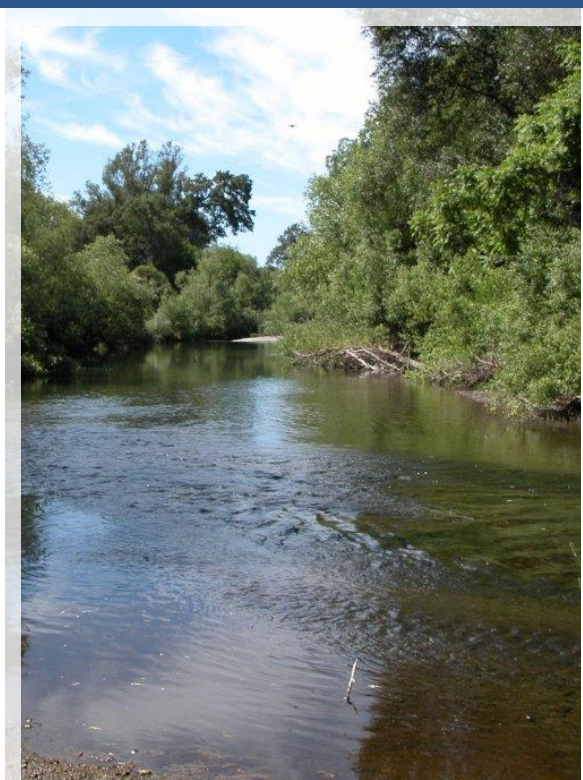
EXECUTIVE SUMMARY

NAPA VALLEY SUBBASIN

GROUNDWATER SUSTAINABILITY PLAN

Draft November 2021



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GROUNDWATER SUSTAINABILITY PLAN

ACKNOWLEDGMENTS

The Napa County Groundwater Sustainability Agency gratefully acknowledges the funding contribution from the California Department of Water Resources. Funding for this project has been provided in part from the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018 (Proposition 68) and through an agreement with the State Department of Water Resources.

NAPA COUNTY GROUNDWATER SUSTAINABILITY AGENCY BOARD OF DIRECTORS

Brad Wagenknecht
Diane Dillon
Belia Ramos
Ryan Gregory
Alfredo Pedroza

GROUNDWATER SUSTAINABILITY PLAN ADVISORY COMMITTEE MEMBERS

The Napa County Groundwater Sustainability Plan Advisory Committee (GSPAC) was established in June 2020 to act as advisors for the Napa Valley Subbasin Groundwater Sustainability Plan (GSP) and is made up of those persons representing various beneficial users and uses of groundwater in the Subbasin. The GSPAC provided general input, review of draft GSP content, defined sustainable management criteria, and provided input on next steps for GSP implementation. The Napa County Groundwater Sustainability Agency appreciates the contributions of the 25 members listed below:

Connor Bennett, Public Water Systems
Michelle Benvenuto, Agricultural Groundwater Users
Garrett Buckland, Agricultural Groundwater Users
Michael Dooley, Environmental Water Users
Joy Eldredge, City of Napa
Geoff Ellsworth, City of St. Helena
John Ferons, Town of Yountville
Dave Ficeli, At Large
Eric Fitz, Public Water Systems
Alan Galbraith, At Large
David Graves, Napa Sanitation District
Mike Hackett, Surface Water Right Holders
Jeri Hansen, Agricultural Groundwater Users
Lester Hardy, At Large
Jim Lincoln, At large
Amber Manfree, Environmental Water Users
Beth Milliken, Agricultural Groundwater Users
Peter Nissen, Overlying Groundwater Right Holders
Derek Rayner, City of Calistoga
Chris Sauer, Environmental Water Users
Patrick Tokar, Overlying Groundwater Right Holders
Suzanne Von Rosenberg, Environmental Water Users
Paul Warnock, At Large
Johnnie White, Agricultural Groundwater Users
Robert Zlomke, Environmental Water Users

MEMBER AGENCY STAFF

David Morrison
Jamison Crosby
Chris Apallas
Jeff Sharp (emeritus)

PLANNING, TECHNICAL, AND FACILITATION SUPPORT

CONCUR, Inc. Facilitation: Scott McCreary, Debbie Schechter, Robert Twiss
One-Water Hydrologic: Randy Hanson
David's Engineering

Luhdorff & Scalmanini Consulting Engineers performed modeling, planning, and other technical support for the Napa County Groundwater Sustainability Agency in addition to composing the Napa Valley Subbasin Groundwater Sustainability Plan.

On behalf of the Napa County Groundwater Sustainability Agency, thank you to all of the community members who participated in public meetings, information sessions, and various outreach events. Your input was vital to shaping this Plan.

NAPA VALLEY SUBBASIN GSP OVERVIEW

ES 1.

Introduction (Section 1)

Section 1 introduces the Napa Valley Subbasin, the purpose and background of the Groundwater Sustainability Plan (GSP), and the Napa County Groundwater Sustainability Agency and its management structure and authorities granted under the Sustainable Groundwater Management Act.

ES 2.

Plan Area (Section 2)

Section 2 describes the geographic and existing jurisdictional areas covered by the GSP and provides an inventory of the existing production wells within the Napa Valley Subbasin.

ES 3.

Water Resource and Land Use Monitoring and Management Programs (Section 3)

Section 3 describes existing water resource monitoring and management programs in the Napa Valley Subbasin as well as the existing general plans and land use plans. Section 3 also details the beneficial uses and users of groundwater in the Subbasin, the notice, communication, and decision-making process of the GSA, and additional GSP elements relating to groundwater management and coordination.

ES 4.

Basin Setting (Section 4)

Section 4 details the geologic setting and the hydrogeologic conceptual model of the Napa Valley Subbasin.

ES 5.

Monitoring Network and Program (Section 5)

Section 5 describes the existing monitoring networks within the Napa Valley Subbasin, the goals and requirements of each network, corresponding monitoring protocols, and an assessment of data gaps and proposed actions to address identified data gaps.

ES 6.

Groundwater and Surface Water Conditions (Section 6)

Section 6 describes the historical and current groundwater and surface water conditions of the Napa Valley Subbasin.

ES 7.

Historical, Current, and Projected Water Supply and Demand (Section 7)

Section 7 describes historical, current, and 50-year projected conditions within the Napa Valley Subbasin relating to land use, population, and water supplies by source and usage according to water use sector.

ES 8.

Water Budget (Section 8)

Section 8 describes the historical, current, and projected water budgets for the Napa Valley Subbasin, including consideration of future land use and climate change for the 50-year future planning and implementation horizon.

ES 9.

Sustainable Management Criteria (Section 9)

Section 9 details sustainable management criteria for the Subbasin, including: the sustainability goal, undesirable results, minimum thresholds, measurable objectives, interim milestones, and the representative monitoring networks for six sustainability indicators.

ES 10.

Monitoring Data Management and Reporting (Section 10)

Section 10 describes the data management system for reporting on and tracking GSP development and implementation and the annual and five-year reporting requirements.

ES 11.

Projects and Management Actions (Section 11)

Section 11 describes planned and potential projects and management actions, which can be implemented as needed to avoid undesirable results, to achieve the Subbasin sustainability goal.

ES 12.

Plan Implementation (Section 12)

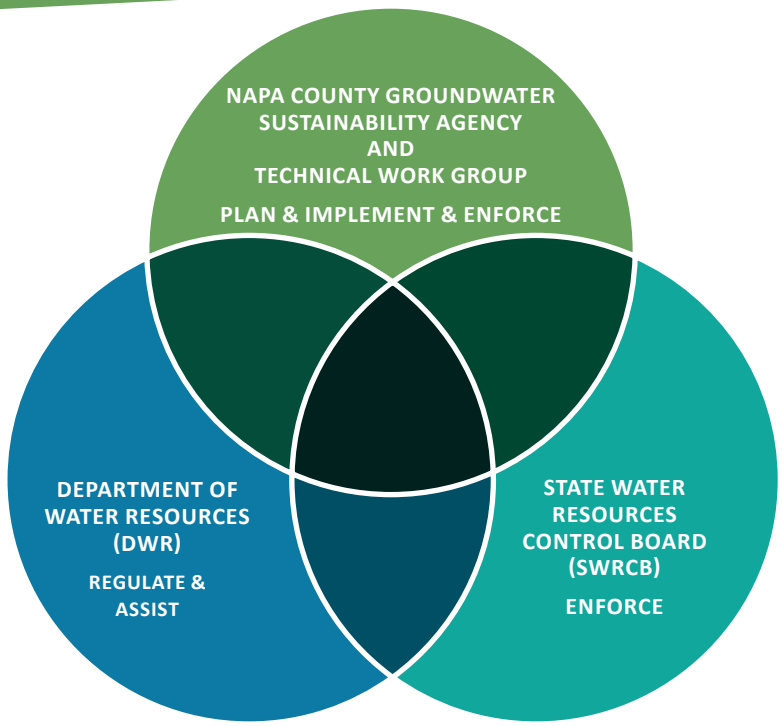
Section 12 presents the activities needed to implement the Napa Valley Subbasin GSP for the first five years, including estimated costs and schedule.

ES 1. INTRODUCTION (SECTION 1)

Sustainable Groundwater Management Act: Background

In September 2014, Governor Jerry Brown signed the Sustainable Groundwater Management Act (SGMA), a three-bill legislative package now codified in Section 10720 et seq. of the California Water Code. Effective in California on January 1, 2015, SGMA provides a framework for the sustainable management of groundwater resources.

SGMA encourages groundwater management at the local level. Local agencies form groundwater sustainability agencies (GSAs) to develop and implement GSPs to guide sustainable management of state-defined groundwater basins. The Napa County Groundwater Sustainability Agency (NCGSA, or GSA) was created in December 2019 to manage groundwater resources consistent with SGMA for the Napa Valley Subbasin.



▲ **Working with state agencies, GSAs develop and implement plans to sustain their groundwater resources.**

The purpose of the GSP is to provide a detailed road map for the Napa Valley Subbasin to achieve and maintain long-term sustainability. The GSP development process primarily included:

- **Characterizing groundwater conditions, identifying data gaps and levels of uncertainty, and developing tools to improve data collection**
- **Integrating adaptive management approaches as part of GSP implementation, including triggers and initial proactive analyses of monitoring data to ensure responses to changed or changing groundwater conditions are timely and next steps are implemented**
- **Developing water budgets, sustainable yield estimates, and defining sustainable management criteria including measurable objectives, minimum thresholds, and undesirable results**
- **Establishing projects and management actions to achieve and maintain sustainability and avoid undesirable results**
- **Assembling a Technical Work Group following GSP adoption to serve as an ongoing advisory group to the NCGSA. Qualified technical members would receive monitoring data and initial analyses on a schedule that provides for timely input from and vetting by the Work Group, support the identification of data gaps and measures to address data gaps and recommend projects and management actions as needed**

Section 1 provides an overview of the Napa Valley Subbasin and GSP organization per the California Code of Regulation (CCR) requirements. (§354, §354.2, §354.6, §354.24)

Napa County Groundwater Sustainability Agency

As the exclusive GSA for the Napa Valley Subbasin, the NCGSA is required to adopt a GSP for the Subbasin and begin GSP implementation by January 31, 2022.

When the NCGSA was formed, the County "committed to sustainable management of its groundwater resources" (December 17, 2019 Resolution). The County also resolved to comply with SGMA and DWR requirements. The work to develop the GSP embodies that commitment and includes the following implementation objectives:

- GSP implementation begins when the GSP is adopted by the NCGSA.
- The GSP is a living, dynamic document to be used to monitor, track groundwater conditions, identify data gaps, address data gaps, and implement projects and management actions as needed to achieve the Napa Valley Subbasin sustainability goal.
- Adaptive management approaches will be used during GSP implementation, including forward looking monitoring, assessment, model refinement, reporting, and renewed evaluation of sustainable management criteria and effectiveness of projects and management actions.
- Upon GSP adoption, GSA staff will commence the process of forming a Technical Work Group with appropriate qualifications to assume the responsibility and the timely opportunity to advise the NCGSA. The Technical Work Group (recommended and unanimously approved by the GSPAC at their meeting on November 8, 2021) will be involved with implementation of the GSP, and include, among other things, a focus on data gaps and adaptive management.
- The GSP identifies data gap areas, such as additional monitoring and model refinement needs, and also provides preliminary information on the means to address data gaps. These will be prioritized and, in coordination with the Technical Work Group and recommendations to the NCGSA, acted upon in a timely manner.
- An overarching aspect of GSP implementation and adaptive management is stakeholder engagement. Stakeholder input will continue to be an essential component of informed analysis of new data, approaches, and recommendations to communicate to the NCGSA for resource management actions to ensure sustainability.
- The GSP must consider the interests of all beneficial uses and users of groundwater, and encourage involvement of diverse social, cultural, and economic elements of the population within the Subbasin during GSP preparation and implementation.

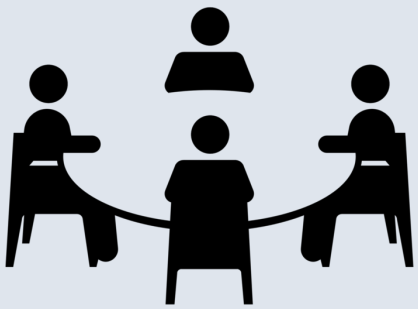
GROUNDWATER SUSTAINABILITY PLAN ADVISORY COMMITTEE

The Groundwater Sustainability Plan Advisory Committee (GSPAC) was formed in June 2020 to advise the GSA Board of Directors on the preparation of the GSP with policies and recommendations to manage and ensure the long-term protection and availability of groundwater resources within the Napa Valley Subbasin. The GSPAC was comprised of 25 diverse community members representing beneficial uses and users for a wide array of community, economic, agricultural, and environmental interests from diverse geographies within the Subbasin.

The GSPAC members shared the NCGSA's goal for developing a GSP that complies with SGMA and GSP regulations. The GSPAC also shares the NCGSA's commitment to sustainable management of groundwater resources. The GSPAC met monthly, held additional special meetings, and coordinated closely with the GSA staff and the technical consultants to prepare a meaningful GSP that meets these goals and achieves the sustainability goal for the Napa Valley Subbasin.

GSPAC members have developed planning options, provided focused input on technical recommendations during GSP development deliberated on the text, and otherwise guided the development of the Subbasin sustainable management criteria.

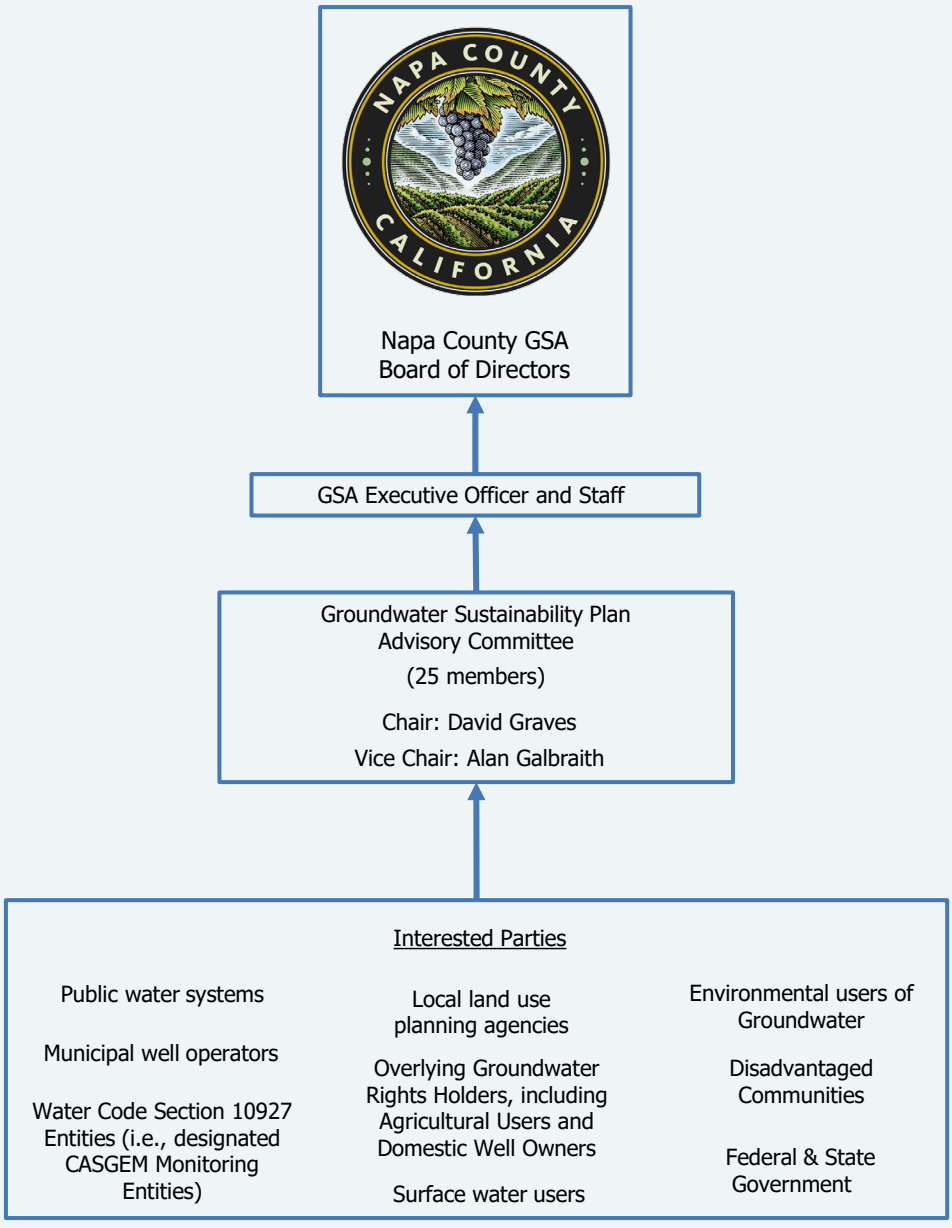
In addition to the GSPAC, early in the GSPAC deliberations, an Ad-Hoc Subcommittee (Workgroup) of seven GSPAC members convened during the GSP development process to explore and identify management tools and policies, including planned and potential projects and management actions (PMAs), for groundwater sustainability. A menu of options was presented for consideration by the full GSPAC. Following GSPAC approval of the PMAs, these were linked to conditions and triggers for the purpose of avoiding undesirable results and achieving groundwater sustainability (see Section 11).



Sustainability Framework

SGMA provides a sustainability framework, including new definitions related to sustainable groundwater management and timelines for achieving sustainable conditions. The NCGSA must define the Subbasin sustainability goal and achieve the goal within 20 years of GSP implementation. Achieving the sustainability goal means avoiding significant and unreasonable adverse effects due to groundwater conditions (i.e., undesirable results) for six sustainability indicators:

- **Chronic lowering of groundwater levels**
- **Water quality degradation**
- **Reduction of groundwater storage**
- **Land subsidence**
- **Seawater intrusion**
- **Depletion of interconnected surface water**



▲ **Napa County GSA Organizational and Management Structure**

ES 2. PLAN AREA (SECTION 2)

Description of the Plan Area

The Plan area covers the entire Napa Valley Subbasin, which is designated as a high priority subbasin by the California Department of Water Resources (DWR) primarily due to the importance of groundwater to the region's economy and welfare. It is adjacent to the Napa-Sonoma Lowlands Subbasin, which is designated a very low priority subbasin. The Subbasin covers approximately 45,900 acres and is composed of urban and developed areas, agriculture, and native vegetation. Water sources supplying the Plan area include surface water, groundwater, and reclaimed water. Based on DWR records, a total of 2,627 production wells are currently identified within the Subbasin, including domestic, irrigation/agricultural, public supply, and industrial production wells.

Jurisdictional Area and Land Use

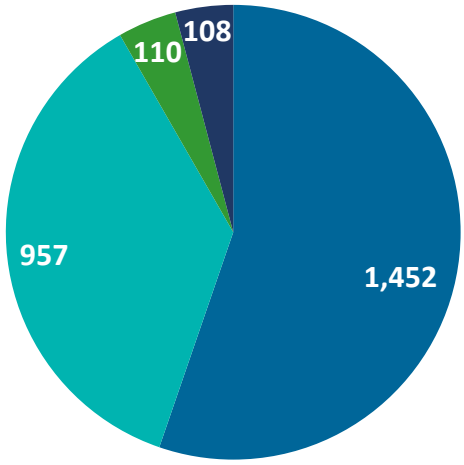
Jurisdictional areas within the Plan area include state and federal lands, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans. These jurisdictional areas, listed below, operate under their own management structure and authorities and may share overlapping jurisdictions.

- California Department of Fish and Wildlife
- California Department of Parks and Recreation
- California Department of Veterans Affairs
- Town of Yountville
- City of Napa
- City of St. Helena
- City of Calistoga
- Napa Sanitation District
- Napa County Flood Control and Water Conservation District
- Napa County

Section 2 describes the geographic and existing jurisdictional areas covered by the GSP and provides an inventory of the existing production wells within the Napa Valley Subbasin.

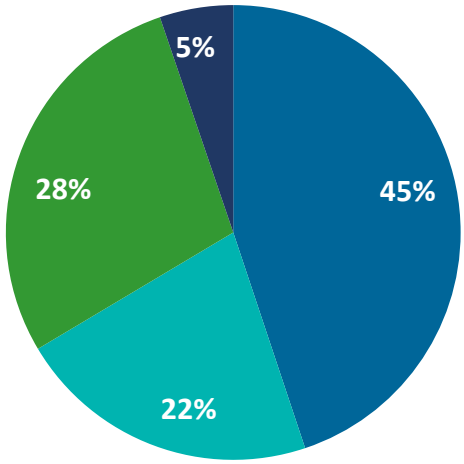
CA Code of Regulations satisfied: §354.8

Napa Valley Subbasin Production Well Count by Well Type (Total Wells - 2,627)



- Domestic - 1,452
- Irrigation/Agricultural - 957
- Public Supply - 110
- Industrial - 108

Napa Valley Subbasin Land Use by Area 45,900 Acres



- Agriculture - 45%
- Native Vegetation - 22%
- Urban - 28%
- Water - 5%

ES 3. WATER RESOURCE AND LAND USE MONITORING AND MANAGEMENT PROGRAMS (SECTION 3)

Water Resource and Land Use Monitoring and Management Programs

Existing monitoring and management programs within the Plan area include programs implemented by federal, state, regional, and local public agencies in support of regulatory or statutory requirements. The programs implemented by these agencies are intended to protect groundwater levels and groundwater and surface water quality for the beneficial uses and users of groundwater within the Napa Valley Subbasin. Various land use, stormwater, erosion control, and water efficiency programs are implemented by Napa County and municipalities within the Subbasin, whereas other state and federal programs regulate drinking water quality, surface water quality, surface water supplies, hazardous waste, oil/gas wells, pesticide use, and contamination sites within the Subbasin. During GSP implementation, the GSA will coordinate closely with other agencies; collectively, existing programs will complement actions implemented with the GSP to achieve the Subbasin sustainability goal. Monitoring for groundwater levels, groundwater use, water quality, stream levels and discharge, surface water diversions, land subsidence, and fish and other biologic indicators are described in detail in Section 3.

Groundwater use in the Subbasin is reported from 101 wells, primarily public supply wells. Surface water diversions are reported for 93 points of diversion or onstream storage. Monitoring conducted in the Napa Valley Subbasin since 2015 has included:

- 77 groundwater level monitoring wells
- 85 groundwater quality monitoring wells
- 22 surface water flow and 7 surface water quality sites
- 3 ground surface elevation benchmarks tracking land subsidence

Beneficial Uses and Users of Groundwater

Beneficial uses, described in the San Francisco Bay Basin Plan[1], are defined for designations of agricultural supply, areas of special biological significance, groundwater recharge, industrial, municipal, and domestic supply, and recreation. Within the Napa Valley Subbasin, beneficial uses and users of groundwater are identified as the following:

- Holders of overlying groundwater rights
- Municipal and public water systems
- Local land use and planning agencies
- Environmental users of groundwater
- Surface water users
- Disadvantaged communities

Section 3 describes existing water resource monitoring and management programs, existing general plans and land use plans, the beneficial uses and users of groundwater in the Napa Valley Subbasin, and the notice, communication, and the GSA's decision-making process.

CA Code of Regulations satisfied: §354.8, §354.10

1 https://www.waterboards.ca.gov/sanfranciscobay/basin_planning.html

GENERAL PLANS AND PUBLIC ENTITIES

A variety of general plans and other management plans developed by Napa County, Subbasin municipalities, and water agencies influence land use and water management in the Napa Valley Subbasin. State and federal entities may also impact available land uses.

The Napa Valley Subbasin is subject to the jurisdiction of the following general plans and other water or land use management plans:

- City of Calistoga General Plan, Infrastructure Element (Amended 2020)
- City of St. Helena General Plan Update 2040 (Adopted 2019)
- Town of Yountville General Plan (Adopted 2019)
- City of Napa General Plan (Amended 2015)[2] , Urban Water Management Plan (Adopted 2017)
- County of Napa General Plan (Amended 2013)

Other local agencies also have related local plans:

- Napa Sanitation District Collection System Master Plan (2021), Wastewater Treatment Plan Master Plan (2011), Strategic Plan for Recycled Water Use (2005)

The following state agencies own or manage lands within the boundaries of the Napa Valley Subbasin:

- California Department of Veterans Affairs
- California Department of Fish and Wildlife

Groundwater level monitoring can provide information on the volume, availability, and reliability of groundwater in an aquifer system and can also indicate the direction of groundwater flow within an aquifer system. Groundwater level monitoring has been underway in the Napa Valley Subbasin for many decades.

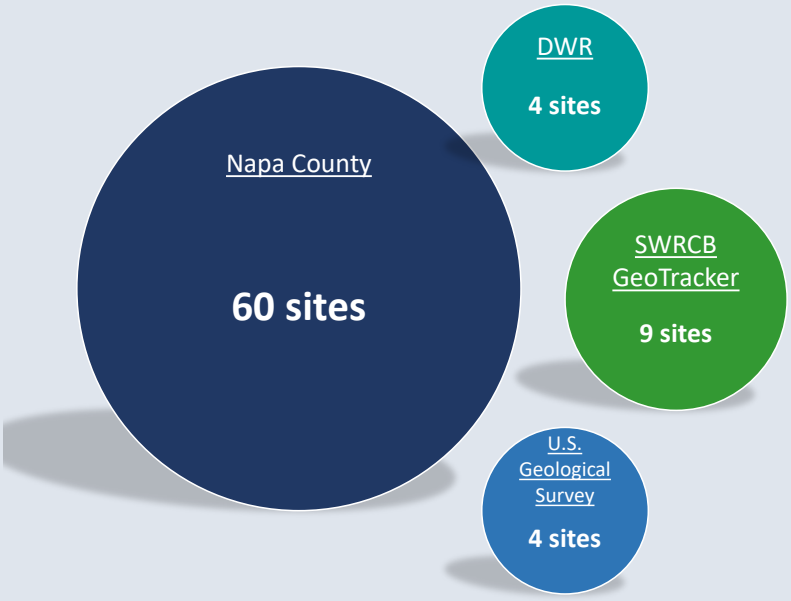
Groundwater Level Monitoring Agencies in Plan Area

CALIFORNIA DEPARTMENT OF WATER RESOURCES

U.S. GEOLOGICAL SURVEY

STATE WATER RESOURCES CONTROL BOARD, GEOTRACKER

NAPA COUNTY



▲ **Count of Recently Monitored Groundwater Level Sites by Monitoring Agency**

2 The City of Napa is a currently preparing a comprehensive update of its General Plan, planned to be completed in late 2021, though not yet available as of the date of GSP drafting: https://napa2040.com/

Notice and Communication

The NCGSA created a Communication and Engagement Plan (CONCUR, 2020) to encourage stakeholder participation at each stage of GSP development. Community engagement efforts included:

GSPAC Meetings

21 public meetings to address GSP objectives, direction, and scope; stakeholder engagement planning; GSA governance; and other GSP topics. Meetings were held via Zoom, and public observation and interactive public comment were encouraged.

Newsletter and Interested Parties List

Regularly distributed emails to registered Interested parties to engage and inform the public on the GSP, including public engagement meetings, GSPAC meetings, and updates to the GSP development.

Napa Valley Subbasin GSP Surveys

Stakeholder feedback was solicited through online surveys, announced through public meetings, news blasts, emails, and made available on the NCGSA website.

Napa County GSA Website

Meeting agendas and materials, recordings, summary notes, announcements, deliverables, and surveys were posted as they occurred via the NCGSA website (https://www.countyofnapa.org/3074/Groundwater-Sustainability)

Public Engagement Meetings / Town Halls / CAC Meetings

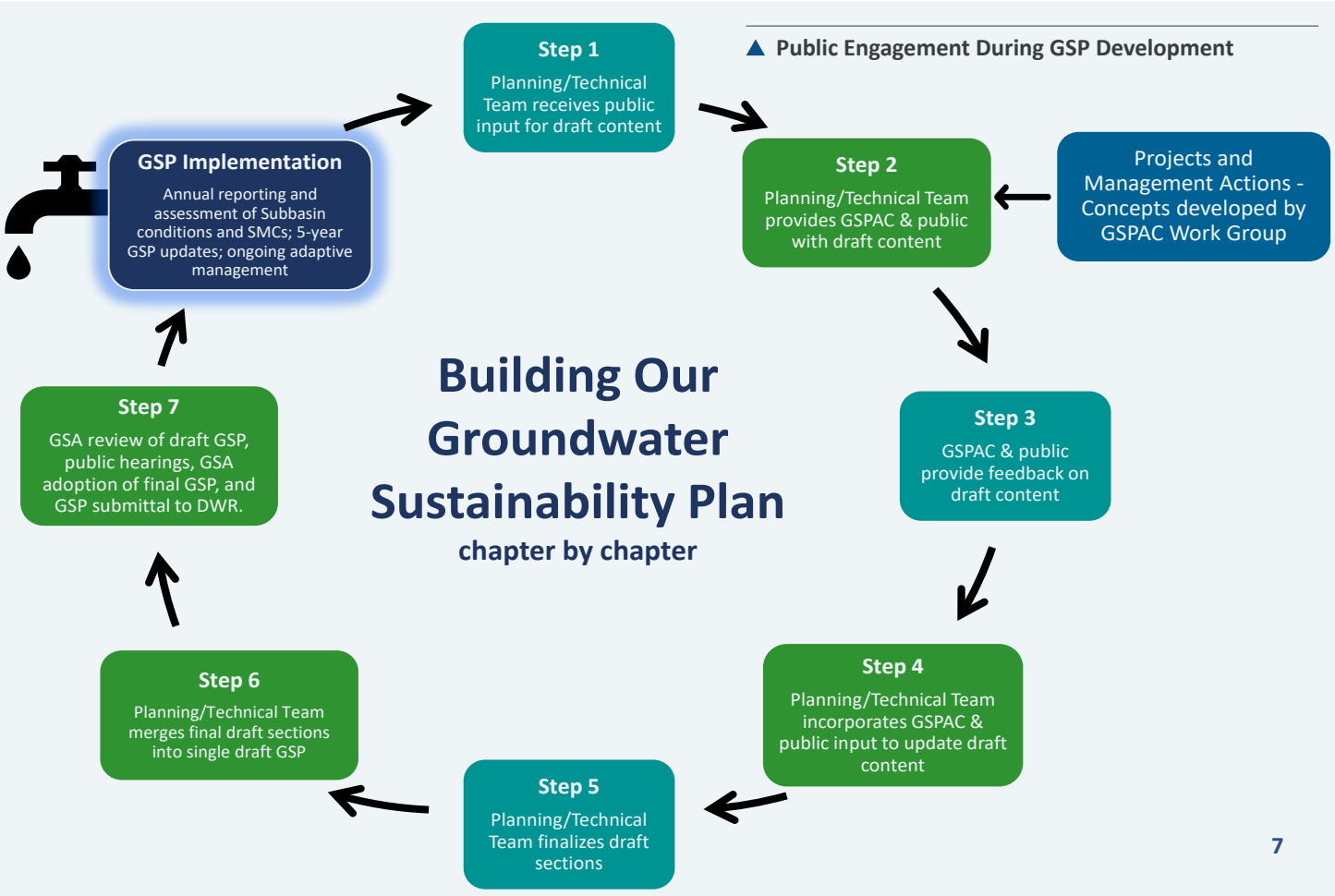
The NCGSA held Town Hall meetings with focused discussions and input sessions around specific topics that required further exploration and engagement. Meetings were held in person plus online.

Do It Yourself Groundwater Level Monitoring

The County of Napa offers training and education to the public to monitor groundwater levels at their own wells. This program engages residents in groundwater data collection to better monitor and track groundwater levels and improve the understanding of groundwater conditions. See https://www.napawatersheds.org/DIY-monitoring-program for more information.

Special Outreach

Distributing 4,300 public meeting postcard invitations to parcels in areas mapped as disadvantaged or severely disadvantaged communities. One outreach meeting with agricultural stakeholders. Three outreach meetings with groundwater dependent ecosystem stakeholders.



ES 4. BASIN SETTING (SECTION 4)

Hydrogeologic Conceptual Model

An important foundation for GSP development is the preparation of a hydrogeologic conceptual model. This type of model refers to a descriptive model that uses physical data and groundwater and surface water quality and quantity measurements to:

> *Characterize the physical components of the subsurface system and how water moves into and out of this system, including the interaction of the surface water and groundwater systems in the basin.*

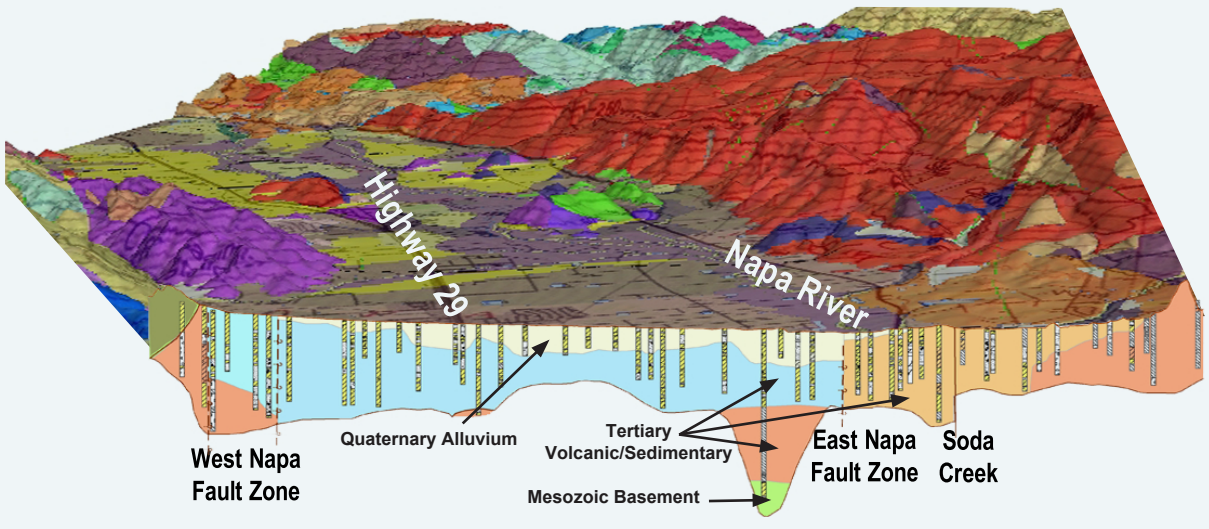
Section 4 details the geologic setting and the hydrogeologic conceptual model of the Napa Valley Subbasin.

CA Code of Regulations satisfied: §354.12, §354.14

The hydrogeologic conceptual model serves many purposes, including providing the physical basis for development of the numerical integrated hydrologic model, understanding groundwater conditions and trends, computing water budgets, and informing approaches for potential projects and management actions to ensure future sustainability.

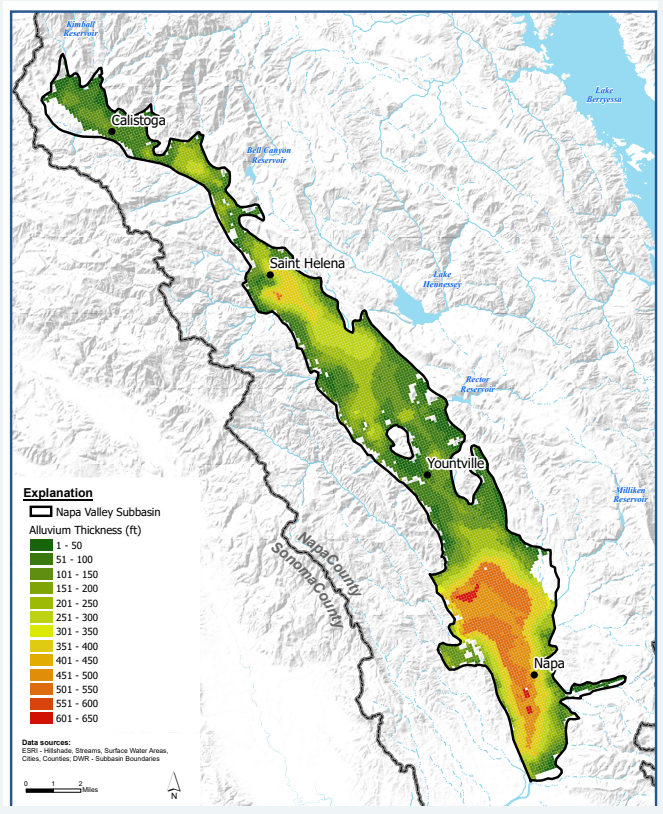
The Napa Valley Subbasin is located in a structural depression in the northern Coast Range Province, characterized by northwest trending low mountainous ridges separated by intervening stream valleys. Napa Valley is a relatively narrow, flat-floored stream valley drained by the Napa River. Soil and surficial geologic units of high permeability within the Subbasin enable infiltration of precipitation and surface waters, which constitute the primary sources of groundwater recharge. The regional geology is represented by three geologic units that characterize the Napa Valley Subbasin:

- Quaternary surficial deposits
- Tertiary volcanic and sedimentary rock
- Mesozoic basement rock

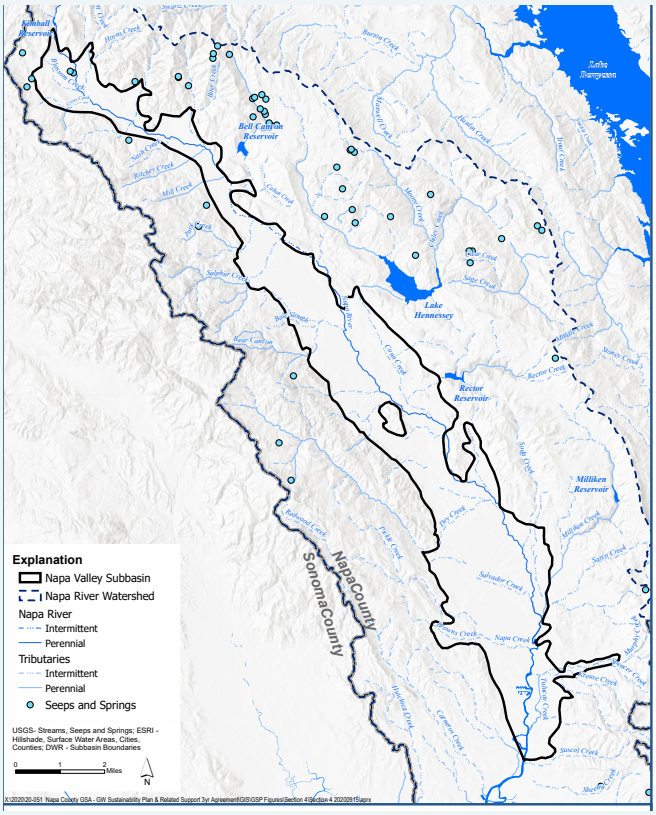


▲ Napa Valley Conceptual Schematic of Topography and Geology

The Quaternary surficial deposits, referred to as the Quaternary alluvium, are the shallowest of these units and are identified as the principal aquifer within the Subbasin. The Quaternary alluvium is present at the surface on the valley floor through most of the Subbasin and ranges in thickness from 650 feet in the center of the valley to 20 feet or less in areas along the valley margins. Groundwater quality in the principal aquifer is generally suitable for beneficial uses, although elevated concentrations of some naturally occurring constituents, including boron, iron, and chloride, have been recorded. Surface water features significant to the management of the Subbasin include many intermittent and perennial reaches of the Napa River and its tributaries within the Subbasin. Other significant surface water features include surface waters that support groundwater dependent ecosystems (GDEs), surface waters outside of the Subbasin that supply water users in the Subbasin, surface waters of the Napa River Watershed that flow through the Subbasin, and surface waters with the potential to affect Subbasin groundwater quality. Surface water and groundwater are interconnected throughout much of the Subbasin, although the nature and degree of connection varies based on location and other factors. Groundwater discharges into stream channels in the Subbasin when the groundwater elevation is greater than the elevation of water in the channel. Other groundwater discharge locations within the Subbasin include springs and wetlands.



▲ Quaternary Alluvium Thickness



▲ Surface Water and Wetland Features

ES 5. MONITORING NETWORK AND PROGRAM (SECTION 5)

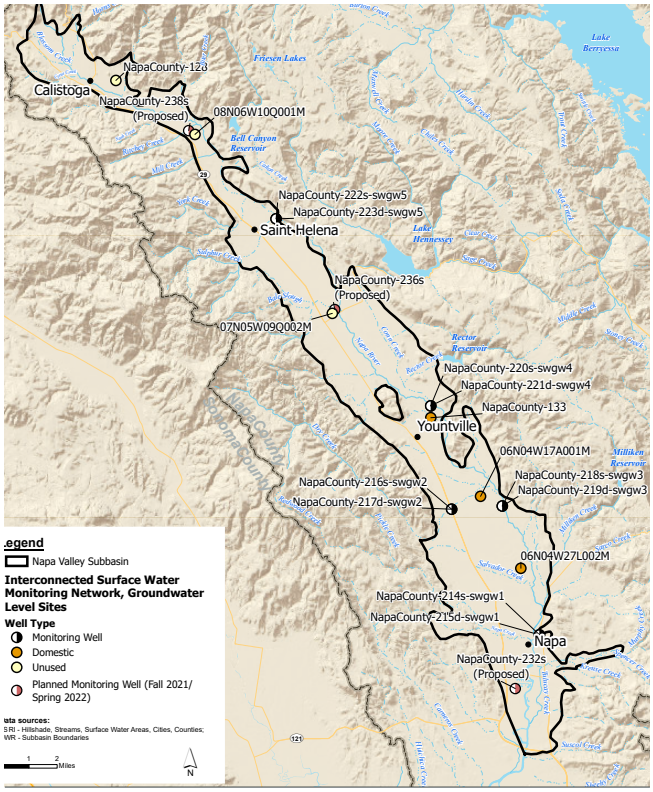
Monitoring Network and Program

Monitoring networks identified for the Napa Valley Subbasin collect data on groundwater levels, groundwater and surface water quality, land surface elevation, stream stage, and stream discharge. In addition to monitoring sites, available geospatial mapping and remote sensing data provide further monitoring of land displacement and for indicators of GDE health. These monitoring networks are developed from existing monitoring sites and are operated or administered by several monitoring agencies, including:

- Napa County
- DWR
- U.S. Geological Survey
- California State Water Resources Control Board
- National Geodetic Survey

Monitoring sites are designed to promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin and evaluate changing conditions that occur during GSP implementation. Monitoring sites are presented for the following nine networks:

1. Groundwater level monitoring: 56 wells (16 more planned)
2. Groundwater quality monitoring: 37 wells (16 more planned)
3. Groundwater storage change monitoring: 26 sites (10 more planned)
4. Seawater intrusion monitoring: 16 wells (2 planned)
5. Surface water quality monitoring: 7 sites (4 more planned)
6. Stream stage and stream discharge monitoring: 20 sites (10 Sites to be upgraded)
7. Interconnected surface water monitoring: 16 wells (8 more planned)
8. Groundwater dependent ecosystem monitoring: 18 wells (3 more planned)
9. Land surface elevation monitoring: 8 land surface elevation benchmark sites and 15 well sites



▲ Interconnected Surface Water Monitoring Network

Section 5 describes the existing monitoring networks within the Napa Valley Subbasin, the goals and requirements of each network, corresponding monitoring protocols, an assessment of data gaps, and proposed actions to address identified data gaps.

CA Code of Regulations satisfied: §354.32, §354.34, §354.38

New and Planned Monitoring Sites

- Four new monitoring sites are being implemented in fall 2021 to fill data gaps along the Napa River in key areas of the Subbasin. These new sites will be dedicated dual completion monitoring wells (8 wells total) for tracking groundwater conditions in both the shallow and deeper portions of the alluvium. These sites are planned to:Increase density of groundwater level monitoring wells.
- Increase density of groundwater level monitoring wells.
- Provide information on surface water and groundwater interaction and conditions near GDEs.
- Provide information on boundary conditions.
- Ensure long-term monitoring results are consistent and reliable.
- Better understand impact of groundwater management to beneficial users.
- Improve characterization of groundwater flow regimes.

Additionally, 10 monitoring wells are recommended to fill data gaps, including eight wells as additions to expand or refine the existing monitoring network in areas of more concentrated domestic and agricultural groundwater pumping, and two wells as additions to the seawater intrusion monitoring network. GSP Section 12, Table 12-3, includes a summary of recommendations for Plan implementation.

ES 6. GROUNDWATER AND SURFACE WATER CONDITIONS (SECTION 6)

Groundwater Levels

Groundwater generally flows through the length of the Napa Valley through the older and younger alluvium from Calistoga to San Pablo Bay. The average horizontal hydraulic gradient in the alluvium is approximately 0.003 ft/ft, which is assumed to represent the unconfined portion of the aquifer system. Groundwater trends and conditions in the Napa Valley Subbasin are largely dependent upon precipitation inputs; therefore, groundwater levels are reviewed in the context of seasonality (spring and fall) and water year types. Groundwater level trends in the Napa Valley Subbasin are stable in many of wells with long-term groundwater level records, however, several wells located near the Napa Valley Subbasin margin in the northeastern Napa area, southwestern Yountville area, and southeastern St. Helena area show periods of declines in groundwater levels, particularly during times of drought.

Groundwater conditions evaluated in this GSP do not account for the drought conditions experienced recently beginning in 2020. After GSP adoption, groundwater and surface water conditions within the Subbasin will be reevaluated and described through annual reporting to reflect the resulting conditions of the preceding water year.

Groundwater Quality

Groundwater in the Napa Valley Subbasin is of sufficient quality for most beneficial uses. Groundwater from the unconfined alluvium is generally of higher quality than groundwater obtained from the Tertiary volcanic formations, which frequently contain higher concentrations of metals and other dissolved minerals. Groundwater from the alluvium is somewhat hard (containing higher concentrations of dissolved calcium and magnesium) and bicarbonate, and contains small concentrations of sulfate, chloride, and other dissolved minerals. The presence of geothermal activity, remnant of volcanic activity during the Tertiary period, has produced many hot, geothermal groundwater sources in the Calistoga area. As a result, groundwater sourced locally from the deeper, geothermal zones below the alluvium contains higher concentrations of total dissolved solids (TDS), dissolved metals, boron, and other minerals in this area of the Subbasin. At the southern end of the Subbasin, saline groundwater has been found in areas of concentrated pumping near the San Pablo Bay and near tidally influenced reaches of the Napa River. Elevated concentrations of arsenic, iron, and manganese occur throughout the Subbasin as a result of natural oxidizing and reducing conditions in the strata, where these conditions strongly affect the release of minerals from surrounding rock to the groundwater. Combined with areas of geothermal groundwaters in the northern end of the Subbasin, these geochemical conditions augment the occurrence of arsenic (and boron) due to increased mineral solubility.

Section 6 describes the historical and current groundwater and surface water conditions of the Napa Valley Subbasin.

CA Code of Regulations satisfied: §354.16

Groundwater Storage

The total estimated storage capacity of the Quaternary alluvium ranges from 190,000 acre-feet (AF) to 300,000 AF, in which the amount of groundwater in storage in the Subbasin generally reflects changes in groundwater elevations over time. Annual changes in groundwater storage have ranged from an increase of approximately 13,000 AF during the 2005 water year to a decrease of approximately 24,700 AF during the 2020 water year, the driest year to occur from 1988 to 2020. Based on historical annual spring groundwater level data, the overall trend in groundwater storage change from year to year generally fluctuates in accordance with the current or preceding water year type. Following the very dry year experienced in 2020, the volume of groundwater in the alluvial aquifer was estimated at approximately 196,700 AF, compared to the average volume of groundwater in storage from 1988 to 2020 at approximately 210,000 AF.

Seawater Intrusion

Groundwater basins along coastlines have the potential to experience intrusion of seawater into the underlying aquifer, resulting in higher-salinity groundwater in affected areas. Elevated chloride (a water quality indicator for seawater intrusion) concentrations relative to the rest of the Napa Valley have been found in the alluvium of the tidal marsh area south of the Napa Valley Subbasin and along the Napa River, attributed to both the connate seawater and brackish water in the tidal reaches of Napa River. In the Napa Valley Subbasin, most wells have stable or declining chloride concentrations that increase somewhat with depth, suggestive of connate brackish water; however, because the spatial distribution of groundwater quality data at any given time interval are limited, it is difficult to determine the characteristic distribution of chloride and TDS concentrations in the region.

Land Subsidence

Land subsidence presents as the sinking or settling of the land surface due to groundwater pumping but can also occur as a result from the collapse of underground cavities, tectonic activity, natural consolidation of sediment, oxidation and compaction of organic deposits, and hydrocompaction of moisture deficient soil and sediments. Subsidence has the potential to cause adverse impacts to infrastructure at the land surface. There are two general types of land subsidence: elastic (reversable) and inelastic (permanent). Historical and current monitoring show there is no inelastic subsidence occurring within the Subbasin.

Surface Water

The Napa River flows southeast from the Coast Ranges, through the Napa Valley Subbasin and Napa-Sonoma Valley Lowlands Subbasin before entering San Pablo Bay at Vallejo. Several intermittent and perennial streams flow through the Napa Valley Subbasin and feed into the Napa River. These tributaries contribute recharge to the Napa Valley Subbasin, some of which likely support low-flow conditions in the Napa River as dry season baseflow. Shallow groundwater within the alluvial deposits generally shows complex hydrologic interactions with the Napa River streambed along its reaches at multiple time scales.

As part of the California Environmental Flows Framework[1] (CEFF), The Nature Conservancy (TNC) published an online resource that provides functional flow metrics for individual stream reaches across the state based on a statistical analysis of watershed characteristics[2]. Applying CEFF guidance, long-term median functional flow metrics calculated from observed streamflow data at stream gages on the Napa River near St. Helena and Napa show flow metrics within the “likely unaltered” percentile ranges predicted in the TNC Natural flows database.

1 https://ceff.ucdavis.edu/
2 https://rivers.codefornature.org/

Although functional streamflow metrics along the Napa River at these two stream gages reflect likely unaltered conditions according to the CEFF, the characteristic hydrologic pattern of streamflow in the Napa River Watershed has been defined as influenced primarily by peak runoff generated by winter storms, where streamflows may not persist through drier months (Lane et al., 2018). Additionally, reaches of the Napa River along its lower streambed surface, or thalweg, have over many decades (since the 1930s) experienced low to no-flow conditions during the fall as groundwater discharge into the stream channel decreases as a function of seasonal fluctuations of the water table and fall groundwater declines (Faye, 1973; Grossinger, 2012). Notwithstanding the historical occurrence of diminished streamflows, maintaining streamflow conditions, especially during the dry season, is of paramount importance to stakeholders and other environmental users within the Subbasin.

Interconnected Surface Water

The California Code of Regulations defines interconnected surface water as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted." Interconnected surface waters can occur when regional groundwater levels are relatively close to the land surface enabling exchange of groundwater and surface water. Conditions when groundwater elevations are above surface water elevations and groundwater flows into the surface water channel are referred to as gaining conditions; whereas, during conditions in which groundwater elevations are below surface water elevations, the stream flow moves from the surface water channel into the groundwater referred to as losing conditions. Such connections have been observed throughout the Napa Valley Subbasin and can vary spatially and temporally. Several streams within the Subbasin are identified as having some degree of hydraulic connection to groundwater, including Bale Slough, Dry Creek, Conn Creek, Garnett Creek, Mill Creek, Napa Creek, Rector Creek, Redwood Creek, Ritchie Creek, Soda Creek, Sulphur Creek, Tulucay Creek, and York Creek. Some of these streams are perennial reaches of the Napa River and others are intermittent tributaries, which only have an established connection to groundwater during specific periods of the year.

Groundwater Dependent Ecosystems

Defined under SGMA, GDEs are ecological communities of species that depend on groundwater emerging from aquifers or groundwater occurring relatively near the ground surface. GDEs are identified as a key beneficial user of groundwater within the Napa Valley Subbasin. Following guidance from TNC, spatial mapping of natural communities commonly associated with groundwater shows approximately 6.3% of the Napa Valley Subbasin area is covered by vegetation and wetlands designated as GDEs. A majority of these GDEs occur along perennial and intermittent riparian channels of the Napa River and tributaries. Available remote sensing data measuring key vegetation health indices show generally stable to improving health trends for GDE units analyzed within the Subbasin; however, fluctuations in vegetation health indices over time are evident during drought periods experienced in the Subbasin.

In addition to GDE areas, the Napa Valley Subbasin coincides with approximately 230 acres of critical habitat for the Contra Costa Goldfields (Lasthenia conjugens) and approximately 23 miles of critical habitat for the Central California Coast Steelhead (Oncorhynchus mykiss - CCC winter). Other endangered or threatened species designated as groundwater dependent documented within the Subbasin include:

- Napa blue grass (Poa napensis)
- California freshwater shrimp (Syncaris pacifica)
- Foothill yellow-legged frog (Rana boylii)
- Calistoga popcornflower (Plagiobothrys strictu
- Tricolored Blackbird (Agelaius tricolor)

ES 7. HISTORICAL, CURRENT, AND PROJECTED WATER SUPPLY AND DEMAND (SECTION 7)

Land Use Trends

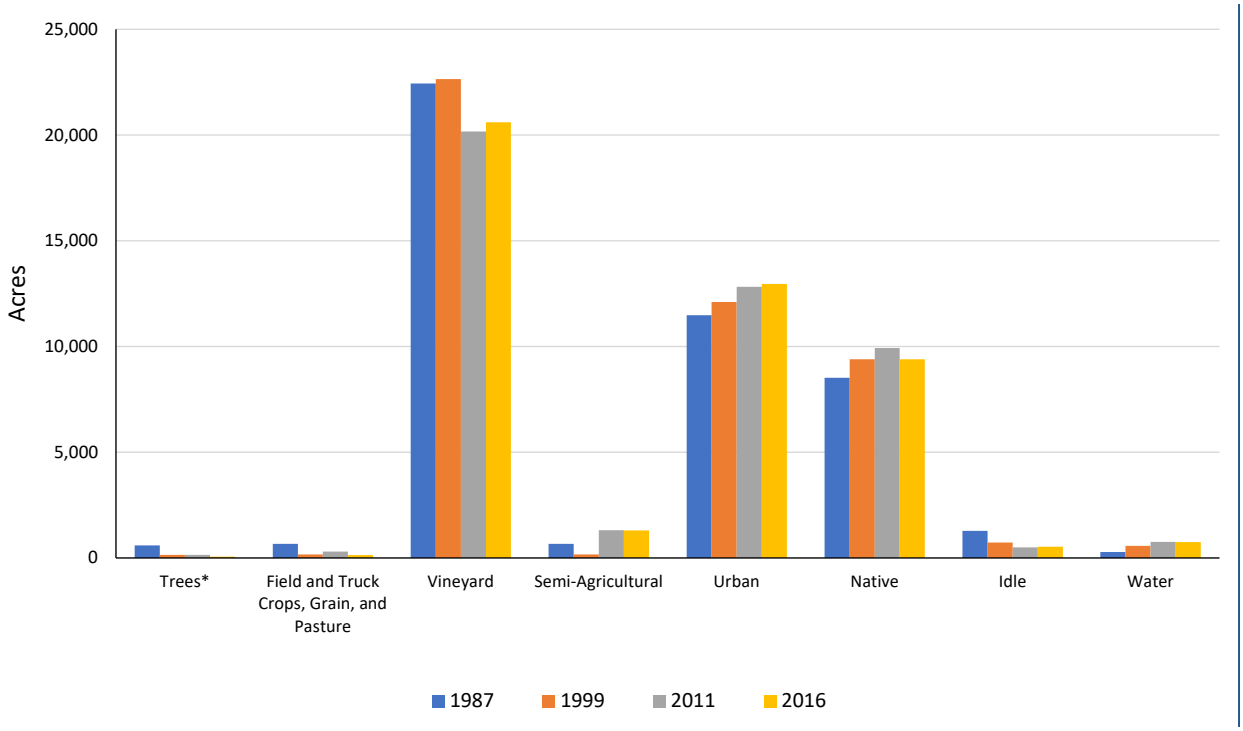
Primary land uses in the Napa Valley Subbasin include urban areas of four incorporated municipalities, agricultural lands supporting perennial vineyards, and rural residences. According to land use mapping conducted by DWR, in 2016 the total vineyard area was approximately 20,600 acres (45% of the Subbasin area), making it the largest single land use category within the Subbasin. Urban land coverage was approximately 13,000 acres (28% of the Subbasin area), and native vegetation was approximately 9,900 acres (22% of the Subbasin area). Land use surveys by DWR over the period since 1987 indicate that total agricultural area and vineyard acreages were consistent over this 30-year period. Newly legislated housing obligations for the state, including Napa County, will affect future land and water use.

Population Trends

The population of Napa County in 2019 was 140,779 (LAFCO-NC, 2020). Napa County remains sparsely populated outside of the incorporated cities, towns, and a small number of urbanized areas in the unincorporated county. The population within Napa County has grown at an average annual rate of 1.5% from 1980 to 2010 (MTC & ABAG, 2021). During this time, the total population across the four incorporated municipalities (City of Napa, City of St. Helena, City of Calistoga, and the Town of Yountville) in the Subbasin grew from 47,600 to 69,100, an increase of 45%. Additionally, population in the unincorporated areas of the Subbasin is estimated to have decreased from 4,900 to 4,100. By 2040, the total population within the Subbasin is projected to be approximately 83,000.

Section 7 describes historical, current, and projected conditions within the Napa Valley Subbasin relating to land use, population, and water supplies by source and usage according to water use sector.

CA Code of Regulations satisfied: §354.18C



▲ **DWR and LandIQ Land Use Survey Summary**

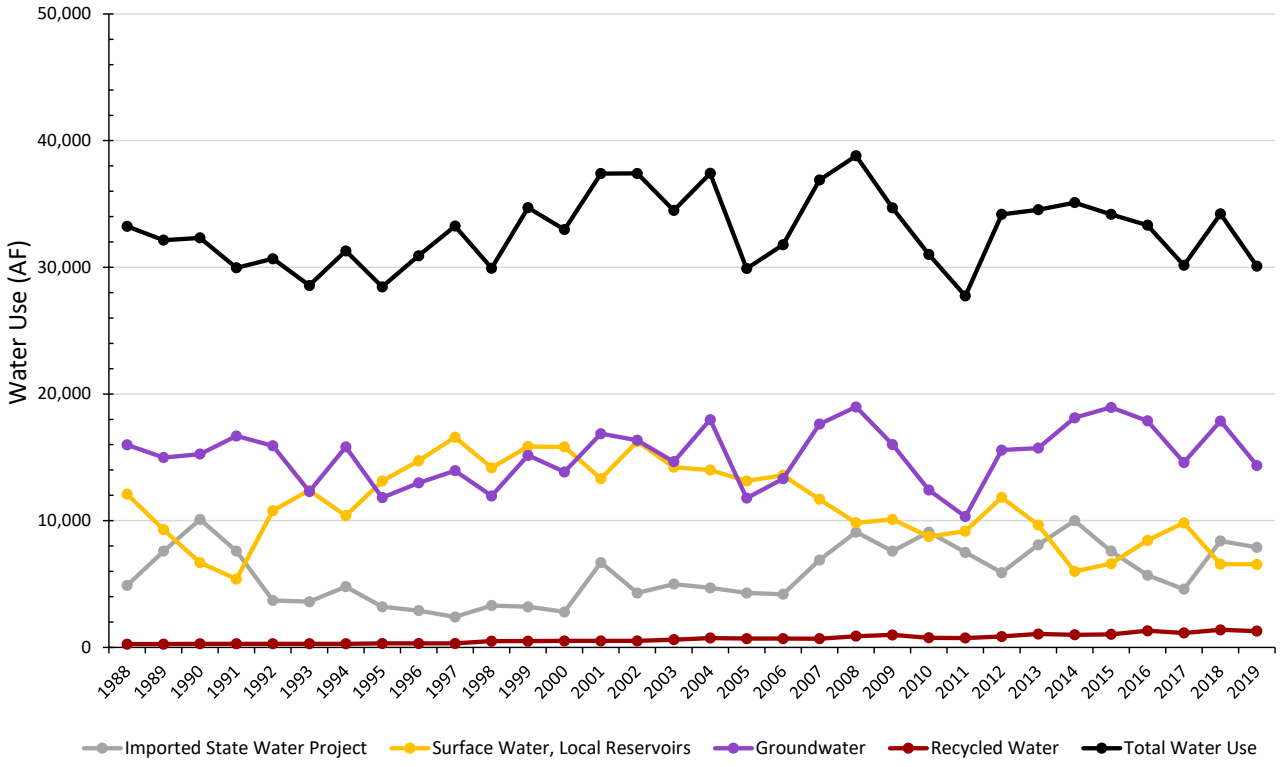
Historical and Current Water Supply and Demand

Total water uses from 1988 to 2019 for the agriculture, public water systems, and self-supplied (i.e., residential domestic well users) sectors ranged from 28,000 acre-feet per year (AFY) to 39,000 AFY. Over the historical period from 1988 to 2014, total water use averaged 33,000 AFY; whereas, over the current period from 2015 to 2019, water use averaged 32,000 AFY. Groundwater pumping made up an average of 45% (14,900 AFY) of total water supplies over the historical period, followed by surface water from local reservoirs and other local sources at 36% (11,700 AFY), and State Water Project (SWP) imports at 17% (5,700 AFY). During the current period from 2015 to 2019, groundwater pumping increased to an average of 52% (16,700 AFY) of total water supplies in the Subbasin, while surface water supplies declined to 23% (7,400 AFY). In addition to the increase in groundwater pumping during the current period from 2015 to 2019, SWP imports and recycled water use made up an average of 21% and 4% of total water use, respectively.

Water use by public water systems made up approximately 53% (17,000 AFY) of the total water use from 1988 to 2019, followed by agriculture at 40% (13,000 AFY), and self-supplied users at 7% (2,500 AFY). In addition to water use from these beneficial users, water use by native vegetation and GDEs averaged 7,500 AFY from 1988 to 2019. Total water use by native vegetation and GDEs is represented as total evapotranspiration (ET), which includes plant transpiration of water from precipitation or shallow groundwater uptake. Groundwater uptake by GDEs is considerable, averaging 4,600 AFY from 1988 to 2019 (computed with the Napa Valley Hydrologic Model; see Section 8 below), which is approximately 30% of total average groundwater pumping of 15,000 AFY during this same period.

Projected Water Supply and Demand

Projected Subbasin water supplies are likely to be affected by climate change over the 50-year planning and implementation horizon. Although there is considerable uncertainty in climate forecasting, projections utilized for this GSP reflect average reductions in supplies from local reservoirs averaging 2% and reductions in SWP supplies averaging 8%, relative to historical water supplies. Projected water demands vary based on land use and population changes, as well as climate change, with the use of groundwater increasing under future conditions of a climate change scenario involving drier and warmer future conditions. Increases in groundwater use are projected for the agricultural sector. Depending on the future climate, groundwater use by agriculture is projected to increase by up to 8% (900 AFY) relative to historical agricultural groundwater uses, while groundwater use by self-supplied users to meet outdoor irrigation demands is projected to increase up to 13% (310 AFY). Based on the historical rate of new and modified use permits in the Subbasin, winery demands are projected to increase by 7 AFY into the future.



▲ **Total Historical Water Use in the Napa Valley Subbasin**

ES 8. WATER BUDGET (SECTION 8)

Water Budget

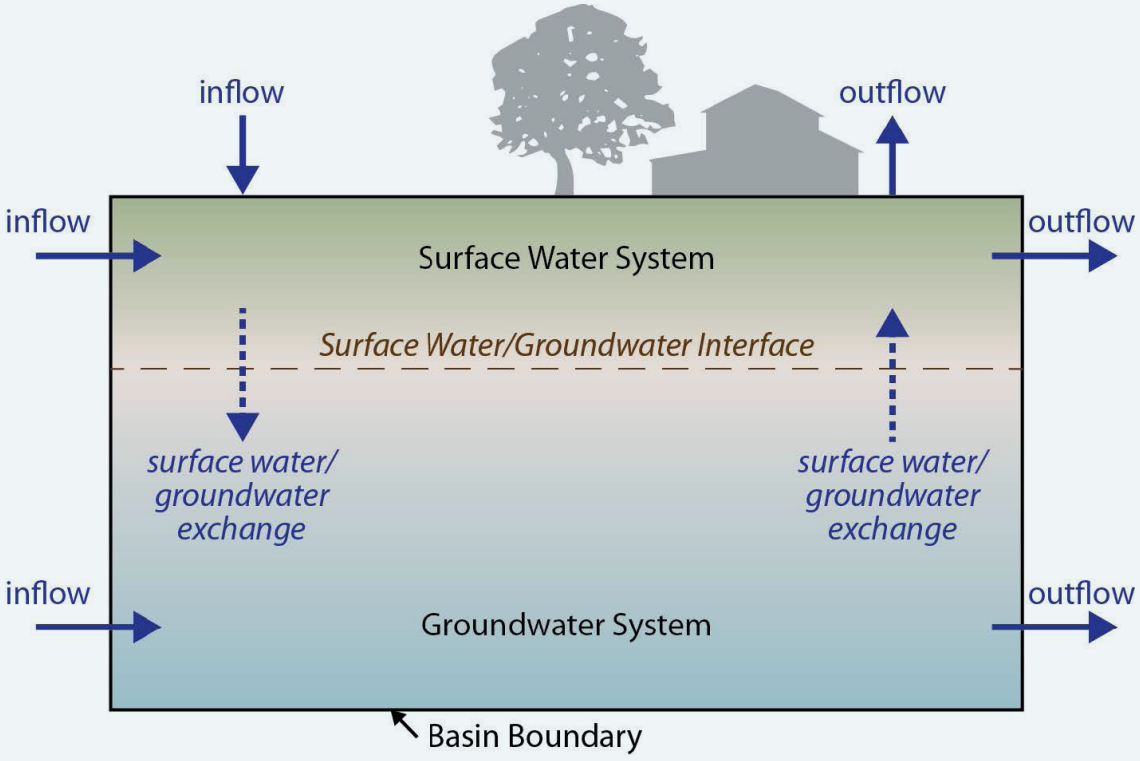
A subbasin water budget provides a complete assessment of the total volume of groundwater and surface water entering and leaving the subbasin over time, along with the change in volume of water stored within the Subbasin. Major water budget components include: precipitation, groundwater extraction, evapotranspiration, evaporation, deep percolation, subsurface flows, and surface water infiltration. Water budgets were developed through application of the Napa Valley Integrated Hydrologic Model (NVIHM), a numerical groundwater flow model developed and calibrated with empirical data to support the GSP preparation. NVIHM was developed in accordance with the best management practices developed by DWR (DWR, 2016).

From 1988 to 2019, total Napa Valley Subbasin inflows and outflows ranged from 399,400 AFY to –398,200 AFY, respectively. Surface water inflows account for approximately 33% of total inflows into the Subbasin, followed by precipitation (29%), whereas surface water outflows made up approximately 47% of total outflows from the Subbasin.

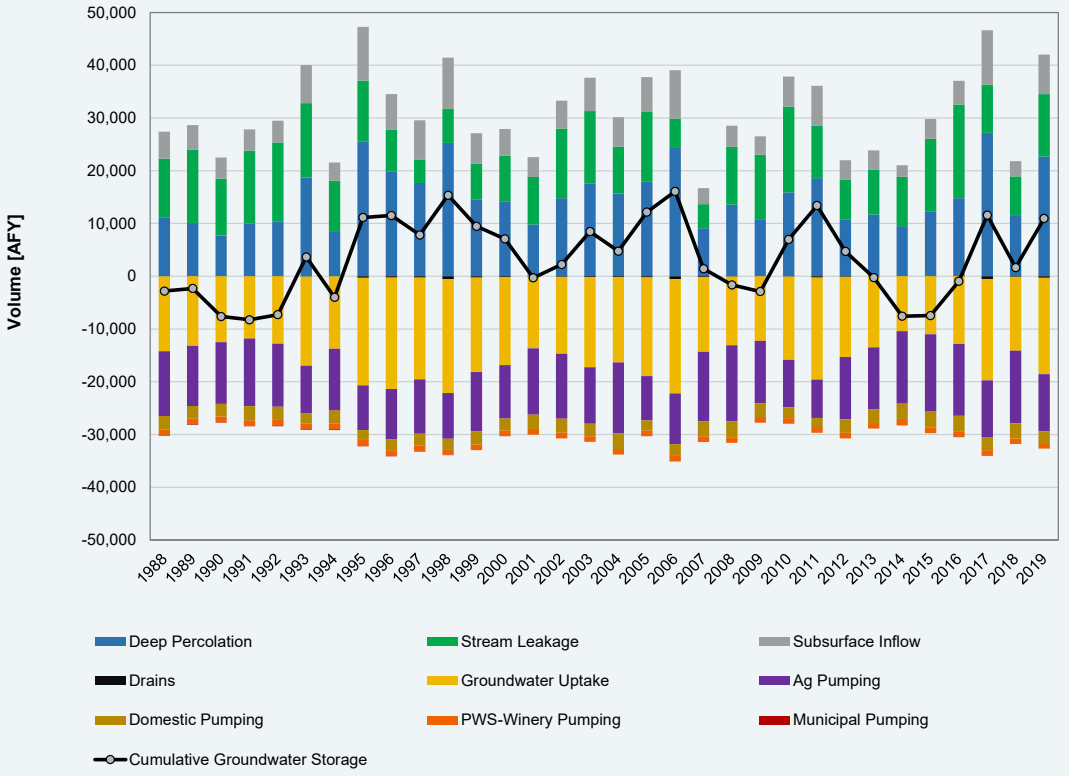
Section 8 describes the historical, current, and projected water budgets for the Napa Valley Subbasin.

CA Code of Regulations satisfied: § 354.18

Water budgets projected for a 51-year future period were analyzed considering changes in land use and climate change. Across three future modeling scenarios, inflows ranged from approximately 413,000 AFY to 595,000 AFY, while outflows ranged from –413,000 AFY to –594,000 AFY. Inflows and outflows to the groundwater system ranged from 35,200 AFY to -34,800 AFY, in which outflow from groundwater pumping is projected to account for 40 to 50% of total groundwater outflows from the Subbasin. Projected cumulative groundwater storage from 2020 to 2070 ranges from a net decline of 9,700 AF to a net increase of 8,200 AF, with annual change in groundwater storage ranging from a net decrease of 200 AFY to a net increase of 160 AFY.

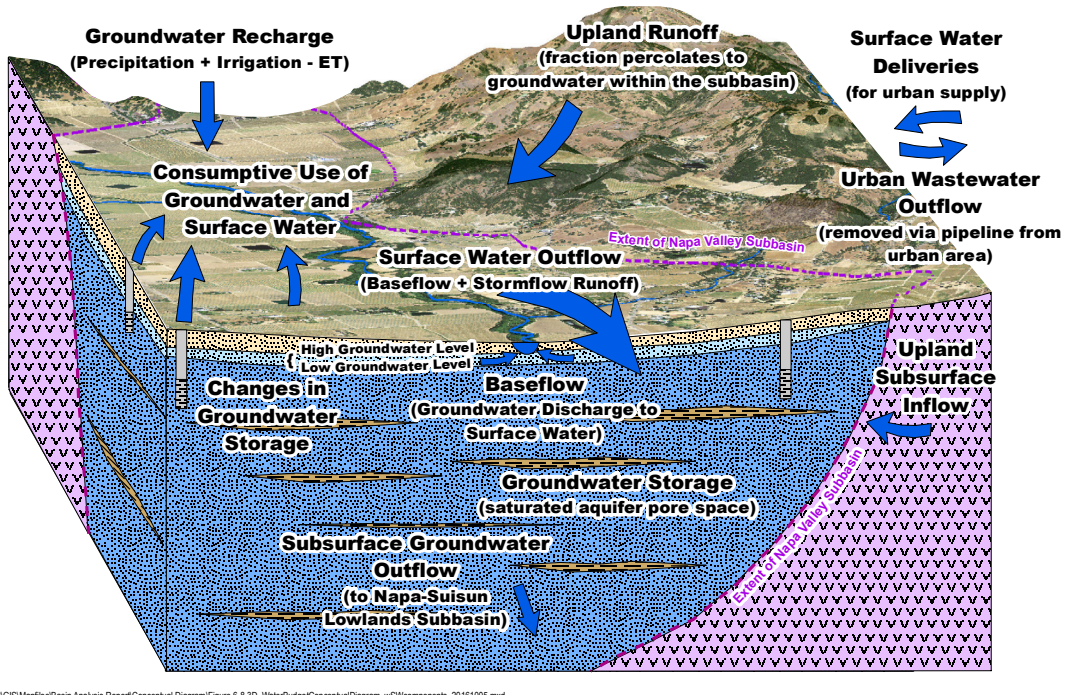


▲ **Water Budget Overview**



▲ Napa Valley Subbasin Historical and Current Groundwater Budget

Climate Change Scenarios and 50-Year Projected Conditions



Projected Subbasin conditions were evaluated using three scenarios that rely on best-available information for future population, water supplies, land use, and climate change. Climate change projections were informed by discussions and coordination with DWR, USGS, and Pepperwood Preserve staff. The climate projections use outputs from global climate models utilized for the California Fourth Climate Change Assessment (Pierce et al., 2018) that align with climate scenarios referenced in DWR guidance for GSP development (DWR, 2018). Accounting for projected population, water use, and land use information, three projected scenarios were evaluated based on projected climate change:

1. Scenario A - historical climate, 26.6 inches precipitation a year on average
2. Scenario B - wetter and warmer climate, 32.1 inches precipitation a year on average
3. Scenario C - warmer and drought prone climate, 25 inches precipitation a year on average

ES 9. SUSTAINABLE MANAGEMENT CRITERIA (SECTION 9)

Sustainable Management Criteria

Sustainability in the Subbasin is defined according to sustainable management criteria. Sustainable management criteria are the metrics by which the sustainability of the Subbasin are evaluated. The sustainable management criteria, including undesirable results (UR), minimum thresholds (MT), and measurable objectives (MO), form the backbone of the GSP. These criteria define sustainable groundwater management, with sustainability being the avoidance of undesirable results. As specified in the California Code of Regulations Section 354.26, "undesirable results occur when significant and unreasonable effects for any of the sustainability indicators occur throughout the basin." Sustainable management criteria were defined based on information developed and presented in the basin setting, water supplies, and water budget sections of the GSP, and reflect input from the GSPAC as well as community outreach and engagement efforts to receive input during development of the criteria.

Sustainable groundwater management is defined by avoidance of URs for six sustainability indicators as described below. Each indicator was evaluated for its relevance to the Subbasin and was assigned MTs and MOs to avoid URs and ensure continued sustainable groundwater management. Because MOs are set at recent historical conditions, interim milestones (IMs) were set identical to MOs.

Interim sustainable management criteria for depletion of interconnected surface water were developed with stakeholder input and using best available science and data.

Sustainability Goal

The sustainability goal for the Napa Valley Subbasin is:

- To protect and enhance groundwater quantity and quality for all beneficial uses and users of groundwater and interconnected surface water in the Napa Valley Subbasin both now and in the future.
- The NCGSA will implement sustainable management criteria and an adaptive management approach supported by the best available information and best available science, resulting in the absence of undesirable results within 20 years from GSP adoption.

The NCGSA monitors Subbasin conditions for six sustainability indicators and implements projects and management actions to avoid undesirable results and achieve the sustainability goal.

UNDESIRABLE RESULTS (URs)

When one or more of the six identified sustainability indicators is significantly and unreasonably affected by unsustainable groundwater use and conditions occurring throughout the basin.

MINIMUM THRESHOLDS (MTs)

A numeric value for each sustainability indicator at each representative monitoring site.

MEASURABLE OBJECTIVES (MOs)

Specific, quantifiable criteria for maintaining or improving specific groundwater conditions included in a GSP to achieve the sustainability goal.

INTERIM MILESTONES (IMs)

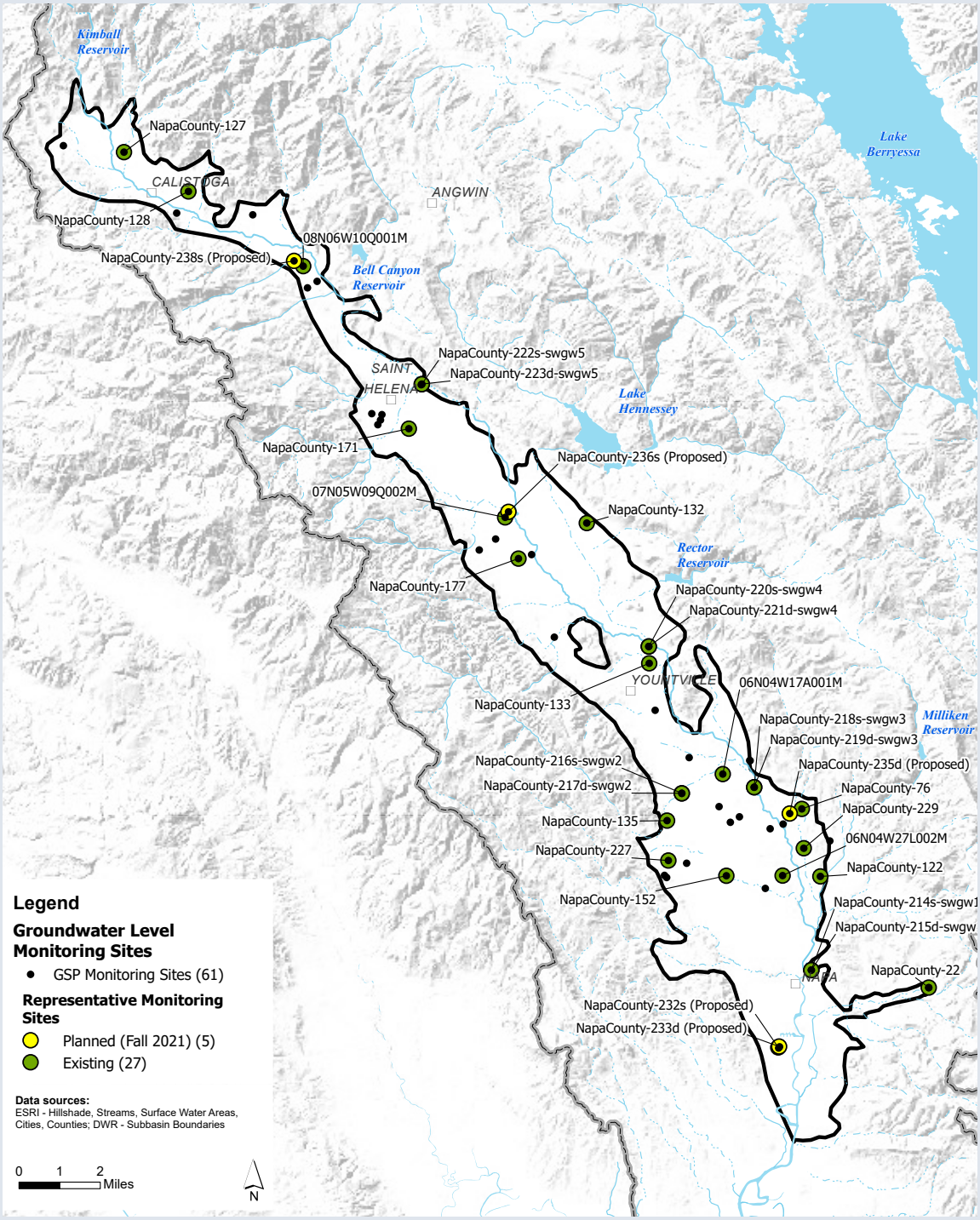
A target value representing measurable conditions set in increments of 5 years.

Section 9 provides a discussion of the Sustainable Management Criteria, which define sustainability in the Subbasin and avoid undesirable results.

CA Code of Regulations satisfied: § 354.22., § 354.24., § 354.26., § 354.28., § 354.30.

Representative Monitoring Networks

Representative monitoring sites (RMS) were identified as the sites where sustainability indicators will be monitored and evaluated with respect to the quantitative values defining MTs, MOs, and IMs. There are a total of 67 RMS (includes 4 planned sites) identified within the Subbasin. RMS locations include 32 wells for chronic lowering of groundwater levels, 21 wells for degraded water quality, 11 wells for seawater intrusion, 20 sites (15 well sites, 5 land surface elevation benchmark sites) for land subsidence and 10 sites (8 well sites, 2 stream sites) for depletions of interconnected surface water. Sustainable management criteria developed for groundwater storage do not involve RMS, but rather are based on monitoring of annual groundwater extraction in relation to the estimate of sustainable yield. The GSP monitoring network will supplement evaluation of change in storage in addition to results derived from the NVIHM.



▲ Chronic Lowering of Groundwater Levels Representative Monitoring Network

Chronic Lowering of Groundwater Levels

UNDESIRABLE RESULTS:

Significant and unreasonable chronic lowering of groundwater levels occur when either one of the following two conditions occur:

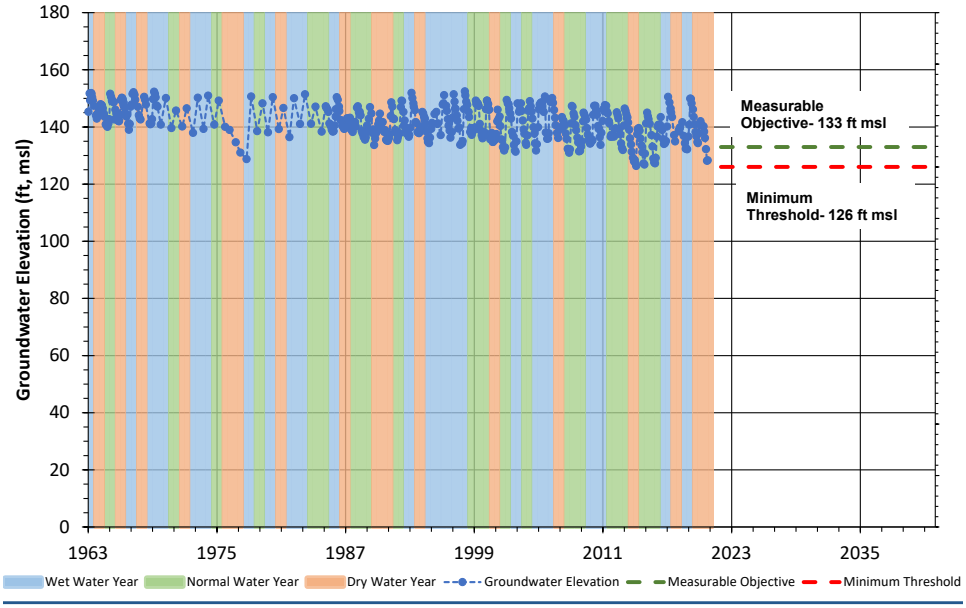
Condition 1: Occurrence of prolonged, year-to-year reductions in groundwater levels below levels recorded historically [10 years] at RMS wells in the Subbasin, excluding during drought periods, and conditions result in impacts to beneficial uses and users of groundwater.

Condition 2: Groundwater level declines continue, including during drought periods, extend for a long period [e.g., 10 years], result in impacts to beneficial uses and users of groundwater, and two other conditions apply:

a. **the long-term period does not end in drought conditions and**
b. **the long-term period includes a balance of above average and below average water years.**

Current Condition

Historical monitoring data do not indicate the occurrence of chronic groundwater level declines in the Subbasin, and projected simulations suggest such conditions are not likely to occur in the future. Water levels in the Napa Valley Subbasin are generally stable with seasonal fluctuations, temporary downward trends during drought periods, and recovery during wet periods.



▲ **Sample RMS Monitoring Well Groundwater Elevation Data**

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
Twenty percent (20%) of designated RMS well levels fall below the MT in fall (October) for three consecutive years of fall measurements in non-drought years.	MT – Set as the minimum static groundwater elevation observed historically in October at wells with more than 10 years of available data prior to 2015, or the inferred minimum static groundwater elevation between 2005 to 2014 (10 years prior to SGMA adoption) for wells that lack at least 10 years of observed data. For wells that lack 10 years of observed data, the setting of the MT is informed by available data and historical groundwater levels simulated by the NVIHM.	Set as the average static groundwater elevation observed historically in October at wells with more than 10 years of available data prior to 2015, or the inferred average static groundwater elevation between 2005 to 2014 for wells that lack at least 10 years of observed data.

Reduction of Groundwater Storage

UNDESIRABLE RESULTS:

Significant and unreasonable reductions in groundwater storage due to groundwater extraction occur when groundwater extractions exceed the Subbasin sustainable yield and result in impacts to beneficial uses and users of groundwater.

Current Condition

Groundwater storage in the Napa Valley Subbasin has been stable over many decades. Separate analyses using groundwater level data and the NVIHM both find that groundwater storage volumes do decrease during drier years; however, storage volumes recover during wetter years without resulting in long-term reductions in storage.

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
Seven (7) year average annual net groundwater extraction in the Subbasin exceeds the sustainable yield.	Net groundwater extraction by pumping exceeding the sustainable yield for the Subbasin, where net groundwater extraction is the volume extracted less any volume of augmented recharge achieved by projects implemented in the Subbasin.	Net annual groundwater extraction by pumping less than or equal to the sustainable yield for the Subbasin.

Seawater Intrusion

UNDESIRABLE RESULTS:

Groundwater conditions in the Subbasin allow for the increase of the flow of seawater into the Napa Valley Subbasin resulting in chloride concentrations measured in select RMS wells that no longer meet the state secondary maximum contaminant level (MCL) of 250 mg/L.

Current Condition

Historical chloride monitoring at RMS wells in the Subbasin indicate that URs due to seawater intrusion have not occurred in the Subbasin. Measured chloride concentrations are stable at RMS wells that have several years to decades of monitoring histories.

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
A detection and confirmed exceedance of an MT at any of the RMS wells or due to expansion of the 250 mg/L chloride concentration isocontour, where seawater is determined to be the source of the elevated chloride concentrations and the MT exceedance is determined to be the result of Subbasin management.	Secondary MCL for chloride (250 mg/L).	Historical maximum native chloride concentration.

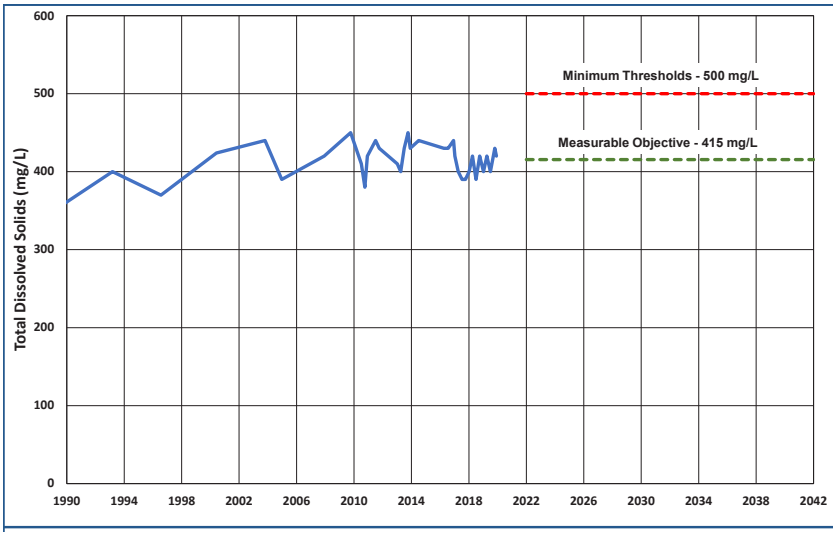
Degraded Water Quality

UNDESIRABLE RESULTS:

A statistically significant increase in concentrations of groundwater quality constituents of concern that negatively affects the suitability of groundwater for domestic, agricultural, municipal or environmental beneficial uses over the planning and implementation horizon of this GSP at any RMS in the Napa Valley Subbasin, as a result of either the action or inaction of the GSA with respect to basin management or GSA projects and management actions.

Current Condition

RMS wells with historical data show detections of constituents of concern at or above MTs; these pre-existing groundwater quality conditions are due to naturally occurring constituents, such as arsenic. URs require that MT exceedances are the result of groundwater conditions caused by action or inaction of the GSA. Historical conditions prior to the formation of the GSA and adoption of the GSP do not constitute a UR.



▲ **Sample RMS Well Water Quality Data**

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
A detected and confirmed exceedance of a MT at any RMS, where the exceedance of the MT is determined to be the result of groundwater conditions caused by action or inaction of the GSA with respect to basin management or PMAs.	Primary MCLs for nitrate (as nitrogen) and arsenic, and secondary MCL for TDS.	Within the historical range and no more than the Trigger Level concentration. Trigger Level concentrations are 75% of the MT.

Depletion of Interconnected Surface Waters

UNDESIRABLE RESULTS:

Significant and unreasonable depletions of interconnected surface water occur when either one of the following two conditions materialize because of groundwater extraction and use in the Subbasin:

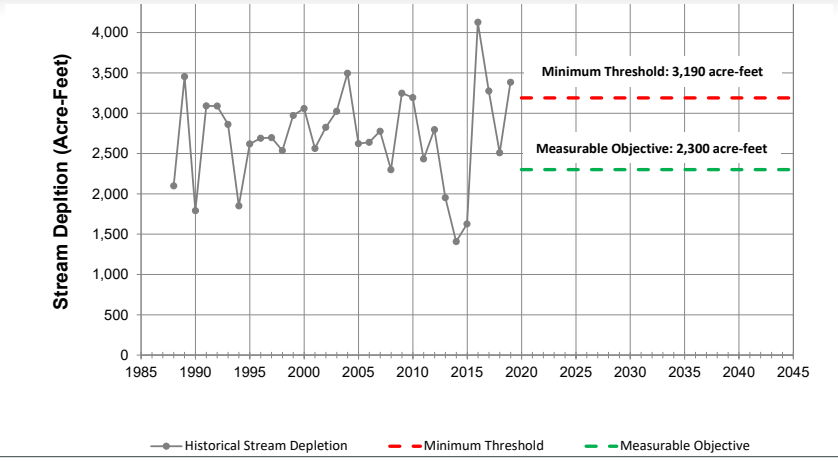
Condition 1: The timing and duration of direct hydraulic connections between groundwater and surface water along the Napa River or its tributaries overlying the Subbasin are reduced relative to the historical conditions and impact groundwater dependent ecosystems or other beneficial users of surface water,

Condition 2: The volume of surface water flowing in the Napa River and/or its tributaries overlying the Subbasin is reduced relative to the historical flow or impacts GDEs or other beneficial users of surface water.

- *20% of RMS well levels are below the MT in the fall for three consecutive years of fall measurements.*
- *Interim UR: Exceedance of the MT for the volume of streamflow depletion occurring for three consecutive years at the Napa River at Pope Street or Napa River at Oak Knoll Avenue locations.*

Current Condition

As a result of generally shallow depths to groundwater, the Napa Valley Subbasin experiences significant interconnections between groundwater and surface waters, primarily along the Napa River and its tributaries. Although there is somewhat greater uncertainty associated with the quantification of the volume of surface water depletion due to groundwater extraction, compared to other sustainability indicators, analysis conducted using the NVIHM finds that rates of depletion have been stable since 1988. Depletion appears to increase somewhat in years following dry or drought conditions and decreases when during periods of moderate to wetter conditions.



▲ **Estimated Surface Water Depletion due to Groundwater Extraction, Napa River near Napa**

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
20% of RMS well levels are below the MT in the fall for three consecutive years of fall measurements. Interim UR - Exceedance of the MT for the volume of streamflow depletion occurring for three consecutive years at the either Napa River at Pope Street or Napa River at Oak Knoll Avenue locations.	Groundwater Level MT: Minimum static groundwater elevation between 2005 to 2014 (10 years prior to SGMA adoption), informed by available data and historical groundwater levels simulated by the NVIHM. Interim Stream Depletion MT: summer/early fall (June to October) streamflow depletion volumes exceeding the second highest seasonal volume of streamflow depletion that occurred from 2005 to 2014 at two RMS on the Napa River at Pope Street and Oak Knoll Avenue	Groundwater Level MO: Average static groundwater elevation between 2005 to 2014 (10 years prior to SGMA adoption), informed by available data and historical groundwater levels simulated by the NVIHM. Interim Stream Depletion MO: A reduced volume of streamflow depletion corresponding to a 10% reduction in average annual historical (2005 to 2014) pumping for all non-de minimis groundwater users. The reduced volume of streamflow depletion during summer/early fall (June to October) is 1,300 acre-feet for the Napa River at Pope Street and 2,300 acre-feet for the Napa River at Oak Knoll Avenue.

Land Subsidence

UNDESIRABLE RESULTS:

Groundwater conditions in the Napa Valley Subbasin result in permanent, inelastic subsidence to a degree that disrupts or causes accelerated damage to important public or private infrastructure (such as: roadways, railways, bridges, and water supply infrastructure) as a result of groundwater extraction. Groundwater levels will be maintained above historical minimum levels [expressed as elevation in feet] at 15 representative monitoring wells to avoid significant and unreasonable effects.

Current Condition

The Subbasin does not have historically documented inelastic subsidence or impacts to surface infrastructure. The sustainable management criteria consider historical rates of displacement and seasonal fluctuations in displacement.

Undesirable Result (URs)	Minimum Threshold (MT)	Measurable Objective (MO)
Any representative monitoring site exceeding MT for three consecutive years. Trigger Level is a MT exceedance at any location. Trigger levels would initiate a review of factors related to negative displacement rates	Land surface elevation change MT: Annual subsidence rate exceeding 0.2 feet/year due to groundwater extraction. Groundwater level MT: Minimum historical groundwater levels exceeded at RMS wells.	Land surface elevation change MO: Annual subsidence rate less than 0.2 feet/year. Groundwater level MO: Minimum historical groundwater levels.

Napa Valley Subbasin Sustainable Yield

GSP regulations require the GSP to quantify the sustainable yield for the Subbasin. Section 10721(w) of the California Water Code states that sustainable yield is defined as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result". The sustainable management criteria described and defined above for the avoidance of undesirable results provide an important basis for determining the sustainable yield. Once those criteria were established, the NVIHM was used in to determine the amount of groundwater that can be withdrawn over a period representing long-term conditions while accounting for any temporary surplus.

Sustainable Yield

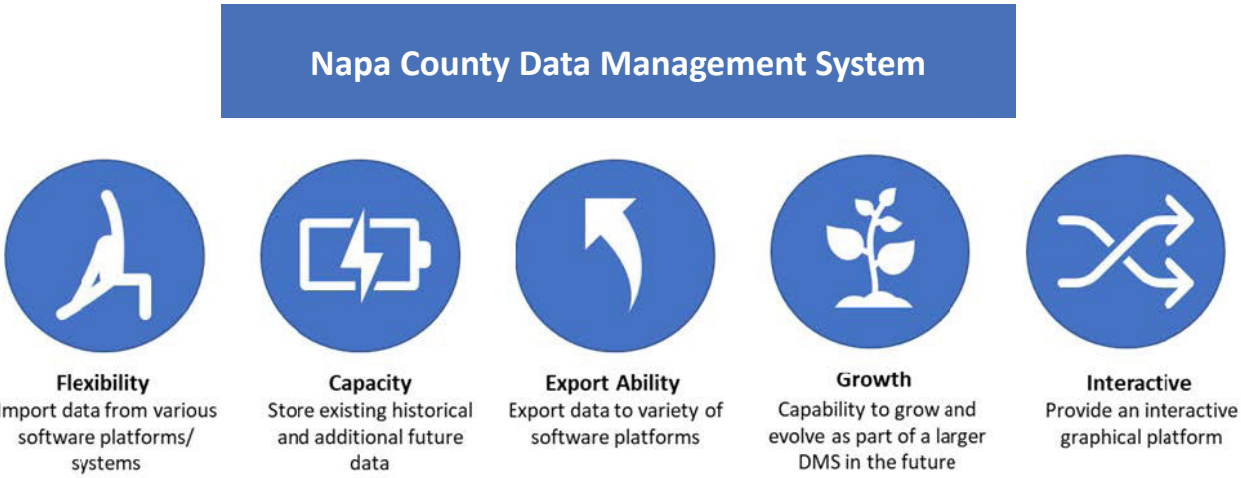
The sustainable yield of the Napa Valley Subbasin is approximately 15,000 AFY, determined from the NVIHM, which accounted for sustainable management criteria through the historical baseline and future model scenario periods.

ES 10. MONITORING DATA MANAGEMENT AND REPORTING (SECTION 10)

Data Management System

Prior to passage of SGMA, Napa County developed the Napa County Data Management System (DMS) for tracking data related to monitoring, analysis, and reporting on groundwater conditions in Napa County (LSCE, 2011). The Napa County DMS was modified to include data relevant to the entire Subbasin and to meet the requirements of the GSP regulations.

The Napa County DMS contains a variety of data types, including well location and construction details, groundwater level and quality data, land subsidence data, and streamflow and stage data. Throughout GSP implementation, water use data, including groundwater extractions, water deliveries, and weather and climate data (e.g., precipitation and evapotranspiration) will be incorporated as part of ongoing DMS updates and maintenance.



Data associated with the six sustainability indicators will be maintained in the DMS for ongoing tracking, assessment, and visualization of groundwater conditions information.

Reporting: Annual Report and Five-Year GSP Updates

After GSP submission, annual reports covering previous water year (October 1st to September 30th) information, primarily including groundwater elevations, total water use, changes in groundwater storage, and progress on Plan implementation, are required. Additionally, a more comprehensive evaluation of basin conditions and Plan implementation actions are required at least every five years that primarily include:

- Updates to groundwater and surface water conditions
- Updates to basin setting, add new information pertinent to the GSP including projects and management actions, and update URs, MTs, and MOs, if necessary
- Evaluation of MOs, MTs, and IMs for each sustainability indicator
- Changes in water resources that may impact the basin setting or lead to URs
- Projects and management actions and their implementation progress as applicable
- Review of monitoring networks
- Update of any notable new information since GSP adoption

Section 10 describes data management software for reporting on and tracking GSP development and implementation.

CA Code of Regulations satisfied: §352.4, §352.6, and §354.4.

ES 11. PROJECTS AND MANAGEMENT ACTIONS (SECTION 11)

Projects and Management Actions (PMAs)

The NCGSA is committed to the sustainable management of groundwater resources in the Napa Valley Subbasin. PMAs have been developed to support the sustainability goal for the Subbasin, in which specific triggers are defined for the six sustainability indicators. These triggers are established to prompt the implementation of PMAs and proactively address the potential or actual exceedance of minimum thresholds or to mitigate undesirable results that have already occurred or are imminent.

Section 11 describes projects and management actions needed for the Napa Valley Subbasin that achieve the sustainability goal in the Subbasin.

CA Code of Regulations satisfied: § 354.42. and § 354.44.

The potential implications for effects on stakeholders, such as agricultural users, public and municipal water systems and their respective users, native vegetation, and GDEs, disadvantaged communities, and self-supplied water users were considered in the selection of PMAs for the Subbasin. Additionally, PMA selection considered the expected effectiveness, benefits, costs, ease of implementation, geographic priority, conformance with existing policies and regulations, and level of inter-Agency coordination required for each planned PMA. Under uncertain future climate conditions, PMAs are viewed as enhancing management capabilities and will be implemented on an as-needed basis. It is anticipated that PMAs would be targeted in specific Subbasin regions that may emerge in the future as potential areas of concern.

Adaptive Management Operational Steps

Napa Valley Subbasin Groundwater Sustainability Plan

SET UP PHASE

1 Promote Stakeholder Engagement

Napa County Groundwater Sustainability Plan Advisory Committee (GSPAC) input on qualitative Sustainable Management Criteria (SMC). Definitions, include Sustainability Goal; support Sustainable groundwater management (Sections 1 & 9)

2 Define Sustainability Goal/Sustainable Management Criteria

GSPAC input on quantitative SMC. (Minimum Thresholds (MTs); Measurable Objectives (MOs); Undesirable Results (URs); Triggers; Interim Milestones (IMs); track/assess conditions; guide decision making to avoid URs and achieve Sustainability Goal (Sections 1 & 9)

3 Outline Projects and Management Actions

GSPAC input on menus of Planned and Potential Project Management Actions (PMAs) and Supporting Actions for decision making and to achieve the Sustainability Goal and avoid URs (Section 11)

4 Develop Models

Hydrogeologic Conceptual Model of physical system (Sections 2 & 4). Integrated Hydrologic Model to develop historical/current/50-year future water budgets (Sections 7 & 8). Models inform complex system responses to natural and human-influenced factors

5 Design Monitoring Programs

Design/implement 9 sustainable management monitoring networks (Sections 3 & 5). Use for ongoing assessment of basin conditions. Includes Representative Monitoring Sites (RMS) wells/other parameters for 6 sustainability indicators (Section 9). Includes Napa County Data Management System (DMS) for storing, querying, analyzing, reporting GSP data (Section 10)

ITERATIVE IMPLEMENTATION PHASE

6 Assessment/Decision Making/ Reporting

- Update basin conditions (Section 6)
- Assess SMC (each sustainability indicator) (Section 9)
- Identify and implement PMAs, as needed (Section 11)
- Annual Reporting (Section 12)

7 Follow-up Monitoring/Refine Tools

- Ongoing monitoring (Sections 5 & 9)
- Identify and address data gaps (Sections 5 & 9)
- Update/refine modeling tools (Sections 8 & 9)

8 Assessment and Interim and/or 5-Year Reporting

- Ongoing assessment of basin conditions (existing and new data) (Section 6)
- Assess conditions' status in response to PMAs (Sections 8 & 9)
- Implement Special Studies, Supporting Actions, Interim and/or 5-Year Reporting (Section 12)

Stakeholder input (GSPAC, public, agencies, etc.)

Stakeholder input (Technical Work Group, public, agencies, etc.)

GSP development incorporates many elements of adaptive management, including requirements to establish quantitative metrics of performance, submit annual reports and review plans every five years (Conrad et al., 2019). In the Napa Valley Subbasin, the components of the GSP align with the steps associated with implementing an adaptive management approach (Williams et al., 2009). Plan implementation and adaptive management commence with the adoption of the Napa Valley Subbasin GSP.

Planned Projects and Management Actions Developed for Implementation	
Vineyard and Winery Water Conservation (Workgroup Tier 1)	Workgroup-compiled vineyard and winery best management practices. GSA adopts or modifies existing well metering and reporting standards and policy and provides direction to groundwater users on aggregate targets for groundwater use.
Managed Aquifer Recharge (Workgroup Tier 2)	GSA develops projects to enhance rates of groundwater recharge, utilizing existing sources of water such as unallocated winter streamflow and runoff generated within the Subbasin.
Expand Recycled Water Use (Workgroup Tier 2)	Municipality-led, GSA-supported efforts to expand the production, distribution, and use of recycled water to offset use of groundwater in the Subbasin.
Pumping Reductions (Workgroup Tier 3)	GSA adopts or modifies existing well metering and reporting standards and policy. GSA adopts groundwater conservation policy, including Subbasin-wide or subregion use limits, consistent with correlative rights. Does not apply to De Minimis extractors.
Groundwater Ordinance and New Well Permit Conditions **(Workgroup Tiers 2 & 3)**	Includes adoption by GSA and/or County of groundwater use restrictions supported by the County Board of Supervisors in 2018 for the Northeast Napa management Area as part of Basin Analysis Report Addendum. Other revisions to the County groundwater ordinance and Water Availability Analysis guidelines will also be considered to align the approval of new uses of groundwater in the Subbasin with the results of the GSP water budget results and sustainable yield analyses.
Potential Projects and Management Actions	
In-lieu Aquifer Recharge (Workgroup Tier 2)	GSA develops or incentives projects to enhance groundwater recharge by expanded capture and use of surplus surface water flows in-lieu of groundwater pumping. Includes verification of pumping reductions through metering and reporting of water use.
Groundwater Ordinance and New Well Permit Conditions (Workgroup Tiers 2 & 3)	GSA adopts well setback or well construction standards to limit direct influence of pumping on interconnected surface waters or subregion groundwater depletion.
Groundwater Ordinance and New Well Permit Conditions (Workgroup Tiers 2 & 3)	County and municipalities revise local codes to align future land use approvals with GSP water budget results and sustainable yield analysis.

In addition to planned and potential PMAs, the GSA and GSPAC identified supporting actions to supplement PMAs. Although supporting actions do not fit the narrow definition of PMAs, they are consistent with the objectives of SGMA. Implementation of supporting actions would begin or continue with GSP adoption.

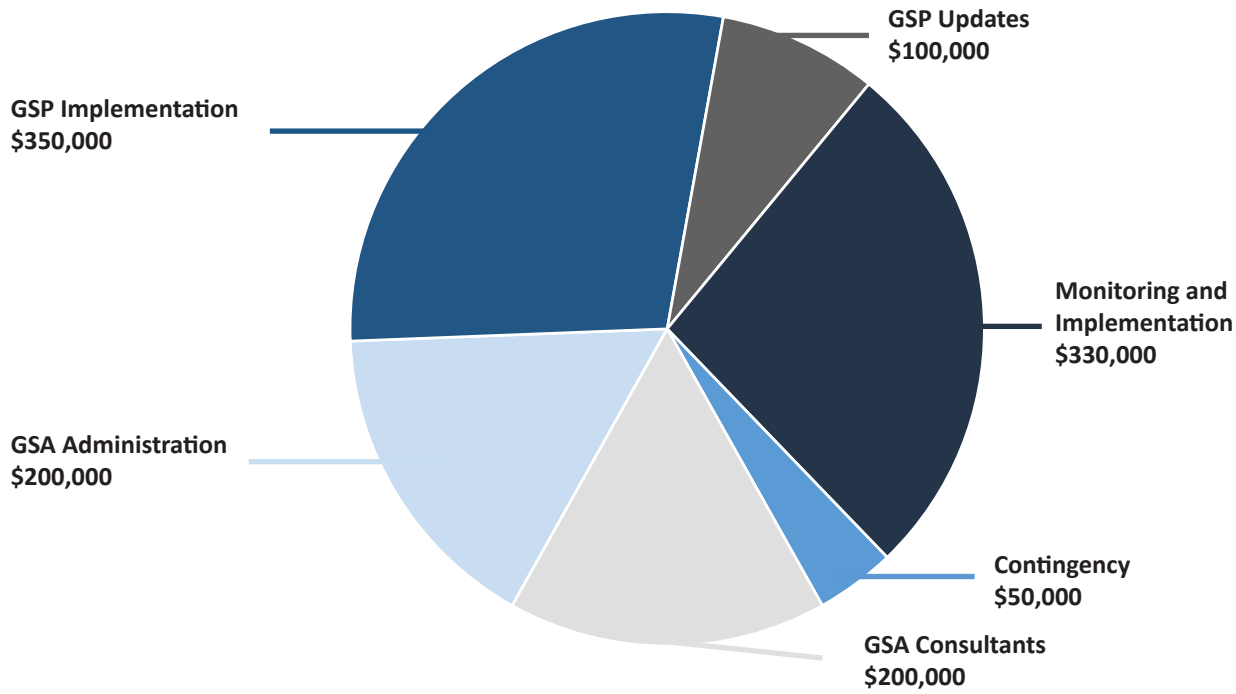
Supporting Actions	
Active Production Well Inventory	GSA will coordinate with Napa County Planning, Building, and Environmental Services and other local well permitting agencies, as necessary, to locate and document all active production wells in the Subbasin.
Tracking Impacts to Drinking Water Users Caused by Groundwater Management	GSA will continue efforts to encourage reporting of water supply shortages, leveraging tools provided to the public by DWR, and report on findings annually and in periodic GSP Updates (required to occur at least every five years).
Stakeholder Engagement and Outreach	GSA will continue to implement the Stakeholder Communication and Engagement Plan adopted by the GSA in 2020.
Coordination with Land Use and Water Management Agencies	GSA will coordinate with local agencies that set land use policy and manage water supplies in the Napa Valley Subbasin to improve sustainable groundwater management efficacy. GSA will continue to encourage participation by those same agencies in SGMA planning and implementation efforts.
Adopt Well Metering and Reporting Standards	GSA will develop and adopt regulations specifying acceptable equipment, installation procedures, reporting procedures, and related aspects necessary to implement groundwater use reporting management actions.

ES 12. PLAN IMPLEMENTATION (SECTION 12)

Plan Implementation

The GSP planning team anticipates that funding and financing sources, including potential fees, will be developed to cover the costs of GSP implementation, development of PMAs, annual reports, and five-year periodic evaluations and updates of the GSP. Implementation of the GSP includes PMAs discussed in Section 11 and the following:

- GSA Administration: Public Outreach, Legal Services, and other tasks.
- GSP Implementation: Grant Writing, Internal Coordination and Convening Technical Work Group Meetings
- GSP Updates: Addressing Comments from DWR on the GSP, Annual Reports, Periodic (five-year) Evaluations, GSP Studies
- Monitoring and Data Management: Monitoring of Wells, Metering and Monitoring Water Use, Data Management System Maintenance
- Contingency



▲ 2022 Annual Estimated Costs for Plan Implementation

The estimated annual cost for GSP implementation ranges from $1.2 to $1.3 million, with a five-year total of about $6 million.

Under SGMA legislation (California Water Code Sections 10730 and 10730.2), GSAs have the authority to charge fees to fund the costs of GSP implementation. Covering the costs of PMAs and general GSP implementation requires evaluating both financing and funding sources and making strategic choices about which to pursue.

Schedule for Implementation

High-priority groundwater basins such as the Napa Valley Subbasin are required to submit and implement a GSP by January 31, 2022. SGMA also requires that groundwater basins meet their sustainability goals within 20 years of implementation (by 2042) and maintain sustainability for the next 50 years (through 2072).

Most GSP activities are ongoing efforts, including GSA administration, community outreach, monitoring activities, grant writing and data management. GSP reporting activities take place on annual and 5-year increments. Responses to DWR comments on the GSP are a one-time activity with expected completion in 2023.

Task Name	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Plan Implementation																					
GSP Submittal to DWR	×																				
Technical Work Group	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Outreach and Communication	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Monitoring and DMS	I	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Model and Water Budget Refinement	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Projects and Management Actions (Planned)																					
Project #1 Managed Aquifer Recharge	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Project #2 Expansion of Recycled Water	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Management Action #1: Vineyard and Winery Water Conservation	I	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Management Action #2: Groundwater Pumping Reductions	I	I	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Management Action #3: Groundwater Ordinance and Well Permit Conditions	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
GSP Reporting																					
Annual Reports	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
GSP Five-Year Updates						×					×					×					×

× **Indicates a submittal**

I **Initial Step: Work Group formation or Workplan preparation**

■ **Indicates ongoing activity (including planning and feasibility studies)**

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