wells that go dry in a specific area cross a specified threshold. A smaller area trigger system would initiate action independent of monitoring related to the groundwater level SMC. The GSA could also support public outreach and education.

9.8.4 Implementation Action D4: Water Quality Coordination Group

The Water Quality Coordination Group will include the CCRWQCB, local agencies and organizations, water providers, domestic well owners, technical experts, and other stakeholders. The purpose of the Coordination Group is to coordinate amongst and between agencies that regulate water quality directly and the GSA, which has an indirect role to monitor water quality and ensure its management does not cause undesirable water quality results.

Numerous agencies at the local and State levels are involved in various aspects of water quality. The SWRCB and CCRWQCBs are the principal state agencies with primary responsibility for the coordination and control of water quality for the health, safety, and welfare of the people of the state pursuant to the Porter-Cologne Water Quality Control Act 1969 (California Water Code Division 7 Section 13001). There are many efforts to address water quality by the SWRCB. For example, at the State level, the Department of Drinking Water's Safe and Affordable Funding for Equity and Resilience (SAFER) program is designed to meet the goal of safe drinking water for all Californians. In addition, at the local level, the County of Monterey Health Department Drinking Water Protection Service is designed to regulate and monitor water systems and tests water quality for new building permits for systems with over 2 connections.

Locally based GSAs established pursuant to SGMA are required to develop and implement GSPs to avoid undesirable results (including an undesirable result related to water quality) and mitigate overdraft in the groundwater basin within 20 years. SVBGSA will coordinate with the appropriate water quality regulatory programs and agencies in the Subbasin to understand and develop a process for determining when groundwater management and extraction are resulting in degraded water quality in the Subbasin.

Both the State and Monterey County have committed to a Human Right to Safe Drinking Water. SGMA outlines a specific role for GSAs related to beneficial users of groundwater including drinking water, which is to manage groundwater according to the 6 sustainability indicators. The Coordination Group will help define the unique role for the GSAs, not related to specific sustainability metrics. Under this implementation action, the GSAs will play a convening role by developing and coordinating a Water Quality Coordination Group.

The Coordination Group will review water quality data, identify data gaps, and coordinate agency communication. The Coordination Group will convene at least annually to share groundwater quality conditions, as assessed for the GSP Annual Reports, and assesses whether groundwater management actions are resulting in unsustainable conditions. The goal of the Coordination Group will include documenting agencies' actions that address water quality concerns including outlining each agency's responsibilities. An annual update to the GSA BOD will be provided regarding Coordination Group efforts and convenings.

This Coordination Group will also serve to collaborate with agencies on local regulation that could affect groundwater contamination, such as county or city groundwater requirements that relate to regulation of septic systems, well drilling, capping and destruction, wellhead protection and storage and/or leaking of hazardous materials.

9.8.5 Implementation Action D5: Land Use Jurisdiction Coordination Program

The Land Use Jurisdiction Coordination Program outlines how the SVBGSA 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. The goal is to ensure that the GSA and Land Use Jurisdiction efforts are aligned. Examples of these activities include the application of the B-8 Zoning district by the County of Monterey in areas with water supply, water quality and other constraints on development, and the consideration of recharge potential for new developments. While the SVBGSA does not have land use authority, and the Land Use Jurisdictions retain all such authority, the Coordination Program also describes how local agencies should consider adopted GSPs when revising or adopting policies, such as adopting and amending general plans and approving land use entitlements, regulations, or criteria, or when issuing orders or determinations, where pertinent. The Coordination Program will be developed immediately upon implementation of this GSP.

9.9 Other Groundwater Management Activities

Although not specifically funded or managed by this GSP, a number of associated groundwater management activities will be promoted and encouraged by the GSAs as part of general good groundwater management practices. If any particular action is scoped further and shown to significantly improve groundwater conditions, SVBGSA may consider implementing it as a project or management action under this GSP.

9.9.1 Continue Urban and Rural Residential Conservation

Existing water conservation measures should be continued, and new water conservation measures promoted for residential users. Conservation measures may include the use of low flow toilet fixtures, or laundry-to-landscape greywater reuse systems. Conservation projects can reduce demand for groundwater pumping, thereby acting as in-lieu recharge.

9.9.2 Promote Stormwater Capture

Stormwater and dry weather runoff capture projects, including Low Impact Development (LID) standards for new or retrofitted construction, should be prioritized and implemented. The Storm Water Resource Plan outlines an implementation strategy to ensure valuable, high-priority projects with multiple benefits (Hunt *et al*., 2019). While not easily quantified and therefore not included as projects in this document, stormwater capture projects may be worthwhile and benefit the basin.

9.9.3 Watershed Protection and Management

Watershed restoration and management can reduce stormwater runoff and improve stormwater recharge into the groundwater basin. While not easily quantified and therefore not included as projects in this document, watershed management activities may be worthwhile and benefit the basin.

9.9.4 Support Reuse and Recharge of Wastewater

Wastewater collection and treatment provides opportunities to use and reuse water in various ways. Each wastewater treatment facility has unique infrastructure with different plans for expansion or upgrades. Potential upgrades could result in greater reliability, improved water quality, the ability to reuse treated wastewater or increase water reuse yields, or increased recharge to groundwater. These upgrades may directly or indirectly affect groundwater conditions.

9.10 Mitigation of Overdraft

As shown in Chapter 6, the Langley Subbasin has historically been in overdraft at the rate of approximately 300 AF/yr., and it is projected to still be in overdraft throughout the GSP planning horizon unless projects and management actions bring extraction in line with the sustainable yield. Based on the water budget components, the GEMS estimated historical sustainable yield of the Subbasin is 500 AF/yr., as summarized in Chapter 6. From 1980 to 2016, the basin was in overdraft for 9 years. The overdraft can be mitigated by reducing pumping or recharging the subbasin, either through direct or in-lieu means. The potential projects and management actions in this chapter are sufficient to mitigate existing overdraft, as presented in Table 9-4. These include potential demand management through pumping allocations to be used if other projects and management actions do not reach sustainability goals and mitigate overdraft. The projects and management actions selected will ensure that the 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.

Table 9-4. Total Potential Water Available for Mitigating Overdraft

Project/ Management Action #	Name	Quantification of Project Benefits
A1	Decentralized Residential In-Lieu Recharge Projects	If 75 households install 5000-gallon rain barrels, up to 4 AF/yr. rainwater harvested, and 1.6 AF/yr. from graywater systems installed by 75 houses
A2	Decentralized Stormwater Recharge	If 1% of the Subbasin is converted from an area of runoff to an area of recharge, 279 AF/yr.
A3	MAR with Overland Flow	400 AF/yr. in groundwater recharge
A4	Surface Water Diversion from Gabilan Creek	On average, 350 AF/yr. of excess streamflow is recharged
B1	Pumping Allocations and Control	Range of potential project benefits

10 GROUNDWATER SUSTAINABILITY PLAN IMPLEMENTATION

This chapter describes how the GSP for the Langley Subbasin will be implemented. The chapter serves as a road map for addressing all of the activities needed for GSP implementation between 2022 and 2042 but focuses on the activities between 2022 and 2027.

Implementing this GSP will require the following formative activities, each of which is detailed in a subsequent subsection:

- Data, monitoring, and reporting
  - Annual monitoring and reporting
  - Updating the DMS
  - Improving monitoring networks
  - Addressing identified data gaps in the HCM
- Continuing communication and stakeholder engagement
- Refining and implementing projects and management actions
- Adapting management with the 5-year Update
- Developing a funding strategy

The implementation plan in this chapter is based on the best available data used to understand groundwater conditions in the Subbasin and the current assessment of projects and management actions described in Chapter 9. The Subbasin's conditions and the details of the projects and actions will likely evolve over time based on future data collection, model development, and input from Subbasin stakeholders.

10.1 Data, Monitoring, and Reporting

Beginning in the first year of GSP implementation, SGMA requires submittal of annual monitoring data and development of an annual report. This annual process tracks groundwater conditions with respect to the SMC established in Chapter 8. The SVBGSA will hire consultant(s), form agreements with agencies, and/or hire staff to implement the monitoring and reporting functions.

Monitoring of the 6 sustainability indicators will begin upon adoption of the GSP. Most of the monitoring networks described in Chapter 7 rely on existing monitoring programs. Only ISW needs the establishment of a new monitoring network. Data from the monitoring programs will be maintained in the DMS and evaluated annually to ensure progress is being made toward sustainability or to identify exceedances of minimum thresholds. SVBGSA will assess monitoring data to prepare annual reports and guide decisions on projects and management actions.

10.1.1 Annual Monitoring and Reporting

SGMA requires completion of annual reports to document Subbasin conditions relative to the SMC presented in Chapter 8. Starting on April 1, 2022, SVBGSA will submit annual reports for the Langley Subbasin to DWR and make them publicly available. The purpose of the reports is to provide monitoring, groundwater extraction, and total water use data to DWR, compare monitoring data to the SMC, and adaptively manage actions and projects implemented to achieve sustainability.

The monitoring of the 6 sustainability indicators is described below. Chapter 7 outlines the data collected through the monitoring programs that will be used to complete annual reports. Where possible, SVBGSA will leverage data collection and analysis completed by MCWRA to avoid duplication of efforts.

10.1.1.1 Groundwater Levels

For groundwater level monitoring, SVBGSA relies on MCWRA's collection of groundwater elevation data and analyzes it to meet SGMA requirements. MCWRA collects groundwater elevation monitoring data under the statewide CASGEM program and their annual, monthly, and August groundwater elevation monitoring programs. The CASGEM system will be replaced by the SGMA groundwater level monitoring program after GSP submission. The new monitoring system will include the 3 existing CASGEM wells and at least 13 additional wells that are already part of MCWRA's monitoring programs. Groundwater monitoring will continue to be conducted by MCWRA, and they will make these data available to the SVBGSA. The GSA will use MCWRA's annual August trough and fall contour maps and develop additional spring contour maps. These contours will be adapted to expand into the entire Langley Subbasin using groundwater elevation data collected from the groundwater level monitoring network and adjacent subbasins. The GSA will also prepare summary tables and figures, compare the data to SMC, and annually upload the data for DWR and to the DMS.

10.1.1.2 Seawater Intrusion

For seawater intrusion, SVBGSA depends on MCWRA's collection and analysis of chloride data from their seawater intrusion monitoring wells. Seawater intrusion currently does not exist in the Langley Subbasin, but its inland progression will be closely followed in the existing monitoring wells in the neighboring 180/400-Foot and Eastside Subbasins. MCWRA will annually produce seawater intrusion contours and make them available to SVBGSA. These contours will be used to compare to SMC.

10.1.1.3 Groundwater Quality

For groundwater quality, SVBGSA relies on state monitoring systems and analyzes it to meet SGMA requirements. SWRCB compiles groundwater quality monitoring data for DDW and ILRP wells in their GAMA groundwater information system. The GSA will annually download these data, analyze exceedances for the COC, prepare summary tables, compare the data to SMC, and upload it to the DMS.

10.1.1.4 Land Subsidence

For land subsidence, SVBGSA relies on data provided by the State and analyzes it to meet SGMA requirements. DWR provides InSAR data that SVBGSA will use to assess land subsidence. InSAR data will be downloaded annually and are provided through DWR's SGMA Data Viewer, if available, and used to create annual change in subsidence maps to compare to SMC in the annual report.

10.1.1.5 Interconnected Surface Water

No entity currently monitors ISW. As described in Chapter 7, the monitoring network for ISW is in the process of development. Shallow groundwater elevations will be used as proxies for depletion rates; thus, shallow wells near the areas of ISW are needed. Monitoring wells will be paired with USGS stream gauges to evaluate groundwater gradient and effects of groundwater levels on surface water depletion. This will also help determine the extent of interconnection. The ISW monitoring wells will be incorporated into MCWRA's existing monitoring network and MCWRA will make these data available to SVBGSA. Water level measurements will be made at least once a year at each ISW monitoring site during MCWRA's annual fall groundwater monitoring event that occurs from mid-November to December. The GSA will annually prepare summary tables and figures and compare the data to SMC.

10.1.1.6 Groundwater Extraction

SVBGSA relies on MCWRA's collection of groundwater extraction data and analyzes it to meet SGMA requirements. Through the GEMS, MCWRA collects groundwater pumping data for agricultural supply wells and public groundwater system wells that have discharge pipes larger than 3 inches within MCWRA Zones 2, 2A and 2B. SVBGSA plans to update and enhance this program, as detailed in Section 10.1.3.3. The GSA will annually use these data to prepare summary tables and figures and compare the data to SMC. Due to the GEMS reporting period and submittal deadlines defined by Monterey County Ordinance No. 3717 and 3718, groundwater extraction reported in the Annual Reports will be lagged by 1 year.

10.1.2 Updating the Data Management System

The SVBGSA has developed a DMS that is used to store, review, and upload data collected from the monitoring programs outlined above, as described in Chapter 7. A web application reporting these data is available on the SVBGSA's website for stakeholders to view the data. The DMS will be updated as new information is collected for annual reports, developed as part of GSP implementation, and provided by stakeholders.

10.1.3 Improving Monitoring Networks

As discussed in Chapter 7, the existing seawater intrusion, groundwater quality, and subsidence monitoring networks already provide sufficient spatial coverage and do not need to be improved.

10.1.3.1 Groundwater Levels

Chapter 7 identifies spatial data gaps in the groundwater level monitoring network due to insufficient coverage throughout the Subbasin. There are 4 general data gaps in the groundwater level monitoring network, shown on Figure 7-2, that would require at least 4 new monitoring wells to fill. To add wells to the monitoring network, SVBGSA will first incorporate existing wells if possible. SVBGSA will contact well owners to gain permission and secure access agreements to incorporate their wells into the groundwater level monitoring network. All candidate existing wells for incorporation into the monitoring network will be inspected to ensure they are adequate for monitoring and to determine depth, perforated intervals, and aquifer designation.

If an existing well cannot be identified, or permission to use data from an existing well cannot be secured to fill a data gap, then a new monitoring well will be drilled and added to the monitoring network. The SVBGSA will obtain required permits and access agreements before drilling new wells. The SVBGSA will retain the services of licensed geologists or engineers and qualified drilling companies for drilling new wells. To the extent possible, the SVBGSA will use grant funds and technical assistance support services through DWR or other entities for new wells. Once drilled, the new wells will be tested as necessary and equipped with dedicated data loggers for monitoring. All new monitoring wells identified as RMS locations will be added to MCWRA's monitoring network for continuity and consistency in data collection.

Additionally, some of the wells in the groundwater level monitoring network are only sampled annually. Thus, SVBGSA will work with MCWRA to update monitoring protocols for these well to be sampled at least twice a year as is required by SGMA. Moreover, for wells in the monitoring network that lack well construction information, SVBGSA will try to address that data gap.

10.1.3.2 Interconnected Surface Water

Depletion of ISW will be monitored through shallow wells adjacent to locations of ISW. There are no existing shallow wells that can be added to the ISW monitoring network. Thus, SVBGSA plans to install a new shallow well along the Gabilan Creek where preliminary model results indicate there is ISW as shown in Figure 4-9. Although Figure 4-9 shows other locations of ISW, only 1 new well will be installed since it can be paired with the nearby USGS gauge on Gabilan Creek within the Eastside Subbasin. The new shallow well will be located in the Eastside Subbasin but will be used to monitor ISW in the Langley Subbasin. The new shallow well will be added to MCWRA's groundwater elevation monitoring program.

10.1.3.3 Groundwater Extraction

Accurate extraction data is necessary to meet the SGMA requirement of reporting annual groundwater extractions. As shown in Figure 3-3, the current GEMS area that includes Zones 2, 2A, and 2B does not provide adequate coverage of the Langley Subbasin. SVBGSA and MCWRA will work together to expand the existing GEMS Program to cover the entire Subbasin and potentially include other program improvements.

10.1.4 Address Identified Data Gaps in the Hydrogeologic Conceptual Model

Chapter 4 identified a few key data gaps related to the HCM. Filling these data gaps would allow the SVBGSA to improve the HCM and thus, the characterization of the Subbasin and the principal aquifer. The data gaps are related to aquifer properties for the Subbasin and the Salinas Valley, and lithologic and hydrostratigraphic data for the Subbasin.

To fill these key data gaps and meet GSP Regulations § 354.14, during early GSP implementation SVBGSA will implement:

- **Aquifer properties assessment.** The values and distribution of aquifer properties throughout the entire Subbasin have not been well characterized and documented. There are very few measured aquifer parameters in the Salinas Valley Groundwater Basin overall. Aquifer properties are important to understanding groundwater flow directions and magnitude within the aquifer. This informs the model with better data, which in turn leads to better model predictions. With better understanding of the aquifer and potential future conditions, SVBGSA and stakeholders will be better equipped to guide the management of water resources throughout the entire Subbasin. To develop better estimates of aquifer properties throughout the multiple geologic formations within the Langley Subbasin, the SVBGSA will identify up to 4 wells in the Langley Subbasin for aquifer testing. Each well test will last a minimum of 8 hours and will be followed by a 4-hour monitored recovery period. Wells for testing will be identified using the following criteria:

- Wells are owned by willing well owners
- Wells have known well completion information
- Wellheads are completed such that water elevations in wells can be monitored with data loggers
- Wells are equipped with accurate flow meters
- Wells have area for discharge of test water
- Preferred wells will have nearby wells that can be monitored during the test

- **Lithologic and hydrostratigraphic data collection.** Lithologic data such as sediment composition and formation designation, as well as hydrologic data such as groundwater elevations and depth-specific water chemistry can be collected during drilling activities. Additionally, more hydrologic data can be collected during well development and well testing. Filling these data gaps would be especially helpful in the Langley Subbasin because there are not many groundwater elevation monitoring wells. These data will improve the understanding of the aquifer properties and potential groundwater-surface water relationships. Furthermore, currently available well completion reports often lack the detail needed to map the extent of the underlying layer of granite that is considered the bottom of the aquifer system in the Langley Area. Gathering and interpreting more lithologic and hydrostratigraphic data will not only help characterize and map the lateral and vertical extent of the principal aquifer with greater resolution, but also the associated aquifer characteristics for improved understanding of groundwater flow. These data will inform SVBGSA and stakeholders for future development location decisions, injection, or recharge project locations, as well as overall groundwater management directions to use the aquifer sustainably under all climatic and future development conditions. Many stakeholders have discussed the importance of data for their decisions throughout the GSP development process; acquiring these data will improve all future GSP updates and subsequent implementation activities.

10.2 Communication and Engagement

The SVBGSA will routinely report information to the public about GSP implementation and progress towards sustainability and the need to use groundwater efficiently. The SVBGSA website will be maintained as a communication tool for posting data, reports, and meeting information. This website features a link to an interactive mapping function for viewing Salinas Valley Groundwater Basin-wide data that were used during GSP development.

- **GSP Implementation – Data, Monitoring, and Reporting:** During GSP implementation, SVBGSA will engage in technical collaboration with partner agencies and stakeholders on data collection and analysis. Correspondingly, it will report out on findings to stakeholders through a variety of engagement strategies and pathways, including but not limited to:

- o Annual Report presentations to Subbasin Committees, Advisory Committee and Board of Directors
- o FAQs
- o Online communications, including SVBGSA website and Facebook page and direct emails
- o Mailings to most-impacted water users and residents
- o Media coverage
- o Talks and presentations to interested stakeholders, agencies, and groups

This collaboration and outreach will be done on an annual basis as data are analyzed for the annual report. Additional outreach will occur more frequently depending on the data collection and analysis undertaken and its relevance for projects, management actions, and other implementation activities.

- **GSP Implementation – Projects and Management Actions:** SVBGSA will engage in outreach, communication, and engagement as part of its efforts to reach and maintain sustainability through undertaking projects and management actions. This will include engagement of stakeholders and other decision-making processes, such as the Langley Subbasin Committee, the Integrated Implementation Committee, the Advisory Committee, and the Board of Directors. It will also involve outreach to interested and potentially affected stakeholders through engagement strategies such as:
  - o FAQs
  - o Online communications
  - o Mailings to most-impacted water users and residents
  - o Co-promotional opportunities with partner entities
  - o Talks and presentations to interested stakeholders, agencies, and groups
- **Engagement in Governance and Partnerships:** In addition to Subbasin-specific processes, SVBGSA will continue to pursue multiple means of engagement in governance and partnerships that directly or indirectly affect the Langley Subbasin. These include:
  - o Valley-wide – The Integrated Implementation Committee will consolidate the needs of all Salinas Valley subbasins and create an integrated approach to groundwater management throughout the Salinas Valley.

- Other agencies – In close collaboration with MCWRA, SVBGSA will work with other local, state, and federal agencies, to meet the Forebay Subbasin sustainability goals as detailed in this GSP. This includes working with the CCRWQCB, Monterey County Health Department, and other agencies on water quality, and the National Marine Fisheries Services on protection of steelhead trout.

- **General Outreach on Groundwater:** SVBGSA will further pursue outreach in order to ensure stakeholders and interested or affected users are aware of SVBGSA efforts, as well as promote broader awareness of groundwater conditions and management. It will do this through means such as:
  - Offer public informational sessions and subject-matter workshops and if possible, provide online access via Facebook Live or via Zoom
  - SVBGSA Web Map
  - FAQs
  - Online communications
  - Media coverage
  - Promote/Celebrate National Groundwater Week
  - Educational materials available through mailers or at public events

- **Underrepresented Communities:** SVBGSA acknowledges that URCs have little or no representation in water management and have often been disproportionately less represented in public policy decision making. SVBGSA will engage more constructively with URCs, including activities such as to:
  - Conduct workshops with specific partners on the importance of water and groundwater sustainability
  - Identify URCs concerns and needs for engagement, as well as URCs' specific engagement strategies
  - Plan listening sessions around GSA milestones
  - Coordinate with partner organizations to develop a resource hub where people can go for support
  - Identify community allies in groundwater engagement work and bring down barriers for participation
  - Consider particular URCs impacts during routine GSA proceedings
  - Convene a partnership group on domestic water, including URCs with partner entities

10.3 Road Map for Refining and Implementing Projects and Management Actions

The projects and management actions identified in Chapter 9 are sufficient for reaching and maintaining sustainability in the Langley Subbasin. They will be integrated with projects for the other Salinas Valley subbasins during GSP implementation. The projects and management actions described in this plan have been identified as beneficial for the Langley Subbasin. The impacts of projects and management actions on other subbasins will be analyzed and taken into consideration as part of the project selection process. In addition, SVBGSA will consider the human right to water and will assess the potential impacts of projects and management actions on water quality in nearby domestic wells and other wells supplying drinking water systems. The SVBGSA Board of Directors will approve projects and management actions that are selected to move forward. These projects assume continued operation of current infrastructure. If conditions change, such as other projects being undertaken that are outside of this GSP, SVBGSA will adapt its approach to reaching and maintaining sustainability, including the projects and management actions considered.

This section outlines a road map to refining and implementing projects and management actions. It organizes the steps SVBGSA will undertake with respect to Langley projects and management actions and the contingency of certain actions.

1. **Implementation Actions**

   Data collection and analysis are critical for the implementation of the Langley Subbasin GSP. These actions, as highlighted in the sections above, are a top priority to be able to better understand the groundwater conditions and necessity of projects and management actions. Along with the expansion of monitoring networks, including updating and enhancing GEMS to improve the collection of extraction data, SVBGSA will develop a well registration program to gain more information on active wells, especially *de minimis* users. In addition, it will begin standing up the Dry Well Notification System within the first 2 years of GSP implementation, which will assist well owners whose access could be jeopardized if groundwater elevations decline. SVBGSA plans to undertake the development of actions within the first 2 years after GSP submittal, and fully implement them through years 3 and 4 through actively reaching out to well owners, visiting and checking wells, and inputting data.

   The Water Quality Coordination Group is also a critical implementation action to coordinate with other agencies that have responsibilities affecting domestic water quality and access. After undertaking preliminary planning work, SVBGSA plans to establish the Coordination Group in the first 2 years after implementation.

2. **Direct Recharge Projects**

   The 2 main direct recharge projects that could help the Langley Area maintain groundwater levels are stormwater recharge projects and MAR of overland flow. These have the greatest potential of generating groundwater benefits at a reasonable cost. SVBGSA will work with agencies and organizations already engaged in similar efforts.

   During the first 2 years of GSP implementation, SVBGSA will actively evaluate opportunities for stormwater recharge and overland flow MAR projects. It will identify general locations that have the highest recharge potential and reach out to landowners, developers, neighborhood groups, and local jurisdictions. These locations will have high recharge capacities and may be areas prone to flooding or that receive high amounts of runoff. Scoping will also look at the potential size of projects; smaller projects may still have aggregate benefits to the groundwater system. These projects are currently scoped as projects that SVBGSA will help identify and encourage, but that individual landowners or partners would implement. As part of encouraging these projects, SVBGSA may assist with feasibility studies, undertake potential site analyses with cone penetration tests (push tests), design recharge basins, and assist with securing grant funding. After the initial phase of pilot projects, SVBGSA may expand outreach and develop a more defined program in years 3 and 4. To implement recharge basins for MAR of overland flow at multiple sites, SVBGSA may evaluate and potentially pursue a programmatic permit to facilitate greater implementation of recharge projects. Whether water rights would need amending should be considered in site selection and considered in the project timeline. After implementation, monitoring and maintenance needs to be undertaken.

3. **Demand Management**

   Demand-side management could be an important tool in the Langley Subbasin given the limited project opportunities and potentially local effects of recharge. After focusing on expanding data collection over the first 2 years, which is needed to form the basis for managing extraction, in years 3 and 4 SVBGSA will work with stakeholders to develop an allocation structure and trigger for enacting pumping controls. Pumping controls may not be necessary immediately, but rather only used when groundwater conditions warrant it. This may include declining groundwater elevations where elevations do not rebound in wet years or multiple years of groundwater extraction above the sustainable yield. As part of undertaking these actions, SVBGSA will conduct extensive outreach to stakeholders and analyze the site-specific potential benefit of pumping controls. Voluntary fallowing or agricultural land retirement may be considered where there is potential land and willing landowners in areas there are declining groundwater elevations.

4. **Other Projects**

   The remaining projects are more expensive, have uncertain or limited groundwater benefits, or rely on others initiating the projects. Therefore, these projects will not be implemented immediately, but rather will move forward only if conditions warrant it or other subbasins initiate implementation of them. This includes residential in-lieu recharge projects, Gabilan Stream Diversion, CSIP expansion, and Eastside floodplain enhancement and recharge.

   The implementation of all projects and management actions will be a dynamic, adaptive process. Refinement of the projects and actions will occur simultaneously with adjustment of the funding mechanism that supports the projects and actions. A start-up budget, provided below, covers required actions such as data monitoring and reporting, and initial funds for selecting and scoping projects and management actions that would need to occur prior to financing a project. Projects and management actions will be approved by the Board of Directors and will be implemented in a coordinated manner across the entire Salinas Valley.

10.4 Five-Year Update

SGMA requires the development of 5-year GSP assessment reports, starting in 2027. The 5-year update will assess whether the GSA is achieving the sustainability goal in the Subbasin. The assessment will include a description of significant new information that has been made available since GSP submittal, whether any new information warrants changes to any aspect of the plan, and how the GSP will be adapted accordingly.

The 5-year update will include updating the SVIHM and SVOM with newly collected data and updating model scenarios to reflect both the additional data and refinements in project design or assumptions. It will also include a reevaluation of climate change to ensure assumptions in the GSP are still valid.

SVBGSA will engage stakeholders in the development of the 5-year update. In contrast to the annual reports, which share monitoring data and progress related to the SMC, the 5-year update will involve a more systemic reevaluation of the SMC minimum thresholds and measurable results, as well as report on progress meeting the interim milestones.

10.5 Start-up Budget and Funding Strategy

10.5.1 SVBGSA Operational Fee

SVBGSA established a valley-wide Operational Fee to fund the typical annual operational costs of its regulatory program authorized by SGMA, including regulatory activities of management groundwater to sustainability (such as GSP development), day-to-day administrative operations costs, and prudent reserves. The Operational Fee funds GSA operational costs, and therefore covers any tasks undertaken by staff, such as planning, technical review, partnership development, communication, stakeholder engagement, and support for the selection, development, and implementation of projects and management actions. The fee is a regulatory fee with the purpose of ensuring that ground water use is managed sustainably so that adequate supplies remain for all users. The Operational Fee is also used as local cost share for grants.

The Operational Fee is based on the 2018 Regulatory Fee Study (Hansford Economic Consulting, 2019) commissioned by SVBGSA. The SVBGSA has the authority to charge fees, as set forth in the California Water Code § 10730, 10730.1, and 10730.2. The Operational Fee is a regulatory fee authorized under California Water Code § 10730 and is exempt from voter approval, as it is not a tax pursuant to California Constitution Article XIIIC (Proposition 26, § 1(e)(3)). As the fee must be proportional and related to the benefits of the program, this study analyzed options and proposed a regulatory fee structure whereby agricultural beneficiaries are responsible for 90% of the cost and all other beneficiaries are responsible for 10% of the cost. The SVBGSA Board of Directors approved this fee in March 2019.

The Langley Subbasin urban and agricultural groundwater are charged the Operational Fee by domestic connection or irrigated acreage by land use code. The Operational Fee funds Valley-wide activities, including initial GSP development; however, additional funding is needed for meeting future requirements, GSP implementation, and projects and management actions.

10.5.2 Start-up Budget

Table 10-1 summarizes the conceptual planning-level costs for the initial 5 years of GSP implementation for the Langley Subbasin. This table does not include the Valley-wide costs for routine administrative operations and other Valley-wide costs funded through the SVBGSA operational fee outlined in Section 10.5.1. The Subbasin specific costs, shown on Table 10-1 include data collection and analysis beyond tasks already undertaken by other agencies. These tasks could be undertaken by staff, consultants, or partner agencies. The costs comprise of annual analysis and reporting of sustainability conditions; improvements to the monitoring networks, including installation of 5 new monitor wells; and supplemental hydrogeologic investigations to address data gaps.

The start-up budget includes implementation actions envisioned to occur within the first 5 years of GSP implementation. It does not include funding for development or implementation of projects and management actions; however, does include some funding for refinement and selection of projects and management actions. When projects and management actions move forward with implementation, they will require additional funding for project feasibility and design studies, environmental permitting, and landowner outreach. These are initial estimates of costs and will likely change as more data become available.

These costs are independent of fees currently collected by MCWRA; SVBGSA will aim to not duplicate fees already being collected by MCWRA.

For components of this GSP being developed in coordination with other GSPs in the Salinas Valley, the establishment costs are split between subbasins, and initial implementation costs are estimated based on the direct costs to the Langley Subbasin. These are initial estimates; however, the final cost and division between subbasins will be reviewed and revised as necessary prior to implementation and per approval of the SVBGSA Board.

Table 10-1. Langley Area Subbasin Specific Estimated Planning-Level Costs for First 5 Years of Implementation

Activity	Estimated Annual Cost	Total Cost for 5 years or Lump Sum	Assumptions
Required Compliance Activities: Data, Monitoring, and Reporting		*$838,000*	
Annual Monitoring and Reporting	$50,000	$250,000	
Updating the Data Management System	$3,000	$15,000	Valley-wide cost split equally between subbasins; includes hosting fee and updating information
Improving Monitoring Networks		$342,000	
Install up to 4 wells for groundwater elevation monitoring		$200,000	
Development of GEMS expansion ordinance		$7,000	Valley-wide cost split equally between subbasins; includes hosting fee and updating information
Implementation of GEMS expansion		$100,000	Estimate for implementation in the Langley Area
Install up to 1 shallow wells for monitoring ISW		$15,000	
Additional groundwater level monitoring	$4,000	$20,000	
Addressing Identified Data Gaps in the HCM – Aquifer Properties Assessment		$21,000	For 4 aquifer properties tests
Coordination with MCWRA		$10,000	Setting up a shared system; MCWRA time
Required 5-year Update		$200,000	
SVIHM and SVOM update (gathering data, getting it into model)		$9,000	
Reevaluate climate change		$2,000	Valley-wide cost split equally between subbasins; includes evaluating extent to which previous estimates of climate change are still valid
Update model scenarios		$14,000	
Stakeholder engagement		$50,000	
Analysis and report-writing		$125,000	
Refine and Implement Projects, Management Actions, and Implementation Actions		*$100,000*	Depends on projects and management actions pursued; Could be grant or project match
Engineering feasibility studies and project design			
Permitting and environmental review			
Cost-benefit analyses			
Total		$938,000	

10.5.3 Funding for Projects and Management Actions

The start-up budget does not include funding for specific projects and management actions. Projects and management actions implemented by other agencies and organizations that contribute to groundwater sustainability will follow the funding strategies developed by those respective agencies and organizations. For projects funded by SVBGSA or funding SVBGSA raises to contribute to the implementation of projects, SVBGSA will evaluate the most appropriate funding mechanisms and engage stakeholders and the Board of Directors in this analysis. These include:

- **Grant funding.** SVBGSA will pursue grants to the extent possible to fund projects and management actions.
- **Contributions from local jurisdictions, partner agencies, organizations, and companies.** Where appropriate, SVBGSA will work with partners to solicit contributions to jointly implement a project or management action.
- **Benefit assessment (Proposition 218 vote).** For projects with considerable capital cost or that benefit multiple subbasins, SVBGSA will consider holding a 218 vote to levy an assessment based upon the special benefits conferred from a specific project. Before doing so, SVBGSA will undertake an analysis to identify the special benefit of the conferred project, the cost of the benefit, the zone of benefit, and method of calculating the assessments to be levied. This requires a public hearing and is subject to a majority protest.
- **Fee.** Fees may be collected for a variety of purposes, such as funding a regulatory program or providing a product or service. Fees are not subject to a vote or protest proceeding, but they cannot exceed the cost of running the program or providing the product or service. Some regulatory programs need to be implemented via ordinance.
- **Fines and Penalties.** With the establishment of an ordinance, SVBGSA has the authority to impose fines and penalties, such as may be associated with a regulatory program. Imposition of a fine or penalty must provide due process, usually a hearing after notice/citation and before assessment of the fine or penalty, and funds must be put back into the program.
- **Special tax.** SVBGSA has the authority to levy a special tax for a specific purpose, such as a parcel tax or some sales tax components. This requires a two-thirds vote of the electorate.

SVBGSA acknowledges that the costs associated with projects and management actions will need to be funded through mechanisms such as these. It will work with funding agencies and local partners to do so.

10.6 Implementation Schedule and Adaptive Management

The SVBGSA oversees all or part of 6 subbasins in the Salinas Valley Groundwater Basin. Implementing the Langley Subbasin GSP must be integrated with the implementation of the 5 other GSPs in the Salinas Valley. The implementation schedule reflects the significant integration and coordination needed to implement all 6 GSPs in a unified manner.

A general schedule showing the major tasks and estimated timeline during the first 5 years of GSP implementation is provided on Figure 10-1. This includes the 6 main sets of tasks and DWR's review and approval process. For projects and management actions, implementation will begin with implementation actions, recharge projects, and pumping allocations and controls. Projects and management actions will be revisited and adjusted as needed throughout GSP implementation. Implementation of this GSP will rely on best available science and will be continually updated as new data and analyses are available.

SVBGSA will adaptively manage groundwater and the implementation of the GSP. The work of SVBGSA and stakeholders to complete this GSP provides a solid base to guide groundwater management; however, certain conditions may provide the need to adapt and change management as envisioned in this plan. For example, if existing conditions change, such as a prolonged drought that affects groundwater conditions, or additional funding for specific projects becomes available, SVBGSA may adapt its management strategy. If that occurs, SVBGSA will work through an open and transparent process with stakeholders, partner agencies, and DWR to ensure it continues to meet regulatory requirements and reaches sustainability.

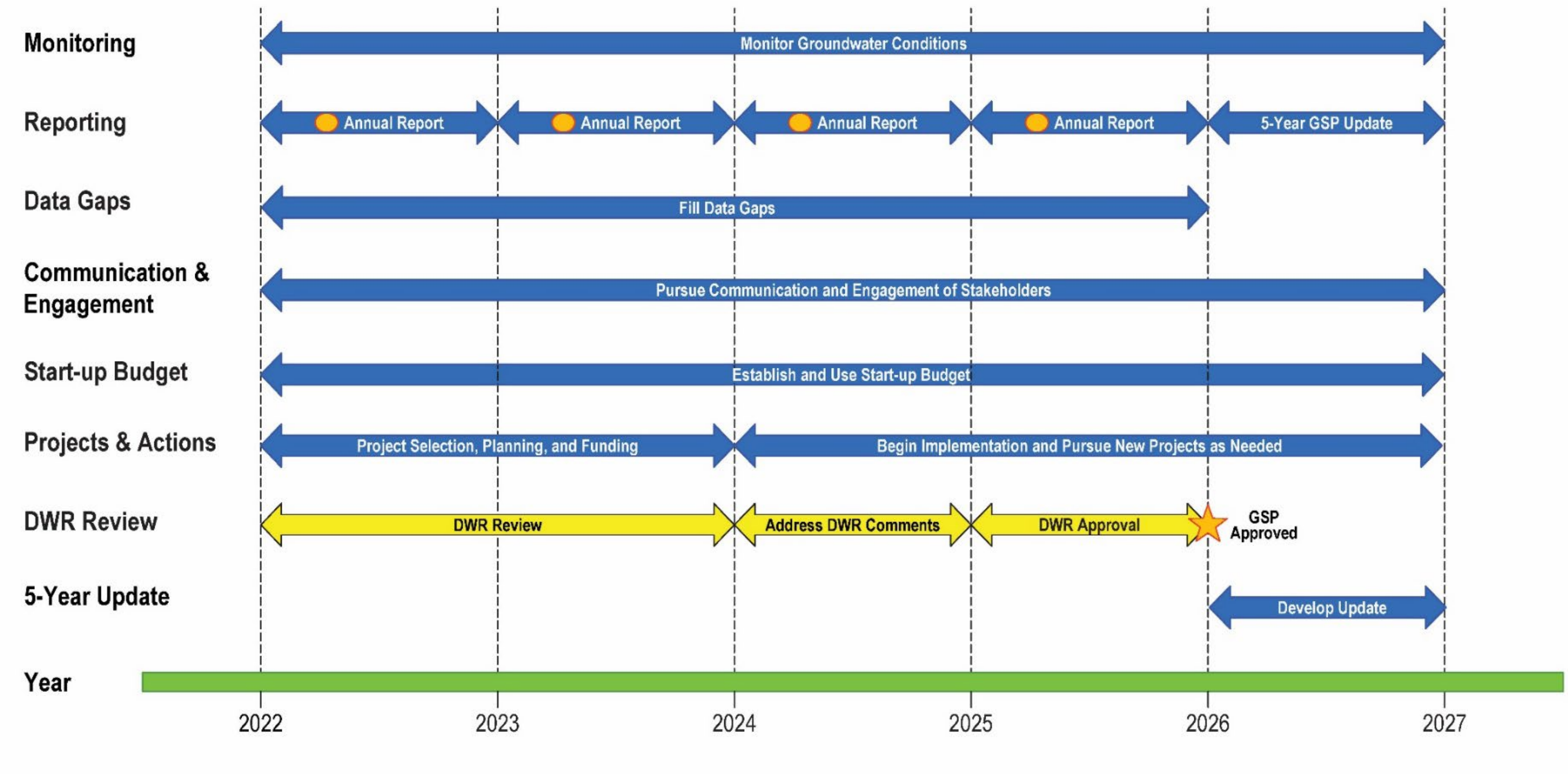


Figure 10-1. General Schedule of 5-Year Start-Up Plan

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