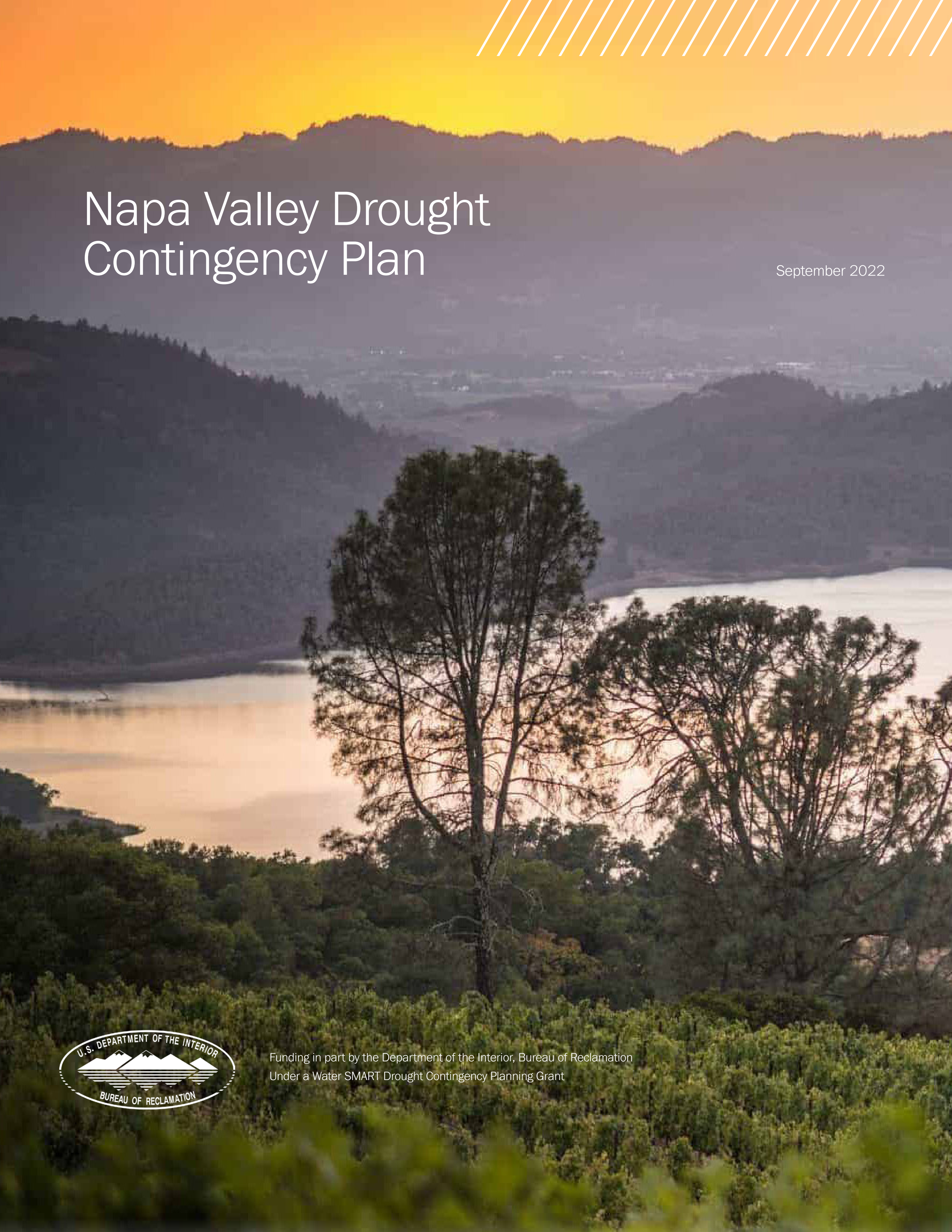

Napa Valley Drought Contingency Plan

September 2022

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Funding in part by the Department of the Interior, Bureau of Reclamation
Under a Water SMART Drought Contingency Planning Grant

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Napa Valley Drought Contingency Plan

Prepared for

City of Napa (Lead Agency) and Napa Valley Drought Contingency Plan Task Force Agencies:

City of American Canyon

City of Calistoga

City of St. Helena

Town of Yountville

Napa County

Napa Sanitation District

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Napa Sanitation District

September 2022

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Specifically, the project team recognizes the following personnel for their efforts:

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List of Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
AF	acre-feet
AFY	acre-feet per year
American Canyon	City of American Canyon
BMP	best management practices
Calistoga	City of Calistoga
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	Consumer Confidence Report
CDVA	California Department of Veterans Affairs
CEQA	California Environmental Quality Act
CO	carbon dioxide
CVP	Central Valley Project
CWC	California Water Code
DAC	disadvantaged community
DCP	drought contingency plan
Delta	Sacramento-San Joaquin Delta
District	Napa County Flood Control and Water Conservation District
DRA	drought risk assessment
DWR	California Department of Water Resources
EO	executive order
eWRIMS	Enhanced Water Right Information Management System
GCM	global climate model
GSA	groundwater sustainability agency
GSP	groundwater sustainability plan
GWR	groundwater recharge
IPCC	Intergovernmental Panel on Climate Change
IPR	indirect potable reuse
IRWM	integrated regional water management
IRWMP	Integrated Regional Water Management Plan
JPA	joint powers authority
KCWA	Kern County Water Agency
LAFCO	Local Agency Formation Commission
Local Agencies	entities participating in the NVDCP
LSCE	Luhdorff and Scalmanini, Consulting Engineers
mgd	million gallons per day
MOU	memorandum of understanding
MSR	Municipal Services Review
MST	Milliken-Sarco-Tulocay
N/A	not applicable/available
Napa	City of Napa
NapaSan	Napa Sanitation District
NBA	North Bay Aqueduct
NBWRA	North Bay Water Reuse Authority
NBWRP	North Bay Water Reuse Program
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NVDCP	Napa Valley Drought Contingency Plan
O&M	operations and maintenance
P3	public-private partnership
Plan Area	drought contingency plan area
Pool	annual entitlement water pool
RCP	Representative Concentration Pathways
Reclamation	United States Department of Interior Bureau of Reclamation
RWCP	Regional Water Conservation Program
SB	senate bill
SGMA	Sustainable Groundwater Management Act
St. Helena	City of St. Helena
SWA	surface water augmentation
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TBD	to be determined
TOC	total organic carbon
USGS	United States Geological Survey
UWMP	urban water management plan

Vallejo	City of Vallejo
Water TAC	Water Resources Technical Advisory committee
WICC	Napa Valley Watershed Information and Conservation Council
WRF	water reclamation facility/ water recycling facility
WSCP	water shortage contingency plan
WTP	water treatment plan
WWTP	wastewater treatment plant
Yountville	Town of Yountville

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Executive Summary

The United States Department of Interior Bureau of Reclamation (Reclamation) provided financial assistance to develop the Napa Valley Drought Contingency Plan (NVDCP). The NVDCP is structured to address the following questions:

- How will we recognize the next drought?
- How might hydrologic risks and uncertainties exacerbate/affect drought?
- How will drought affect us?
- How can we protect ourselves from the next drought?

The planning process is structured to help planners answer these questions and to encourage an open and inclusive planning process that employs a proactive approach to building long-term drought resiliency.

Background

The drought contingency plan area (Plan Area) includes the Napa River watershed that drains into the northern edge of San Pablo Bay and includes an area of 430 square miles, as shown on Figure ES-1. The agencies participating in the NVDCP, collectively referred to as the Local Agencies, include the City of Napa (Napa), City of American Canyon (American Canyon), City of Calistoga (Calistoga), Town of Yountville (Yountville), City of St. Helena (St. Helena), Napa County, and Napa Sanitation District (NapaSan). Water users in the Plan Area rely on a mixture of water supplies from local surface water, imported surface water, groundwater, and existing recycled water produced at several wastewater treatment plants.

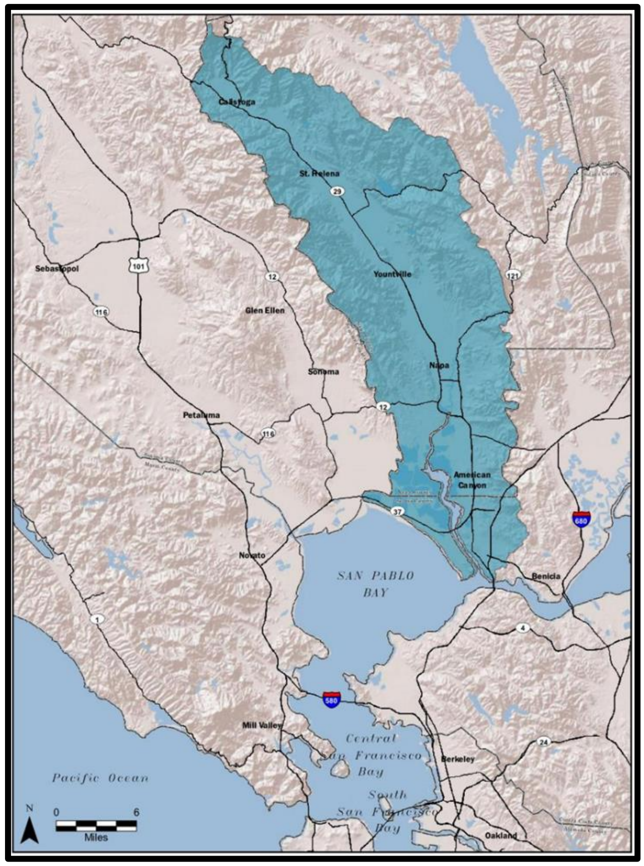

Figure ES-1. Napa Valley drought contingency Plan Area boundary

This NVDCP addresses a geographic area that experienced multiple impacts associated with California's last drought, which was from 2012 to 2016. During this period, Napa County was in a Severe to Exceptional Drought and now find themselves in the midst of another one at the time of this report in 2021. To provide supply reliability and resilience and to adapt to future uncertainties, each of the NVDCP agencies is steadfast in implementing drought contingency strategies, such as demand management, water supply portfolio diversification, aging infrastructure repairs/replacement, and interagency facility connections. The recent drought also inspired more integrated regional water management and drought mitigation among the NVDCP agencies to cooperatively address water supply reliability concerns and drought preparedness on a mutually beneficial and regionally focused basis.

The Local Agencies developed this NVDCP to meet the required elements of Reclamation's WaterSMART Drought Response Program Framework. Staff from each of the Local Agencies formed part of the DCP Task Force that collaborated in defining the NVDCP's direction and developing its content. The DCP Task Force communication and outreach process provided stakeholders and interested parties an opportunity for substantive engagement on the NVDCP development.

Water System Overview

Each Local Agency has its own unique water supply portfolio. Each relies on a diverse infrastructure network and supply portfolio to deliver high-quality, reliable water within their respective service areas. Collectively, existing and planned water supply sources among the Local Agencies include surface water from local and imported sources, groundwater, and recycled water. Local surface water is used by urban water suppliers, agricultural users, and some smaller self-supplied domestic users within the region. Napa County Flood Control and Water Conservation District (District) is the State Water Project (SWP) contract administrator for supplies from the North Bay Aqueduct (NBA). The District administers the SWP water contract on behalf of sub-contractors, including the cities of American Canyon, Napa, and Calistoga. Groundwater is the main supply for most agricultural, rural residential, and other users in unincorporated areas of Napa County (including the Milliken-Sarco-Tulocay [MST] basin area in the southern part of the valley). Recycled water is widely used throughout the Plan Area.

The multiple water and wastewater agencies, cities, environmental uses, and agricultural areas are linked by water. Understanding these links is critical to addressing drought response. Coordinating efforts to manage supplies and respond to drought impacts will benefit all. A schematic showing the interlinkage between the water supplies and the Local Agencies is shown on Figure ES-2.

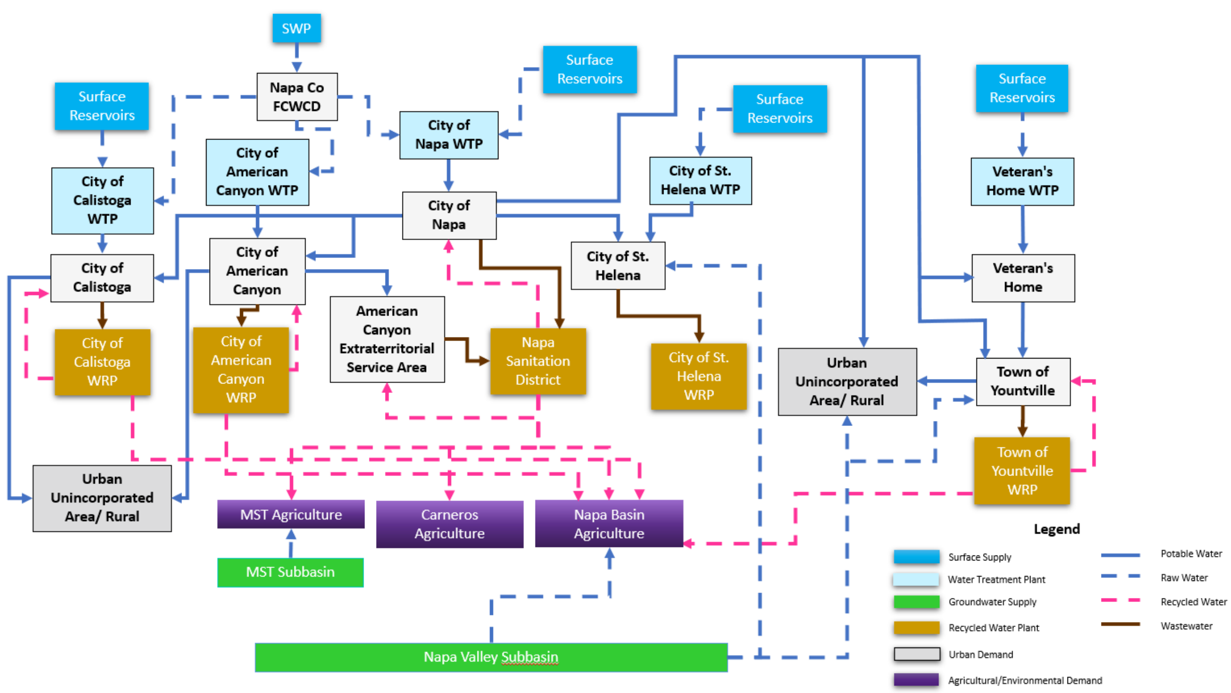

Figure ES-2. Schematic of the interconnectedness of existing water supplies in the Napa Valley

Regional Water Demand and Water Use Efficiency

The Local Agencies collectively serve more than 140,000 customers, providing water for municipal, industrial, landscape, and agricultural uses. Water use varies year to year depending on many factors, such as weather, regulatory and environmental drivers, and the economy. Despite this annual variability, Local Agencies' collective water use over the last two decades demonstrates a downward trend. More substantial water use reductions over the last decade, and particularly over the last several years, are largely due to recession, drought water use restrictions, and changing culture. Some lasting efficiencies were gained during the recent drought; however, extreme water use reductions over the last several years are due in part to short-term actions taken in response to the emergency drought mandate, such as interior water conservation practices and limited outdoor watering.

The Local Agencies have implemented water use efficiency programs over decades to manage demands and effectively reduce per capita demands. As part of this ongoing commitment to water use efficiency, the Local Agencies continue to expand and update their programs to integrate new practices and policies. In addition to their individual programs and initiatives, many of the Local Agencies work together coordinating conservation and other water awareness efforts, including participating in education programs and fostering public understanding of Napa Valley's water challenges and opportunities.

Drought Monitoring

The California Department of Water Resources (DWR), Reclamation, and others monitor water supply conditions on a statewide level. In addition to the statewide monitoring, the Local Agencies also have their own monitoring procedures for groundwater and local surface water supplies. The Napa Valley has an extensive network of monitoring wells that have been monitoring groundwater levels, storage, quality, and overall groundwater use going as far back as 1918. As of 2020, there was a total of 107 monitoring sites across Napa County (Napa County GSA, 2021). These sites form part of monitoring networks that are operated by several entities, including Napa County, DWR, State Water Resources Control Board, and the United States Geological Survey. The data from these monitoring networks are currently being used in the development of the Napa Valley Groundwater Sustainability Plan (GSP) to establish a baseline on groundwater and related surface water conditions and to develop a representative monitoring network to track sustainability indicators for the Napa Valley Subbasin. Monitoring procedures for local surface water supplies vary by source but typically involve monitoring flows, reservoir storage levels, and water quality. The Local Agencies also monitor customer water use, track the effectiveness of water conservation programs, and provide regular updates to their decision-making bodies (e.g., city councils) on water use trends and projections compared to available supplies. Monitoring data is typically used to meet state-mandated reporting requirements.

Vulnerabilities in the Region

To create a basis for drought contingency planning, specific threats to the region's critical water resources and factors contributing to those threats must be understood. In addition, past climate, water supply, and water use trends and potential future drought conditions and climate change impacts must be considered. In the context of this DCP framework, drought vulnerability is the extent to which Local Agencies and the region are exposed or susceptible to risk. Risk is a combination of frequency of occurrence, magnitude and severity, and consequences. The Local Agencies use the resulting baseline risk assessment to inform potential drought response actions and mitigation measures described in this NVDCP.

The Plan Area's collective supply varies with hydrology in terms of total volume available and diversity of the supply portfolio. Information from the Local Agencies was compiled to quantify potential regional supply shortfalls for the collective and individual Local Agencies in 2020 and 2035, based on comparing the region's future direct demands to projected total supplies under future conditions (Normal Year, Third Consecutive Dry Year, and Critical Dry Year conditions).

As of 2020, the total available annual supply of about 72.7 thousand acre-feet (TAF) in a Normal Year is expected to reduce to 54.9 TAF in a Third Consecutive Dry Year, and 50.5 TAF in a Critical Dry Year. When additional supply is available in wet and Normal Years, groundwater and surface water storage are typically replenished. These supply totals are expected to increase to 74.9 TAF for a Normal Year, 56.8 TAF in a Third Consecutive Dry Year, and 52.3 TAF in a Critical Dry Year by 2035 due in large part to the continued investment in building up local recycled water programs. When considered from a regional perspective, the region can anticipate meeting Normal Year demands for wet/normal water supply years in the near term (2020) and long term (2035). Discrepancies in the total projected water supplies when comparing Normal Year, Third Consecutive Dry Year, and Critical Dry Year scenarios in 2020 and 2035 stem mainly from reductions in SWP supplies. While some reduction in available supply from other local surface water supplies is anticipated, none is as substantial as the one stemming from the SWP.

Not all the Local Agencies supplies vary consistently with the cumulative regional perspective. The composition of an individual Local Agency's supplies vary from Normal Year, to Third Consecutive Dry Year, and Critical Dry Year scenarios. Some Local Agencies have more significant challenges in dry conditions. While the overall supply numbers suggest there is enough water across all year types in both the near term (2020) and future scenarios (2035), it's only when water supplies are disaggregated to the individual agencies that you find supply deficits during drought conditions for some agencies. To make up these shortfalls, drought response and mitigation actions (i.e., projects) from a regional perspective will be needed to varying degrees in the region.

Regional Uncertainties

Critical water supplies in the region face multiple threats and uncertainty factors (see Figure ES-3). These factors may reduce the availability and reliability of existing and future water supplies to serve the region's population.

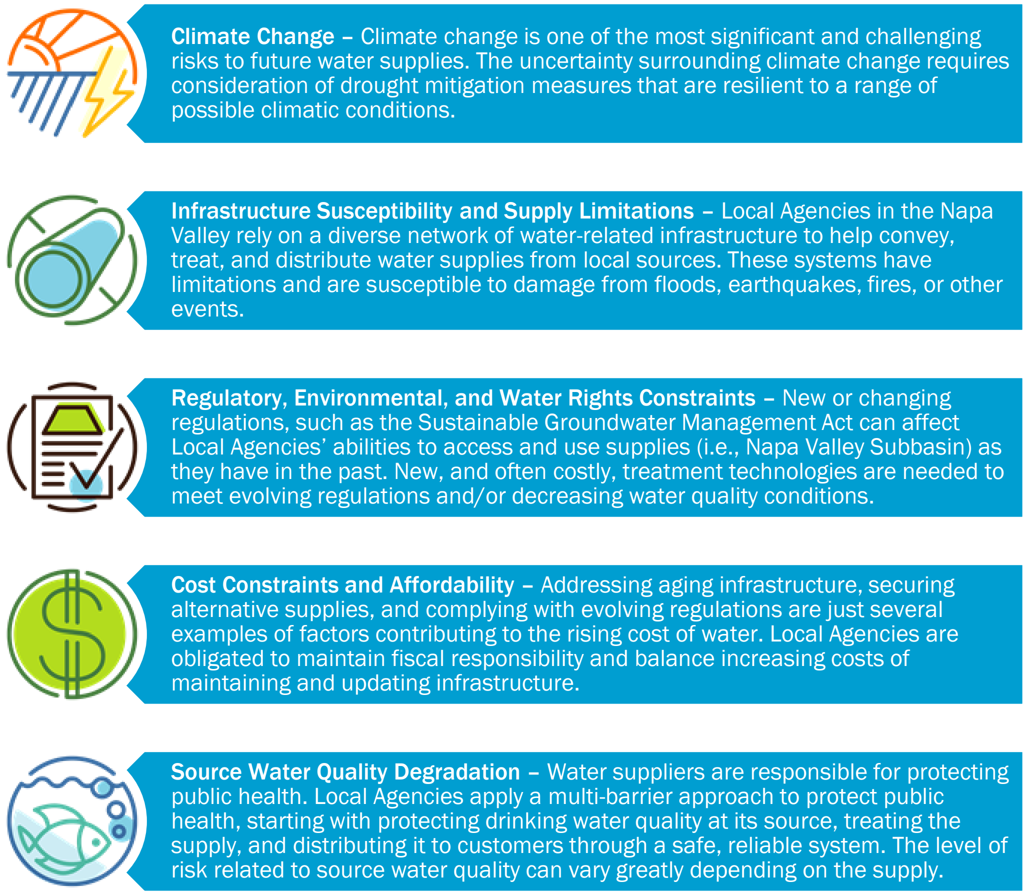

Figure ES-3. Uncertainty factors in the Plan Area

Climate change is one of the greatest sources of uncertainty in long-term (more than 50 years) water supply planning. Based on the findings from California's Fourth Climate Change Assessment, the Plan Area is projected to see a jump in temperatures and an increase in the year-to-year variability in precipitation (Ackerly et al, 2018). Quantifying the effects of some of these climactic uncertainties on existing water supplies can be challenging; however, based on some of the projected temperature and precipitation trends one can infer that the amount of water supply from existing sources may be adversely impacted by greater variability in rainfall and the water demands increased due to temperature in the future. Potential drought impacts extend beyond the water supply sources themselves. According to California's Fourth Climate Change Assessment Report, the 2012–2016 record-low snowpack resulted in an estimated $2.1 billion in economic losses and 21,000 jobs lost in the agricultural and recreational sectors statewide and exacerbated an ongoing trend of groundwater overdraft (Ackerly et al, 2018).

Drought Response Actions

The Local Agencies acknowledge the distinction between long-term water conservation (ongoing water use efficiency), short-term emergency water use reductions (temporary cutbacks), and the difference between actions to appropriately support each. Water shortage conditions, such as what transpired during the last drought, can require actions to support short-term emergency water use cutbacks. These drought response actions are near-term actions triggered during specific stages of drought to manage the limited supply and decrease the severity of immediate impacts. Drought response actions can be quickly implemented and provide expeditious benefits.

Each Local Agency has its own unique set of drought response actions that were established for specific stages of drought and are guided by corresponding triggers and goals. During the last drought, the Local Agencies implemented their Water Shortage Contingency Plans (WSCP) and expanded their conservation efforts to increase public awareness, restrict specific water uses, prohibit wasteful water practices, and increase conservation rebate program funding. Not all of the Local Agencies are required to prepare WSCPs. Calistoga, St. Helena, and Yountville fall below the water delivery trigger amounts of serving at least 3,000 customer connections or delivering more than 3,000 acre-feet per year (AFY) of water specified by the California Water Code (CWC), and thus are not required to maintain a WSCP or an Urban Water Management Plan (UWMP). Even though these agencies do not have formal UWMPs or WSCPs, they do have procedures in place with their Municipal Codes to address water shortage conditions.

There are no overall regional stages or triggers that guide action to be taken during drought. Rather, each Local Agency relies on its WSCP or Municipal Code for direction. It is unlikely that the region will work toward one set of uniform stages and triggers because the planning approaches vary based on numerous factors, such as each agency's water supply portfolio, customer base, and policies and ordinances adopted by their decision-making bodies (e.g., city councils). Although each of the Local Agencies have varying stages and triggers, a key objective of continuing drought contingency planning efforts as a result of this NVDCP is a regional, coordinated effort to prepare response actions to mitigate impacts of water shortages during times of drought. The Local Agencies have identified the following response actions that could be implemented regionally:

- **Regional Water Conservation Program:** A Regional Water Conservation Program (RWCP) would help water utilities in the Napa Valley work together to encourage their customers to use water efficiently and meet best management practices for urban water conservation. Elements of an RWCP could include coordinated public outreach campaigns, outreach materials, conservation devices, and community events and workshops. Consistent regional messaging through a coordinated outreach campaign (e.g., press releases, social media, radio, billboards, and television announcements) may improve public involvement in water conservation. Regional programs and materials would also expand eligibility for participation in coordinated efforts beyond an individual agency's service area. The RWCP would lead regional water conservation efforts and provide the public with consistent messaging and useful tools designed to ensure efficient use of Napa Valley water resources.

- **Putah South Canal Intertie:** This conceptual project, which was previously identified during the 2012–2016 drought, could be viewed as both a drought response action and a mitigation action. It would involve installing a pipeline that connects the Putah South Canal of the Solano Project to the NBA of the SWP to provide an urgent water supply to agencies in the Napa Valley. The intertie would afford agencies in the Napa Valley access to water supply from the Solano Project during emergency situations. During the last drought, a transfer of up to 10,000 acre-feet (AF) was considered. The actual amount of water that could be made available is not known at this time.

Drought Mitigation Measures

Drought mitigation measures are actions, programs, or strategies implemented to address potential risks and impacts and reduce the need for response actions when drought occurs. The findings of the vulnerability assessment conducted as part of this NVDCP were critical in identifying and developing potential mitigation and response actions (i.e., projects). As the NVDCP transitioned to this stage of the DCP process, the DCP Task Force recognized that having a clear set of goals and objectives was paramount to formulating projects with a high degree of economic, social, and institutional benefits as well as increased funding support potential. Using an interactive process, a set of goals and objectives (including weighting) for the NVDCP were established by the DCP Task Force. These are summarized in Table ES-1.

Table ES-1. NVDCP Goals and Objectives

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives	Weighting Factor
Supply reliability and flexibility	• Improve local, regional, and State Water Project supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project in dry years	35%
Watershed approach	• Interface with Napa County Groundwater Sustainability Agency to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	20%
Environmental enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems	15%
Economic feasibility and financial viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	30%

With a clear set of goals and objectives to guide the process, the NVDCP focused on identifying projects aimed at mitigating some of the supply shortfalls and vulnerabilities identified during the water supply and demand analysis and vulnerability assessment conducted in this NVDCP. This project identification process leveraged regional efforts that had been or were being conducted, as well as existing studies and data. Many of the Local Agencies have individually or collaboratively identified projects that can help build drought resiliency. These projects are in the planning, design, or even implementation phases. The NVDCP provides a mechanism by which to understand the regional implications of the projects under development, identify where potential vulnerabilities exist, and collaboratively plan and build support for projects that build long- term resilience to drought.

Table ES-2 lists these possible mitigation measures and the Local Agencies engaged in each. Each of the identified projects features shared benefits, including:

- A reduction in regional vulnerability to drought.
- A direct or indirect water yield of water under future conditions.
- The ability to use existing resources, facilities, and infrastructure to reduce both the overall cost and the environmental footprint of the measure.

The projects were categorized into one of two stages. Certain projects fell under the **Implementation Ready** stage, which includes projects that are thought to be relatively well-defined and physically implementable, or the **Planning** stage, which includes concept-level projects and/or implementable studies. This distinction is identified in Table ES-2. Regardless of stage designation, the Local Agencies consider the entire list of 22 measures viable possibilities, depending on need and timing.

Table ES-2. Drought Mitigation and Response Measures

Project Category	Number	Drought Mitigation Measure	Stage	Engaged Agencies
Groundwater management	1	Aquifer Storage and Recovery	Planning	All DCP Task Force Agencies
	2	Indirect Potable Reuse via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	Planning	All DCP Task Force Agencies
	3	Integrated Water Supply Wells	Planning	All DCP Task Force Agencies
Conveyance	4	Phase 1 Recycled Water Distribution System Expansion	Implementation Ready	American Canyon, Napa County
	5	Phase 2 Recycled Water Distribution System Expansion	Implementation Ready	American Canyon, Napa County
	6	Milliken-Sarco-Tulocay Northern Loop	Implementation Ready	NapaSan, Napa County
	7	Milliken-Sarco-Tulocay Eastern Extension	Implementation Ready	NapaSan, Napa County
Storage	8	Additional Soscol Water Recycling Facility (WRF) Covered Storage	Implementation Ready	NapaSan, Napa County
	9	Napa State Hospital Storage Tank	Implementation Ready	NapaSan, Napa County
	10	NapaSan Seasonal Storage	Implementation Ready	NapaSan, Napa County
	11	Lake Curry Purchase (Vallejo Lakes System)	Implementation Ready	All DCP Task Force Agencies
	12	Sites Reservoir Allocation Purchase	Implementation Ready	All DCP Task Force Agencies
Treatment	13	Water Reclamation Facility (WRF) Phase 2 Treatment Plant Upgrades	Implementation Ready	American Canyon, Napa County
	14	Soscol WRF Phase 2 Treatment Plant Upgrades	Implementation Ready	NapaSan, Napa, Napa County
	15	Purified Water Feasibility Study	Planning	Napa, American Canyon, NapaSan
	16	Mitigation Strategies for Boron Reduction	Planning	Calistoga, Napa County
Operations	17	Dwyer Road Pump Station Project	Implementation Ready	Calistoga, Napa, St. Helena
	18	Dunaweal Pump Station Replacement Project	Implementation Ready	Calistoga, Napa
	19	Putah South Canal Intertie	Implementation Ready	All DCP Task Force Agencies
	20	North Bay Aqueduct Expansion	Planning	All DCP Task Force Agencies
	21	Regional Water Conservation Program	Implementation Ready	All DCP Task Force Agencies
	22	Integrated Supply and Operations Study	Planning	All DCP Task Force Agencies

The NVDCP goals and objectives were used to conduct the evaluation and prioritization analysis to identify those drought measures best suited to build long-term resiliency to drought and mitigate the risks posed by drought in the region. Quantitative and qualitative criteria were used to assign raw scores based on each project's ability to satisfy project objectives. These raw scores were normalized, and the weighting factors applied to develop a composite score for each assessed project. Results of the project evaluation and prioritization are summarized for Implementation Ready (Figure ES-4) and Planning Projects (Figure ES-5) below. These figures illustrate the overall score of each project and the performance of the project against each goal (shown by the length of each color in the bar). The order in which projects are shown on the figures should not be interpreted to be the order in which projects should occur. To develop drought resiliency for the region, a portfolio of many measures must be implemented both in the near term and in the long term. The NVDCP is intended to be a living document that is updated regularly to ensure implementation status and project details are up to date. Those measures in concept or development need to be further developed so their overall scores can be updated once more information is known. This will provide the region with a dynamic DCP that can address continually evolving conditions.

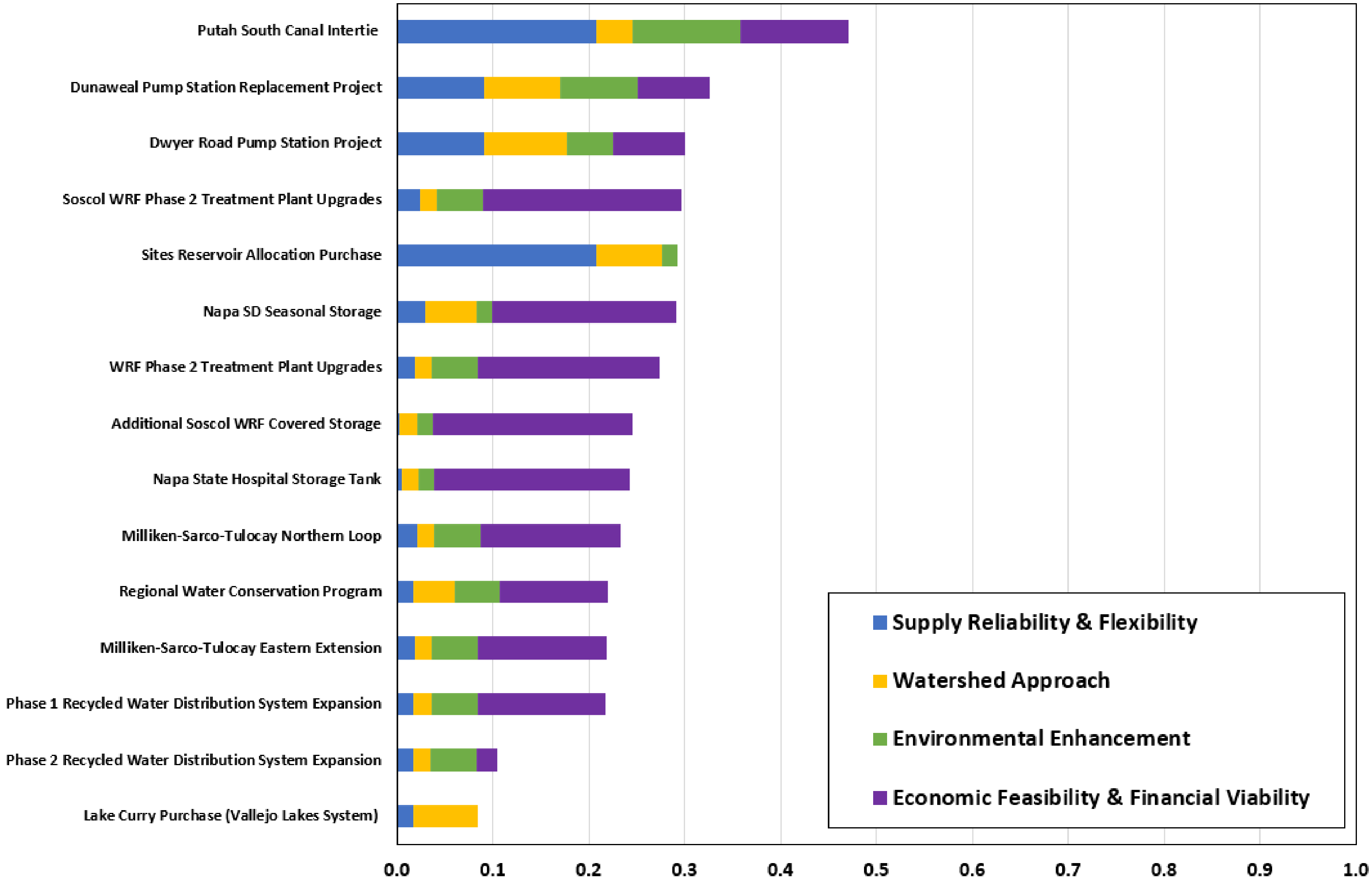

Figure ES-4. Implementation Ready projects evaluation results – Goal Level

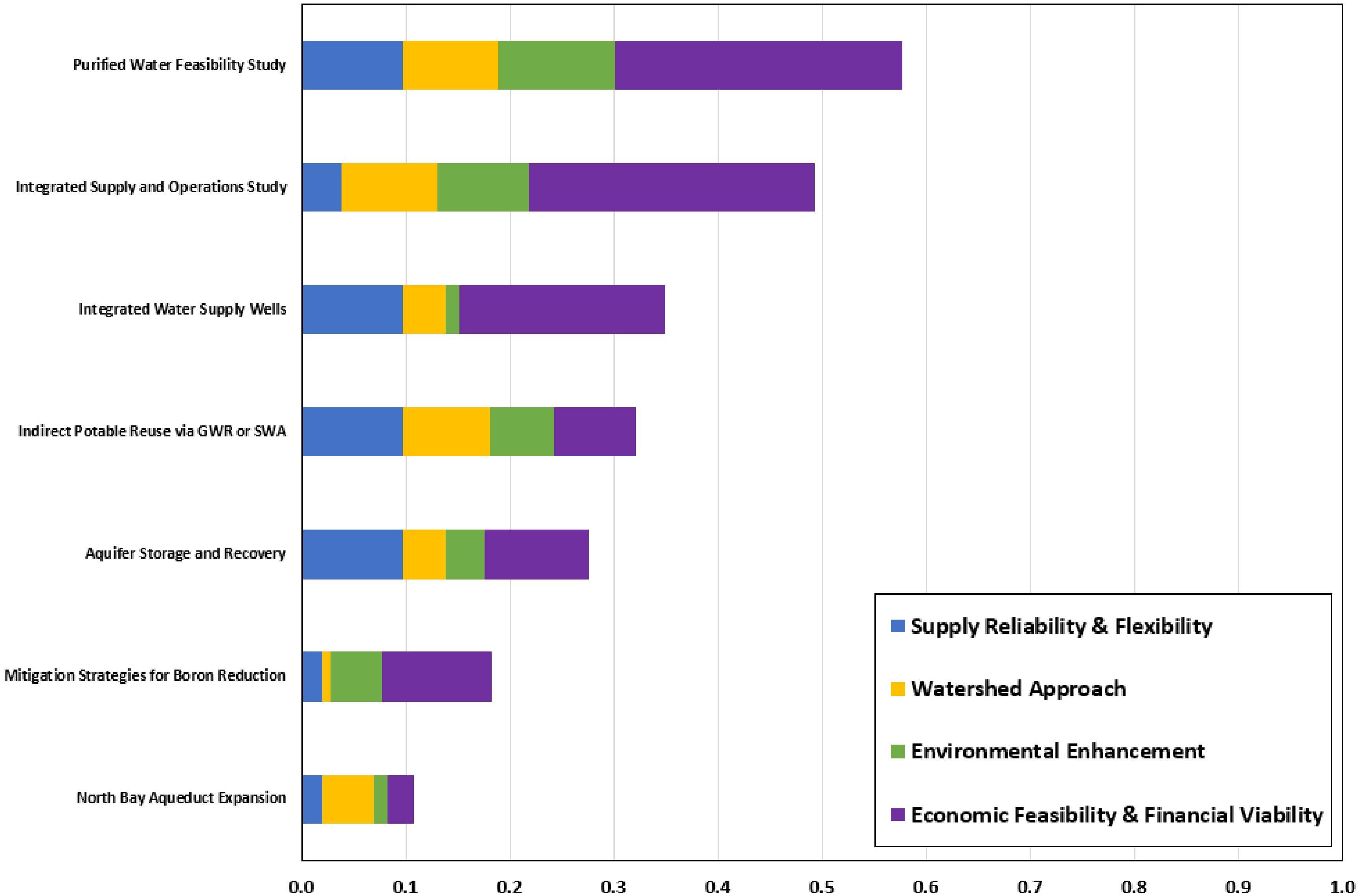

Figure ES-5. Planning projects evaluation results – Goal Level

DCP Implementation Strategy and Administrative and Organizational Framework

It is important to assign the roles and responsibilities for undertaking the actions necessary to implement each element of the NVDCP, including the procedures necessary to conduct drought monitoring, initiate response actions (including emergency response actions), initiate mitigation actions, and make updates to the document. Information flow and coordination among the Local Agencies and others, as well as the approach for undertaking the actions necessary to implement each element of the NVDCP, will leverage efforts and stakeholder activities already in place, as well as the considerations and preferences discussed with the DCP Task Force. Based on discussions and feedback, the DCP Task Force was presented with the following two implementation strategy options for supporting their future work in building organizational capacity and in undertaking future studies and projects:

- **Implementation Strategy Option 1:** The DCP Task Force would leverage its existing Water Resources Technical Advisory Committee (Water TAC) meetings as the forum to continue addressing the various elements of the NVDCP. The Water TAC meets monthly and would remain a staff-level forum for discussing projects and potential partnerships and exchanging information. Implementation of any additional regional studies, project analysis, grants, and/or financing proposals would need approval of individual Local Agency boards and could be administered under project specific Memorandum of Understanding (MOUs).
- **Implementation Strategy Option 2:** This approach would be a more facilitated process that would involve developing a Regional MOU. A consultant, such as CONCUR. Inc., who is currently facilitating the Napa Valley Subbasin GSP stakeholder engagement process, would help the Local Agencies craft the Regional MOU. The Regional MOU would serve as an ongoing, long-term agreement among the Local Agencies that would provide a clear understanding among the parties as to their common expectations and objectives of the evolving NVDCP, thus establishing a common intention or framework for future engagements.

In the near term, the DCP Task Force or some subset thereof expect to use Implementation Strategy Option 1 to further advance plans, explore funding options, and study feasibility for the projects and programs described in this NVDCP. Early efforts are already underway to advance some of the drought mitigation actions identified in Table ES-2, such as the Dwyer Road Pump Station Project and the Dunaweal Pump Station Replacement Project, for which a subset of the Local Agencies is currently looking to procure implementation funding. Other projects are still conceptual, and the feasibility and timing of implementation will depend on future needs, Local Agency approvals, and funding opportunities.

Beyond the measures considered in this NVDCP, the Local Agencies are also pursuing other projects individually or with agencies outside of the NVDCP partnership to further improve Napa Valley supply reliability. Taken together, joint NVDCP and individual Local Agency efforts are solidifying systems and resources to provide drought reliability with a sustainable, reliable, high-quality water supply for a healthy community and vibrant Napa Valley economy.

Section 1
Introduction

The United States Department of Interior Bureau of Reclamation (Reclamation) provided financial assistance to develop the Napa Valley Drought Contingency Plan (NVDCP). The NVDCP is an outgrowth of the North Bay Water Reuse Authority (NBWRA) that is implementing a regional Title XVI recycled water program. The agencies participating in the NVDCP's development, collectively referred to as the Local Agencies, includes several of the same member agencies as the NBWRA and continues their work toward building resiliency into the regions' water supply. Most drought contingency planning processes are structured to address the following questions:

- How will we recognize the next drought in the early stages?
- How might hydrologic risks and uncertainties exacerbate/affect drought?
- How will drought affect us?
- How can we protect ourselves from the next drought?

The planning process is structured to help planners answer these questions and to encourage an open and inclusive planning effort that employs a proactive approach to building long-term drought resiliency. This section describes the background, objectives, and steps taken in the development of this Drought Contingency Plan (DCP). The coordination with other ongoing studies in the plan area, and agency and stakeholder engagement, is also described

1.1 Background

The drought contingency plan area (Plan Area) includes the Napa River watershed that drains into the northern edge of San Pablo Bay and includes an area of 430 square miles, as shown on Figure 1-1. The Local Agencies participating in the NVDCP are the City of Napa (Napa), City of American Canyon (American Canyon), City of Calistoga (Calistoga), Town of Yountville (Yountville), City of St. Helena (St. Helena), Napa County, and Napa Sanitation District (NapaSan). The Napa Valley is home to urban and rural residential areas, extensive vineyards and agriculture, and diverse environmental communities that include riparian corridors and salt marsh that provide habitat for fisheries and aquatic species and a home for migrating waterfowl on the North American Pacific flyway. Water users in the Plan Area rely on a mixture of water supplies from local surface water, imported surface water, groundwater, and existing recycled water produced at several wastewater treatment plants (WWTP).

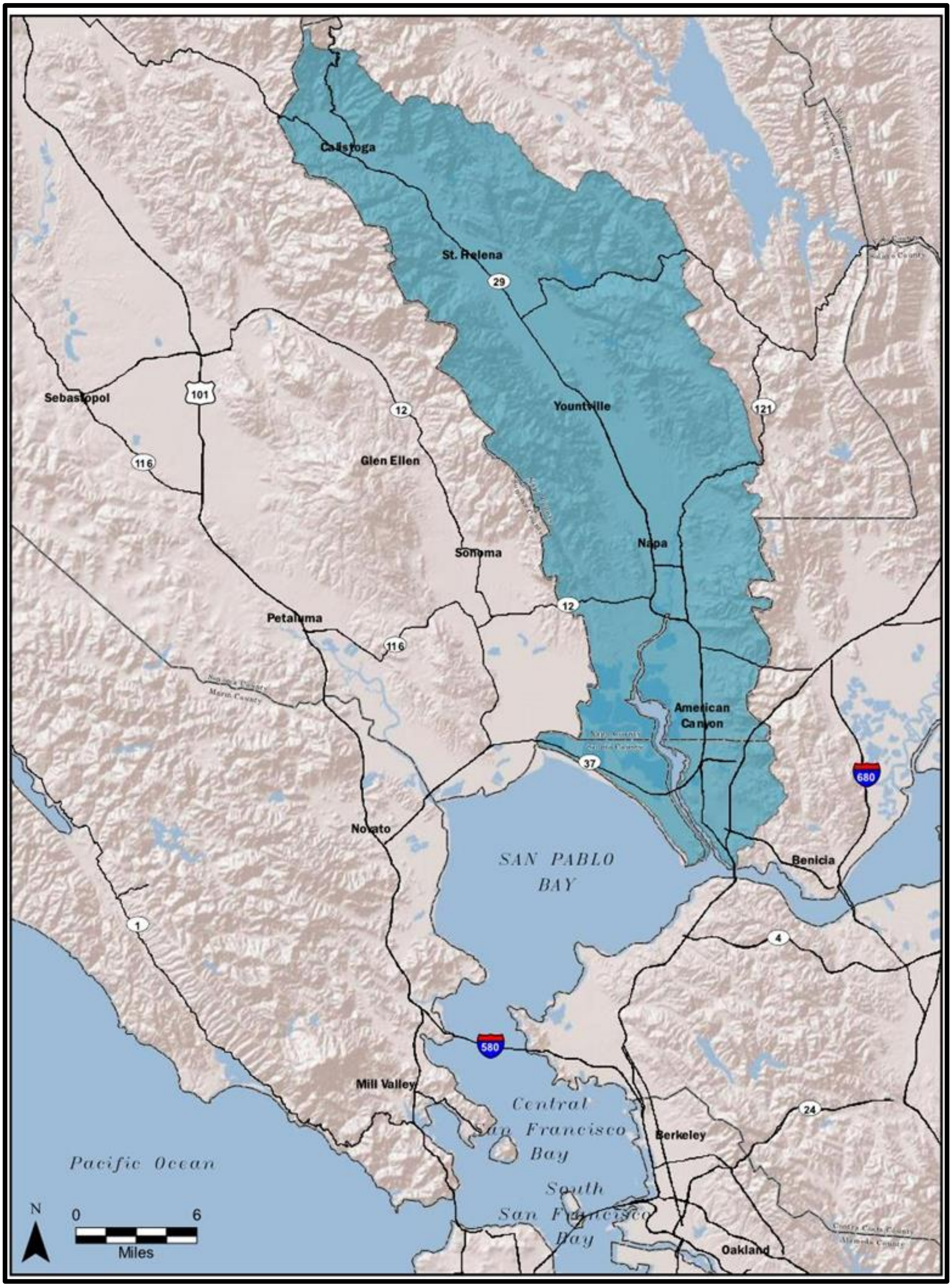

Figure 1-1. Napa Valley drought contingency Plan Area boundary

Local surface water is used by urban water suppliers, agricultural users, and some smaller self-supplied domestic users within the region. The Napa River watershed is the primary drainage in the Plan Area and includes many smaller tributaries that feed into the river and, in turn, into San Pablo Bay. Streamflow in river and creeks varies greatly by season and year depending on precipitation.

Napa County Flood Control and Water Conservation District (District) is the State Water Project (SWP) contract administrator for supplies from the North Bay Aqueduct (NBA). The District administers the SWP water contract on behalf of sub-contractors, including the cities of American Canyon, Napa, and Calistoga. American Canyon and Napa treat SWP water at individually owned and operated plants and distribute to their customers. Napa treats Calistoga's SWP water and wheels it to them. Napa also wheels some of American Canyon's SWP water during emergencies or high demand periods. St. Helena, Yountville, and the California Veterans Home are considered "wholesale" customers of Napa as any water they purchase is then sold to their own retail customers. The SWP has been providing reduced flow levels due to drought, Sacramento-San Joaquin Delta (Delta) water constraints, and NBA conveyance capacity limitations.

Recycled water is widely used throughout the project area. NapaSan conveys recycled water to Napa, the Carneros agriculture region, the Milliken-Sarco-Tulocay (MST) agricultural and rural residential region east of Napa, and to other unincorporated areas in southern Napa County. American Canyon, St. Helena, Calistoga, and Yountville convey recycled water within their jurisdiction as well as to unincorporated agricultural and rural residential areas in Napa County.

Groundwater is the main supply for most agricultural, rural residential, and other users in unincorporated areas of Napa County (including the MST basin area in the southern part of the valley). Cities of Napa, American Canyon, and Calistoga do not currently rely on groundwater for drinking water supplies. St. Helena uses groundwater to supplement water supplies, and Yountville has a groundwater well for emergencies and drought back up.

The multiple water and wastewater agencies, cities, environmental uses, and agricultural areas are linked by water. The five water purveying municipalities rely primarily on a combination of local surface water and imported supplies. A dry year in Napa Valley and/or reduced imported supplies will impact all agencies simultaneously. Coordinating efforts to manage supplies and respond to drought impacts will benefit all. Given that the Plan Area is unique with a mix of sensitive environmental resources, urban areas, and high-value agriculture all competing for limited water resources, the key water supply challenges facing the Plan Area are summarized as:

- **Water Quality and Reliability.** Continued urbanization of the greater San Francisco Bay Area, including the Plan Area, requires highly reliable sources of water. Additionally, the local agricultural economy is dominated by high-value vineyards, which requires a highly reliable water supply to maintain both production and the secondary tourism economy associated with the industry.
- **Environmental Protection.** The vitally important estuarine ecosystem of the North San Pablo Bay area is home to the Napa-Sonoma Salt Marsh, which provides habitat for listed and endangered species. Although protective and restorative measures are in place and underway, the habitat restoration program requires a reliable water supply to support these efforts.
- **Water Vulnerability.** The local surface water supplies are less-reliable sources due to climate and precipitation changes that result in drought, reduced winter flow, and dry or low summer flows. These shortages are further exacerbated by impacts associated with multiple demands on these limited supplies, including environmental flow requirements. Imported water supplies are subject to reduced availability during the most severe drought conditions and because of pumping restrictions attributable to Delta Smelt and other environmental constraints. These water supplies have limited ability to be expanded in the future. Additionally, excessive costs for

imported supplies may require some agencies to seek alternative sources and options in order to reduce impacts on water rates.

- **Groundwater Availability and Quality**. Groundwater supplies are primarily pumped for agricultural and rural residential users, with some municipal wells supplementing surface water supply. In some Napa Valley sub-regions, basins have experienced declining levels and marginal quality and are at risk of intrusion from poor quality water.
- **Recreation.** Water is a highly valued recreation and aesthetic amenity for the outdoor-oriented citizens of the North Bay.
- **Costs.** Potential new supplemental supplies have often been shown to be very costly when studied under the North Bay Water Reuse Program. Stringent wastewater effluent discharge requirements regulate reuse and discharges year-round, which impact the costs of wastewater treatment and disposal.

These water management challenges have resulted in the need for the agencies in the Napa Valley to investigate expanding the use of various water supply alternatives as a way to increase water supply and reliability within the budgetary constraints of the agencies and their users.

1.1.1 Drought in the Region

This NVDCP addresses a geographic area that experienced multiple impacts associated with California's last drought (2012–2016). During this period, Napa County was in a Severe to Exceptional Drought. The drought monitor map shown on Figure 1-2 (California map on the left) shows that the entirety of Napa County was in a state of Exceptional Drought during the Summer of 2014. Even though supply conditions for water agencies in the Napa Valley improved significantly during the 2017 water year (Fall 2016 through Spring 2017), the potential for future droughts looms as evidenced by the recent drought monitor map on Figure 1-2 (California map on the right) that shows Napa County once again in Exceptional Drought. To provide supply reliability and resilience and to adapt to future uncertainties, each of the Local Agencies is steadfast in implementing strategies, such as demand management, water supply portfolio diversification, aging infrastructure repairs/replacement, and interagency facility connections. Through implementing these strategies, the Local Agencies aim to maintain a reliable water system at affordable rates while protecting the environment and preparing for the future. Additionally, recent drought has inspired more integrated regional water management and drought mitigation among the Local Agencies to cooperatively address water supply reliability concerns and drought preparedness on a mutually beneficial and regionally focused basis.

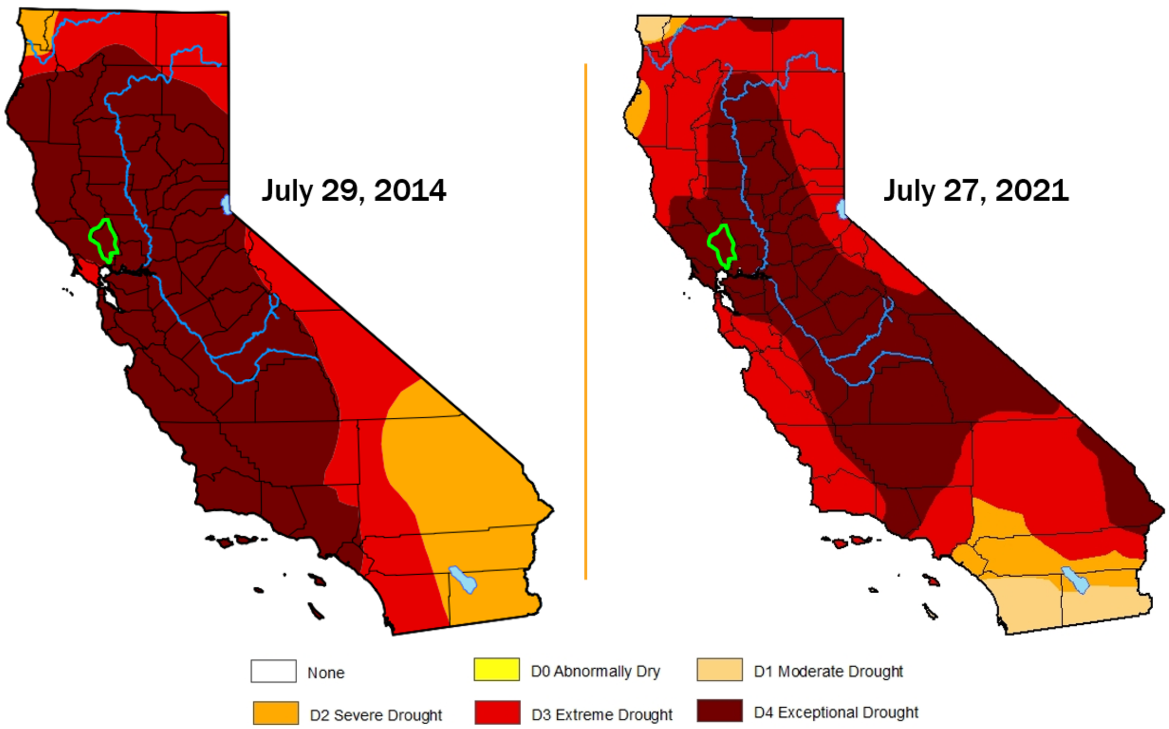

Figure 1-2. U.S. drought monitor comparison

1.2 DCP Development Steps and Elements

As part of the required steps undertaken to initiate a DCP, a Detailed Work Plan and a Communications and Outreach Plan were developed.

1.2.1 Detailed Work Plan

Napa developed a Detailed Work Plan in consultation with Reclamation that described in detail how the various tasks included in developing the DCP will be accomplished. This included a detailed project schedule, and descriptions of the coordination and responsibilities of Reclamation, Napa as the planning lead, the Drought Contingency Plan Task Force (DCP Task Force), and key stakeholders. The Detailed Work Plan was submitted on November 4, 2019, and subsequently approved by Reclamation.

1.2.2 Development of a Communications and Outreach Plan

As part of the DCP process, Napa also developed a Communications and Outreach Plan (attached to the Detailed Work Plan) that established a DCP Task Force and described how stakeholders and the public would be informed of and involved in the planning process. For this NVDCP, the Napa Valley Watershed Information and Conservation Council (WICC – https://www.napawatersheds.org/) was identified as the host entity for stakeholder input in the DCP process. The WICC is hosted by Napa County, and cities and local organizations regularly attend quarterly meetings to learn about and discuss water and resource management issues throughout the Napa Valley. The WICC provided a well-organized and pertinent vehicle for disbursing project information and for gathering input from a wide range of potentially affected community and regional stakeholders. The implementation of the Communications and Outreach Plan for agency and stakeholder engagement in the development of the NVDCP is further described in Section 1.4.

1.2.3 DCP Elements

Reclamation defines six elements to be addressed in the DCP. When available, existing information is used to satisfy the required elements. The elements are described below and illustrated on Figure 1-3. A checklist of the DCP elements and items to be discussed within each element based on the Detailed Work Plan, Reclamation's WaterSMART Drought Response Program Framework (Reclamation, September 2019), and corresponding DCP section number is provided in Table 1-1.

- **Drought Monitoring.** Define the Local Agencies' processes for monitoring near- and long-term water availability and a framework for predicting the probability of future droughts or confirming an existing drought. Drought monitoring is discussed in Section 3. Discussion on improving communications and coordination on future droughts is discussed in Section 5 and 7.
- **Vulnerability Assessment.** Include a vulnerability assessment evaluating the risks and impacts of drought based on a range of future conditions. A vulnerability assessment of the Local Agencies' water supplies and drought impacts to other sectors is provided in Section 4.
- **Response Actions.** Identify, evaluate, and prioritize response actions and activities that can be quickly implemented during a drought to mitigate the impacts. Existing Water Shortage Contingency Plans (WSCP) for each DCP Task Force agency and the drought response actions are described in Section 5.
- **Mitigation Actions.** Identify, evaluate, and prioritize mitigation actions and activities (referred to as drought mitigation measures) that will build long-term resiliency to drought and that will mitigate the risks posed by drought. Drought mitigation measures are described and evaluated in Section 6.
- **Operational and Administrative Framework.** Identify who is responsible for undertaking the actions necessary to implement each element of the DCP, including communicating with the public about those actions. The operational and administrative framework to continue the implementation of the recommendations and coordination developed as part of this NVDCP are described in Section 7.
- **Plan Development and Update.** Describe the process that was undertaken to develop the plan, including how stakeholders were engaged and how input was considered. In addition, the DCP must also include a process and schedule for monitoring, evaluating, and updating the DCP. The process to develop this NVDCP is described in Section 1, and the proposed process to update this NVDCP is described in Section 7.

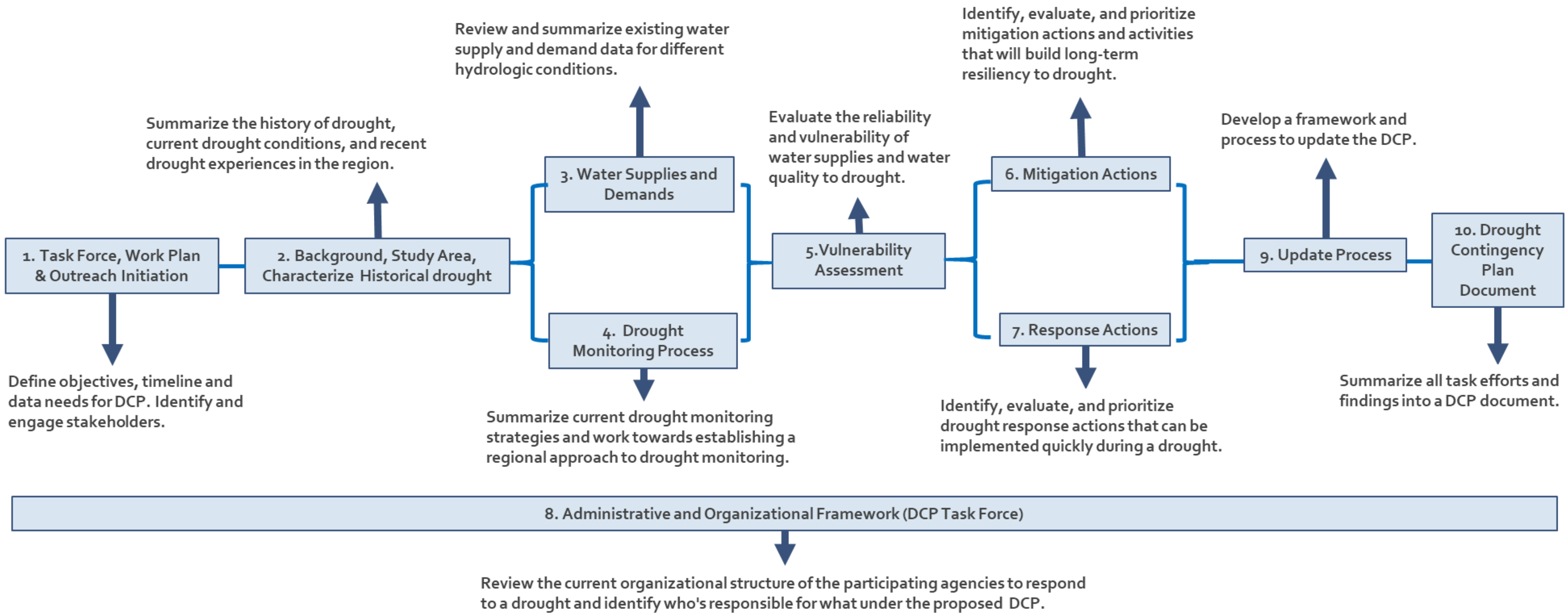

Figure 1-3. Drought contingency plan development steps and elements

Table 1-1. Drought Response Program Requirements Aligned with Napa Valley DCP Report Sections

Drought Response Program Framework Element	Drought Response Program Element Description	Section in this NVDCP Where Addressed
Drought monitoring	Establish process for monitoring near- and long-term water availability and framework for predicting the probability of future droughts or confirming an existing drought.	• Section 3.2 describes how Local Agencies monitor water supplies
	Explain how water availability and drought-related data will be used to predict or confirm droughts, including identifying metrics and triggers that will be used to define stages of drought.	• Section 5.1.2 describes water shortage stages and triggers for each of the Local Agencies
Vulnerability assessment	Include a vulnerability assessment evaluating the risks and impacts of drought.	• Section 4.3 defines risks to critical resources • Section 4.4 defines climate change risks, including preliminary findings from Basin Study • Section 4.5 defines impacts of drought across various sectors
	Assessment must be based on a range of future conditions.	• Section 4.1 defines future conditions used for this NVDCP • Section 4.2 defines potential supply shortfalls under the future conditions • Section 4.4.8 presents a supply reduction analysis based on the potential effects of climate change
Mitigation actions	Identify, evaluate, and prioritize mitigation actions and activities that will build long-term resiliency to drought and that will mitigate the risks posed by the drought.	• Section 6.2 describes the approach to identifying drought mitigation measures • Section 6.2 characterizes the list of potential drought mitigation measure projects • Section 6.3 defines the screening approach for prioritizing the drought mitigation measures • Section 6.3 summarizes the ranking of the drought mitigation measures • Section 6.5 outlines potential next steps for certain drought mitigation measures of interest
Response actions	Identify, evaluate, and prioritize response actions and activities that can be implemented during a drought to mitigate the impacts.	• Section 5.1.2 describes water shortage stages and triggers for each of the Local Agencies • Section 5.2 presents regional drought response coordination • Section 5.3 recommends future regional potential drought response actions
Operational and administrative framework	Identify who is responsible for undertaking the actions necessary to implement each element of the DCP.	• Section 7 describes the implementation of the NVDCP and overview of the NVDCP work plan
	Identify roles, responsibilities, and procedures necessary to conduct drought monitoring, initiate response actions, initiate mitigation actions, and update the plan.	• Section 7 describes NVDCP implementation and a potential sequence of decisions for implementing the drought mitigation measures
Plan development and update process	Describe the process that was undertaken to develop the plan.	• Section 1 describes the coordination with other ongoing regional studies, and the agency and stakeholder engagement process
	Include a process and schedule for monitoring, evaluating, and updating the DCP.	• Section 1 defines the process to develop the NVDCP • Section 7.3.3 describes the process to update the NVDCP

1.3 Coordination with other Studies

The development of this NVDCP included coordination with other local studies so that potential linkages supporting project implementation funding could be identified as part of the NVDCP. Initially, this meant coordinating with the Local Agency Formation Commission (LAFCO) consultant that was developing Napa County's Water and Wastewater Municipal Services Review (MSR). With the formation of the Napa County Groundwater Sustainability Agency (GSA) in December 2019 and the corresponding development of the Napa Valley Subbasin Groundwater Sustainability Plan (GSP), opportunities for collaboration were identified.

The formation of GSAs and development of GSPs was spurred by Governor Brown's signed legislation requiring that California's critical groundwater resources be sustainably managed by local agencies. The Sustainable Groundwater Management Act (SGMA) gives local agencies (cities, counties, and water districts) powers to sustainably manage groundwater over the long term and requires GSAs be formed and GSPs be developed for medium- and high-priority groundwater basins. The Napa Valley Subbasin GSP will include policies and recommendations for taking care of and protecting groundwater within the subbasin for the long term. In addition to addressing SGMA's GSP requirements, the Napa Valley Subbasin GSP is expected to generally describe a proactive approach to managing the Napa Valley groundwater subbasin through the implementation of projects that build capacity into the regional urban water supply portfolio and result, to the greatest extent possible, any future urban demand on groundwater resources.

The NVDCP and the Napa Valley Subbasin GSP are considered separate but complementary planning efforts. They have very similar study areas (see Figure 1-4) and similar tasks. Although they are independent studies, opportunities for integration between the plans are expected to be available. While the two efforts are on slightly different timelines, the Draft Napa Valley Subbasin GSP is expected to be available later this year (2021), and both planning efforts will propose projects and management actions to achieve their respective goals. Due to the limited new water supply options in the Napa Valley, and as described in the opening discussion, both the NVDCP and Napa Valley Subbasin GSP will likely identify a similar set of projects. As such, there is opportunity for collaborating on potential joint projects that address both groundwater and drought resiliency.

Since a portion of the DCP Task Force members are also part of the Napa County GSA, the two study teams have been able to openly communicate, share data, and continue to look for collaboration opportunities. This is key, as the region has a robust stakeholder community that may be confused by the appearance of some overlap between these two studies and how future projects would be implemented. Additionally, under current and likely future economic conditions, it can be anticipated that stakeholder groups will be scrutinizing all public investment in studies and projects. Anticipating this scenario, leadership is working on developing a unified message that demonstrates a collaborative process that leverages local, state, and federal funding opportunities to develop plans for urban supply resiliency that will in turn protect groundwater for agricultural and other designated uses. By continuing to work together, both studies can better help secure and leverage project funding, eliminate potential competition for state and federal grants , and provide equitable cost distribution across agencies, assessed properties, and/or ratepayers.

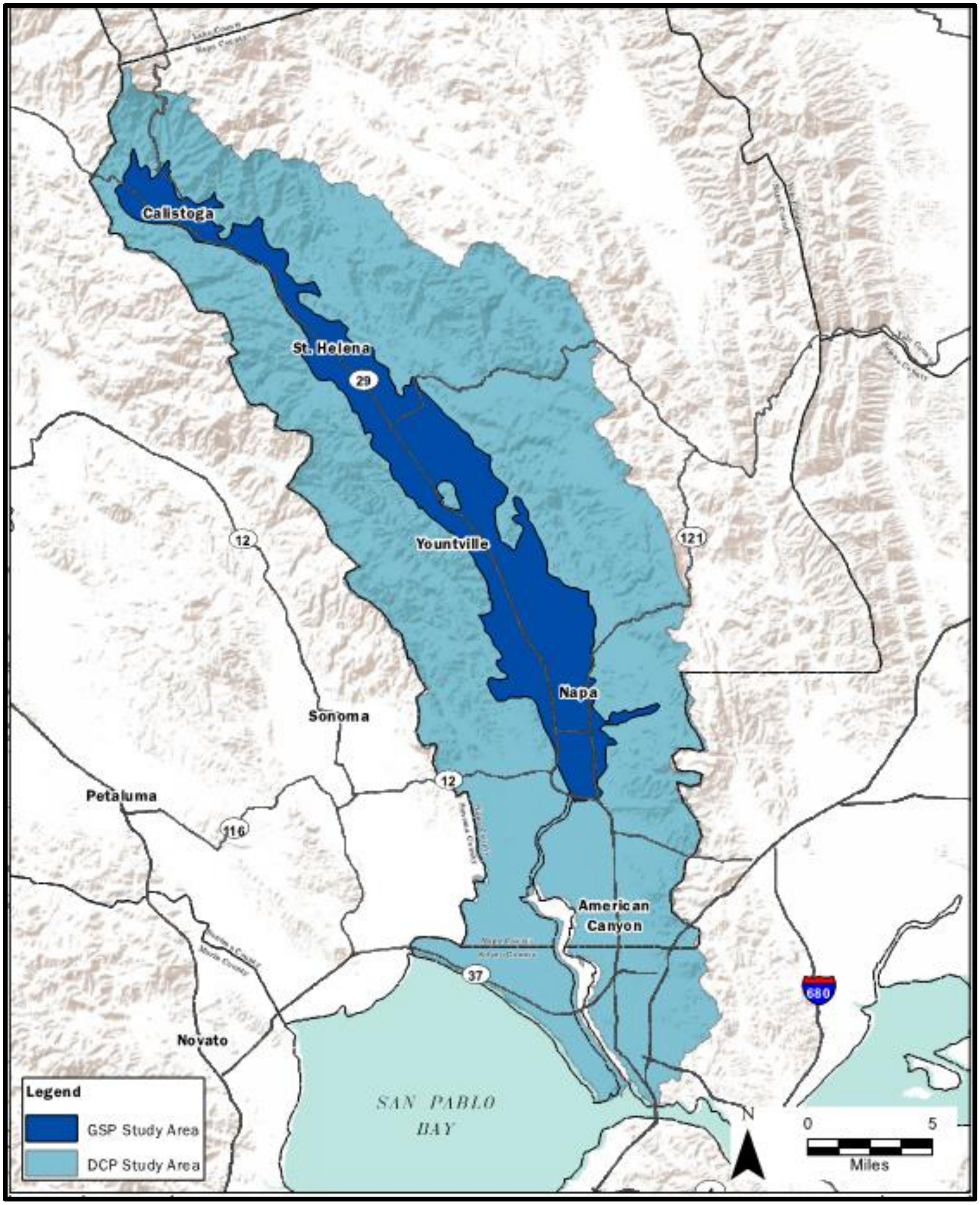

Figure 1-4. Napa Valley DCP and Napa County GSP study areas

1.4 Agency and Stakeholder Engagement

Staff from each of the local participating agencies formed part of the DCP Task Force that collaborated in defining the NVDCP's direction and developing its content. DCP Task Force Meetings were held at key junctures of the NVDCP development process to afford agencies the ability to provide direction and feedback on strategies and work products developed as part of the DCP process. The DCP Task Force meetings and other work sessions are summarized in Table 1-2. The Local Agencies in the DCP Task Force are:

- City of American Canyon
- City of Calistoga
- City of Napa
- City of St Helena
- Town of Yountville
- Napa County
- Napa Sanitation District

The DCP Task Force communication and outreach process provided stakeholders and interested parties an opportunity for substantive engagement on NVDCP development. The DCP Task Force identified the WICC as the host entity for stakeholder input in the NVDCP process. As previously mentioned, the WICC hosts quarterly meetings where regional stakeholders convene to learn about and discuss water and resource management issues throughout Napa Valley. At various intervals during the DCP development process there were plateaus and/or milestones. These were opportune times in the process where key stakeholders and the public were briefed on the status of assessments and allowed to provide comment and input to the DCP Task Force. Regional stakeholders were afforded the opportunity to provide input through five WICC meetings. These meetings are also summarized in Table 1-2. All relevant meeting materials, including presentations, meeting agendas, and attendance logs, are included in Appendix A.

The DCP Task Force agencies were provided a draft DCP report to review in September 2021.

Table 1-2. Napa Valley DCP Agency and Stakeholder Engagement			
Meeting Number	**Meeting Date**	**Attendees**	**Activities Covered**
DCP Task Force Meeting #1	September 9, 2019	DCP Task Force, Reclamation	The purpose of the meeting was to kickoff the NVDCP. The meeting provided an overview of a DCP, review of the NVDCP tasks and proposed approach, and included a discussion with the DCP Task Force to identify desired outcomes. As part of the meeting, the DCP Consultant team briefly discussed activities completed to date, which included a discussion on the system interconnectedness schematics, data needs, and an introduction to the data request template. The DCP Task Force agencies were tasked with the review and update of the system interconnectedness schematics and initial data gathering.
DCP Task Force Meeting #2	January 22, 2020	DCP Task Force, Reclamation	The meeting primarily focused on water demands and supplies for the region. This included reviewing population and land use trends, reviewing existing and projected water demands, identifying sources and quantities of existing water supplies, and comparing supply and demand in the near term and in a future condition. The DCP Consultant team also led a discussion on the goals, objectives, and measures to be used for screening the mitigation and response actions. Included in this discussion were the desired outcomes from the DCP Task Force, Reclamation guidance, and an explanation of how these metrics would be used to evaluate and prioritize mitigation and response actions. A brief introduction of the administrative and organizational framework was provided during the meeting. The DCP Task Force agencies were tasked with review and confirmation of the preliminary supply and demand analysis, drought response procedures, and the proposed goals and objectives to be used to evaluate and prioritize mitigation and response actions.
Stakeholder Outreach Meeting #1	February 27, 2020	WICC	Regional stakeholders were introduced to the NVDCP. The meeting included a general overview of the proposed study area, tasks, and schedule. Stakeholders were provided with an update on activities completed to date, as well as a summary of the preliminary supply and demand analysis, development of the goals and objectives, and an introduction to the administrative and organizational framework aspect of the DCP. Stakeholders were informed about the NVDCP website, which they could visit for information and to provide input.
DCP Task Force Meeting #3a	June 10, 2020	DCP Task Force, Reclamation	The DCP Consultant team presented the updated water supply and demand analysis. The analysis was updated with revised values that had been provided by the DCP Task Force agencies. An overview of the vulnerability assessment, climate change considerations, and results of the analysis were provided. DCP Task Force members were allowed an opportunity to provide feedback and ask questions to refine/update the vulnerability assessment. The meeting also included an update on the potential interface between the NVDCP and the Napa Valley Subbasin GSP. A potential implementation grant opportunity was also discussed.
DCP Task Force Meeting #3b	June 17, 2020	DCP Task Force, Reclamation	The meeting provided a recap of the vulnerability assessment that was presented at the previous Task Force meeting and continued the discussion on the goals and objectives. As part of this discussion, the DCP Task Force assigned weighting factors to each of the goals to facilitate the numerical evaluation of the projects being assessed. The drought mitigation and response actions tasks were previewed, and the administrative and organizational framework, including some of the governance structures identified in the LAFCO MSR, were discussed. The DCP Task Force agencies were tasked with reviewing the water supply and demand data and the vulnerability assessment.
Stakeholder Outreach Meeting #2	July 30, 2020	WICC	Regional stakeholders were provided with an NVDCP status update. This included a brief summary on tasks completed to date, such as water supply and demand analysis and the vulnerability assessment. A preview of upcoming work included the screening that would be used to evaluate mitigation and response actions. Discussions continued regarding an appropriate NVDCP administrative and organizational framework. The stakeholders were also informed about the ongoing interface between the NVDCP and the Napa Valley Subbasin GSP.

Table 1-2. Napa Valley DCP Agency and Stakeholder Engagement			
Meeting Number	Meeting Date	Attendees	Activities Covered
Mitigation and Response Actions Worksession	September 14, 2020	DCP Task Force, Reclamation	This workshop was used to review the preliminary list of mitigation and response actions (i.e., projects). The preliminary list of projects was sorted into project “categories” (see Section 6) and was comprised of projects that were at various stages of implementation ranging from concept level to construction/implementation. Also discussed was the project evaluation and prioritization approach. Results of the project evaluation and prioritization would be used to score/evaluate the projects from the aforementioned list. The DCP Task Force agencies were tasked with reviewing and providing feedback on the preliminary list of projects prior to the evaluation and prioritization process.
Stakeholder Outreach Meeting #3	October 22, 2020	WICC	Regional stakeholders were provided an update on recent NVDCP activities. The update primarily focused on the progress made on the mitigation and response actions. This included providing a general overview of the preliminary project list, summary of the recent DCP Task Force work session, and outlining next steps in the process. A brief update on the administrative and organizational framework and the interface between the NVDCP and the Napa Valley Subbasin GSP was provided.
DCP Task Force Meeting #4a	November 9, 2020	DCP Task Force, Reclamation	The meeting focused primarily on the mitigation and response actions. A review of the activities covered during the August 2020 work session was provided, and the DCP Task Force was guided through the updates and refinements that were made to the preliminary list of projects based on the feedback and input that was received. The DCP Consultant team then guided the DCP Task Force through the approach that was used to evaluate and prioritize the list of mitigation and response actions. The results of the analysis were also presented and discussed. The DCP Task Force agencies were asked to review the approach, including the scoring that was used in the evaluation process, and to provide input and feedback based on the information that was presented during the meeting.
DCP Task Force Meeting #4b	November 16, 2020	DCP Task Force, Reclamation	The DCP Consultant team provided a recap of the information discussed during the previous meeting and continued the discussion on the mitigation and response actions. As part of the discussion, the DCP Task Force identified three projects that were to be further investigated. The meeting then transitioned to a discussion on the administrative and organizational framework. As part of this discussion the DCP Consultant team discussed roles, responsibilities, and procedures needed as part of the implementation strategy and offered potential strategies for the DCP Task Force to consider. The DCP Task Force agencies were asked to review the work completed on the mitigation and response actions and to complete a questionnaire that would be distributed after the meeting on the administrative and organizational framework.
Stakeholder Outreach Meeting #4	January 28, 2021	WICC	Regional stakeholders were provided a summary on activities completed as part of the mitigation and response actions task. This included a high-level discussion on the compiled project list, evaluation process, and outcomes of the process. An update on the administrative and organizational framework was provided. This included a review of the task and overview of the ongoing progress on drafting a framework to help support the NVDCP’s implementation.
Napa Valley GSP Advisory Committee Meeting	February 11, 2021	Napa Valley Subbasin GSP Advisory Committee	The DCP Consultant team provided an overview and update of the NVDCP at the GSP Advisory Committee Meeting. The meeting included a discussion on what a DCP was, progress to date, interface between the NVDCP and Napa Valley Subbasin GSP, and next steps for the NVDCP.

Table 1-2. Napa Valley DCP Agency and Stakeholder Engagement			
Meeting Number	Meeting Date	Attendees	Activities Covered
DCP Task Force Meeting #5	April 14, 2021	DCP Task Force, Reclamation	An update on the ongoing studies of the three projects that the DCP Task Force had expressed interest in having the DCP Consultant team further develop was presented. This included a discussion on how the Local Agencies might participate in the Sites Reservoir Project, an update on the refinements made to the Purified Water Assessment, and a summary of the Integrated Supply and Reservoir Operations Study. The meeting then pivoted to a discussion on the administrative and organizational framework. The DCP Consultant team went over the results of the questionnaire that had been previously distributed and whose responses helped guide the development of potential framework strategies. The DCP Task Force was presented with two potential implementation strategies, one strategy that focused on having project-specific memorandum of understanding (MOU) and another strategy that involved a facilitated process that would ultimately result in a regional MOU (see Section 7).
Stakeholder Outreach Meeting #5	April 22, 2021	WICC	The meeting provided regional stakeholders with an update of the ongoing activities with the NVDCP. This included a discussion on the work that had been completed as it pertained to the mitigation and response actions. The group was presented with an overview of the evaluation approach and outcome, a brief discussion on the projects the DCP Task Force had requested be further investigated, and an update on where those investigations currently stood and what was to follow. Lastly, the stakeholders were provided with a brief update on where the administrative and organizational framework, which included feedback gathered from the questionnaire the DCP Task Force was asked to complete.
DCP Task Force Meeting #6	October 12, 2021	DCP Task Force, Reclamation	Met with the DCP Task Force agencies to discuss the administrative draft of the DCP and provide an overview of the tentative schedule to complete the DCP. Agency staff used this meeting to provide input and feedback based on their review of the draft document.
DCP Task Force Meeting #7	September 6, 2022	DCP Task Force	Met with the DCP Task Force agencies to review the comments received from Reclamation's review of the administrative draft and discuss next steps to help complete the current version of the NVDCP.

Section 2

Water System Overview

The multiple water and wastewater agencies, cities, environmental uses, and agricultural areas in the Plan Area are linked by water. Understanding the Local Agencies' service areas, existing water facilities, and key water resources provides a critical foundation to the NVDCP. Regional and individual agencies' water service areas, systems, and supplies are described in this section. Existing planning documents, such as Urban Water Management Plans (UWMP), describe similar topics for the individual agencies in greater detail.

2.1 Local Agencies' Service Areas and Existing Facilities

For this analysis, the Local Agencies' most recent planning studies, such as the LAFCO MSR, 2015 UWMPs, and input from agency staff served as the primary source of information. A brief description of each local agency is described in this section.

2.1.1 City of American Canyon

American Canyon was incorporated in 1992. The city is located in the southern portion of Napa County and provides services within an area that encompasses the city limits as well as portions of the surrounding area located within unincorporated Napa County.

- **Type of agency:** American Canyon provides water and wastewater services. American Canyon also coordinates with NapaSan as they provide wastewater and recycled water services in the northern portion of American Canyon's service area.
- **Service area:** Total service area is approximately 30 square miles and includes the city itself (approximately 6 square miles), the commercial/industrial areas in and around the Napa County Airport (approximately 5 square miles), and portions of unincorporated Napa County to the west, east, and north of the city limits.
- **Current population served:** 20,987 as of 2020 (see Appendix A for more information).
- **Sources of supply:** SWP, Vallejo Supply, and recycled water.
- **Water conveyance/distribution facilities:** Potable water system includes 102 miles of water mains. The recycled water distribution system includes approximately 10 miles of pipeline.
- **Storage facilities:** Three storage tanks for potable water and one for recycled water.
- **Treatment facilities:** The city operates one water treatment plant (WTP) (5.5 million gallons per day [mgd]) and a 2-5 mgd WWTP that produces recycled water.

2.1.2 City of Calistoga

Calistoga provides water and collects and treats wastewater from businesses and more than 5,000 residents in Napa County. The city was incorporated in 1886 and is located in the northern part of Napa County.

- **Type of agency:** Calistoga provides water and wastewater services. It also coordinates with Napa as they provide a portion of their potable water supply through the NBA.

- **Service area:** Total service area is approximately 7 square miles and includes the city itself (2.61 square miles) and portions of unincorporated Napa County (4.61 square miles).
- **Current population served:** 5,464 as of 2020 (see Appendix A for more information).
- **Sources of supply:** SWP, Kimball Reservoir, and recycled water.
- **Water conveyance/distribution facilities:** The potable water distribution system consists of 22 miles of distribution and 18 miles of transmission mains. The city's recycled water distribution system is made up of 6 miles of pipeline.
- **Storage facilities:** Kimball Reservoir and three storage tanks (Feige, High Street, and Mt. Washington).
- **Treatment facilities:** The city owns and operates the Kimball Surface WTP (0.35 mgd), which provides potable water, and the Dunaweal WWTP (0.84 mgd capacity), which produces recycled water.

2.1.3 City of Napa

Napa is located on the southern base of the Napa Valley. The city was incorporated in 1872 and provides municipal services that includes providing water. Napa serves drinking water to an area encompassing much of the lower Napa Valley and extending up to the foothills on the east and west sides of the valley.

- **Type of agency:** Napa provides water and several other municipal services to its constituents. The city coordinates with a counterpart wastewater supplier (NapaSan) in the service area to serve recycled water.
- **Service area:** Most of the city's water service area is encompassed within the Water Operational Boundary (WOP). The WOP contains the current area served by the system, including the city limits and areas along transmission mains emanating from the treatment plants north and southeast of the city. Napa also exports water to American Canyon, St. Helena, Calistoga, and Yountville.
- **Current population served:** 80,617 as of 2020 (see Appendix A for more information).
- **Sources of supply:** SWP, Lake Hennessey, Milliken Reservoir, and recycled water.
- **Water conveyance/distribution facilities:** Approximately 360 miles of transmission and distribution pipelines.
- **Storage facilities:** Lake Hennessey (31,000 acre-feet [AF]), Milliken Reservoir (1,390 AF), and 15 water storage tanks ranging from 10,000 gallons to 5 million gallons (approximately 30 million gallons total).
- **Treatment facilities:** The city operates three WTPs—the Edward I. Barwick Jamieson Canyon WTP (20-mgd capacity), the Hennessey WTP (20-mgd capacity), and the Milliken WTP (4.0-mgd capacity).

2.1.4 City of St. Helena

St. Helena provides municipal services to more than 6,200 residents in Napa County. The city was incorporated in 1876 and is located in the northern part of Napa Valley.

- **Type of agency:** St. Helena provides potable water services and wastewater collection and treatment to residential, commercial, institutional, industrial, and landscape irrigation customers within its service area.
- **Service area:** The city's service area encompasses 4.7 square miles.

- **Current population served:** 6,222 as of 2020 (see Appendix A for more information).
- **Sources of supply:** Bell Canyon Reservoir, City of Napa Supply, and groundwater from the Napa Valley Subbasin (Stonebridge Wells).
- **Water conveyance/distribution facilities:** Approximately 50 miles of pipe.
- **Storage facilities:** In addition to the Bell Canyon Reservoir, the city owns six storage tanks (Treatment Plant Reservoir 1A, Tank 2, Meadowood Tanks [1,2,3], and Holmes).
- **Treatment facilities:** Water from Bell Canyon Reservoir is treated at the Louis Stralla WTP. The plant has a treatment capacity of 4.3 mgd. The city also owns and operates a small WTP to treat water pumped from the Stonebridge Wells prior to introduction into the city's potable water system.

2.1.5 Town of Yountville

Yountville was incorporated in 1965 and sits in the central portion of Napa County. The town provides potable water services and wastewater collection and treatment to residential, commercial, industrial, and agricultural customers.

- **Type of agency:** Yountville provides a wide range of municipal services to its customer base, including providing water and collecting and treating wastewater. Yountville coordinates with the California Department of Veterans Affairs (CDVA) to secure most of the town's potable water supply.
- **Service area:** The city's service area encompasses 1.5 square miles.
- **Current population served:** 2,907 as of 2020 (see Appendix A for more information).
- **Sources of supply:** Rector Reservoir, City of Napa Supply (emergency use), groundwater from the Napa Valley Subbasin (emergency use), and recycled water.
- **Water conveyance/distribution facilities:** The potable water distribution system is made up of approximately 7 miles of pipe, and the recycled water distribution system is comprised of 5.5 miles of pipe.
- **Storage facilities:** Yountville does not own or operate any storage facilities. Rector Reservoir is owned and operated by the CDVA.
- **Treatment facilities:** The CDVA owns and operates the Rector Reservoir WTP (4.5-mgd capacity) that provides most of Yountville's water supply. Yountville does own and operate a 0.55-mgd WWTP that produces recycled water for irrigation and landscaping uses.

2.1.6 Napa County

Napa County oversees groundwater in the region and, through the District, administers the SWP Contract. The District was formed in 1951 as an independent special district under the Napa County Flood Control and Water Conservation District Act for the purpose of creating a separate government entity responsible for developing and managing domestic water supplies and managing flood and storm waters in Napa County.

- **Type of agency:** Napa County helps manage and monitor groundwater in the region and, through the District, administers the SWP water contract on behalf of sub-contractors in the county.
- **Service area:** Napa County covers an area of approximately 789 square miles north of San Pablo Bay.

- **Current population served:** More than 140,000 in Napa County and 25,971 in the unincorporated area (see Appendix A for more information)
- **Sources of supply:** Napa County helps manage and monitor groundwater in the region. The District administers the SWP and control, reclaim, and retain flood and storm waters for beneficial uses.
- **Water conveyance/distribution facilities:** Napa County does not own or maintain any conveyance or distribution facilities. The subcontractors that receive their water entitlements from the SWP are responsible for conveying it to their customers.
- **Storage facilities:** Napa County does not own any storage facilities within the Plan Area.
- **Treatment facilities:** The subcontractors are responsible for treating water that stems from their respective SWP entitlements. Napa County does not own or operate any treatment facilities within the Plan Area.

2.1.7 Napa Sanitation District

NapaSan was founded in 1945. Since its inception, NapaSan has been collecting and treating wastewater from residents and businesses in Napa and surrounding unincorporated areas.

- **Type of agency:** Wastewater agency that also produces recycled water to customers in the region for irrigation purposes.
- **Service area:** NapaSan collects and treats wastewater in a 22-square-mile area that comprises Napa, Silverado Country Club, the Napa County Airport, and several adjacent unincorporated areas.
- **Current population served:** NapaSan serves approximately 83,000 residents.
- **Sources of supply:** NapaSan produces recycled water from the wastewater it collects within its service area.
- **Water conveyance/distribution facilities:** The recycled water distribution system consists of approximately 27 miles of pipe.
- **Storage facilities:** NapaSan has approximately 1,200 AF of storage existing at their WWTP that currently retains summer flows to prevent discharges during summer months in accordance with the NapaSan National Pollutant Discharge Elimination System (NPDES) permit.
- **Treatment facilities:** NapaSan owns and operates the Soscol Water Recycling Facility. It has an average dry weather influent flow permitted capacity of 15.4 mgd and can produce Title 22 unrestricted non-potable recycled water.

2.2 Water Supply Sources

Each Local Agency has its own unique water supply portfolio. They rely on a diverse infrastructure network and supply portfolio to deliver high-quality, reliable water within their respective service areas. Collectively, existing and planned water supply sources among the Local Agencies include surface water from local and imported sources, groundwater, and recycled water. Table 2-1 provides a summary breakdown of each agency's existing (as of 2020) Normal Year water supply portfolio. Normal Year refers to the amount of water that most closely represents the average water supply available to each agency. Table 2-1 not only identifies the supply sources in each agency's respective water supply portfolio but also the composition of each agency's water supply. For example, approximately 54 percent of Napa's existing water supply stems from Lake Hennessey, with an additional 42 percent sourced from the SWP and the remaining 4 percent from both Milliken

Reservoir and recycled water. A complete breakdown of each Local Agencies' water supply portfolio is included in Appendix B.

Table 2-1. All Existing Sources of Supply Within Local Agencies' Service Areas in a Normal Year

Supply	City of Napa	Napa County	City of St. Helena	City of Calistoga	City of American Canyon	Town of Yountville
Napa Valley Subbasin	0%	60%	19%	0%	0%	6%
Milliken-Sarco-Tulocay Subbasin	0%	11%	0%	0%	0%	0%
Carneros Subbasin	0%	5%	0%	0%	0%	0%
Lake Hennessey	53%	0%	0%	0%	0%	0%
Milliken Reservoir	2%	0%	0%	0%	0%	0%
City of Napa Supply	0%	0%	30%	0%	0%	0%
State Water Project	41%	0%	0%	65%	38%	0%
Rector Reservoir	0%	0%	0%	0%	0%	56%
Bell Canyon Reservoir	0%	0%	51%	0%	0%	0%
Kimball Reservoir	0%	0%	0%	16%	0%	0%
Surface Water Diversions	0%	15%	0%	0%	0%	0%
Vallejo Supply	0%	0%	0%	0%	41%	0%
Recycled Water	3%	9%	0%	19%	21%	39%

Understanding how the Local Agencies are linked by water supplies is critical to determining the appropriate drought response. Coordinating efforts to manage supplies and respond to drought impacts will benefit all. A schematic illustrating the interlinkage between the water supplies and the Local Agencies is shown on Figure 2-1.

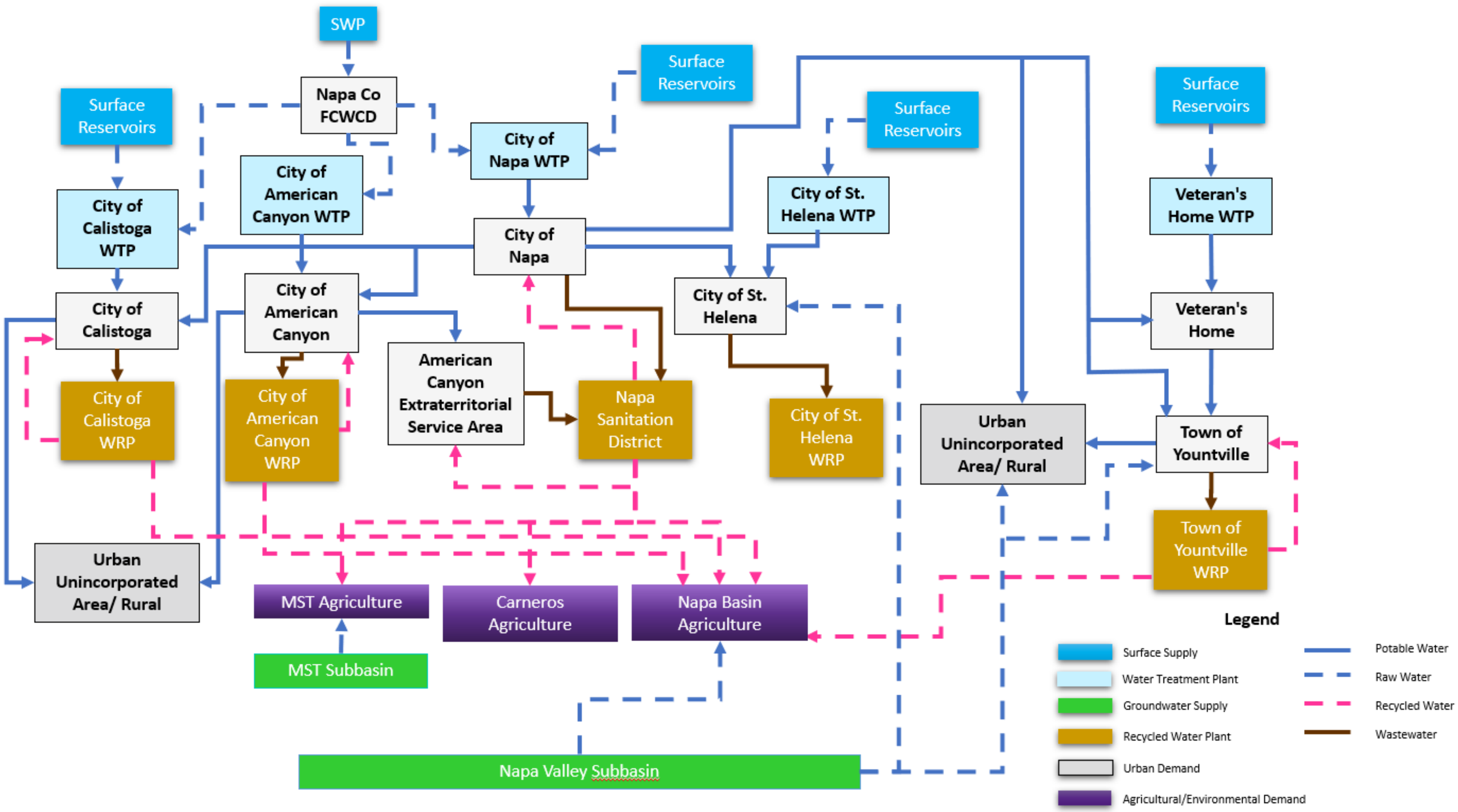

Figure 2-1. Schematic of the interconnectedness of existing water supplies in the Napa Valley

2.2.1 Groundwater

The three main groundwater subbasins of interest in the NVDCP area are the Napa Valley Subbasin, Milliken-Sarco-Tulocay Subbasin, and the Carneros Subbasin. Figure 2-2 presents a general overlay of the subbasins relative to the Plan Area. A brief description of each is provided below.

2.2.1.1 Napa Valley Subbasin

The Napa Valley Subbasin has a surface area of 71.8 square miles, generally aligning with the floor of the Napa Valley. It is the only groundwater basin in Napa County subject to SGMA. The subbasin is bounded to the north, east, and west by the Coast Ranges and on the south by San Pablo Bay. The subbasin consists of permeable sediment eroded from surrounding mountains and deposited by the Napa River. These hydrogeologic features include alluvial sediments, such as clay, silt, and sand, and range in thickness from tens to hundreds of feet. The alluvial sediments lie on top of volcanic formations that contain lower aquifer units. The subbasin's sustainable yield has been estimated to be between 17,000 and 20,000 acre-feet per year (AFY) with the only source of recharge being precipitation from the alluvial plains, adjacent hills, and mountains within the watershed (LSCE, 2016). The Napa Valley Subbasin predominantly aligns with four of the Napa Valley Floor groundwater subareas. From north to south these areas are the Calistoga, St. Helena, Yountville, and Napa subareas. The groundwater level conditions within these subareas are described below.

Calistoga and St. Helena Subareas. Hydrographs containing data dating back to the 1970s suggest that groundwater levels in the Calistoga Subarea and northern portion of the St. Helena Subarea have remained relatively stable (Napa County GSA, 2021). While the depth of the water table tends to vary seasonally, monitoring wells in these locations tend to be relatively shallow, with depths at less than 10 feet below the ground surface in the spring in the Calistoga Subarea and less than 20 feet in northern St. Helena Subarea. In other portions of the St. Helena Subarea, groundwater levels tend to exhibit greater seasonal declines (about 20 feet). While the susceptibility to drought conditions is more pronounced, the groundwater levels have also been relatively stable through the years.

Yountville and Napa Subareas. Data from monitoring wells in the Yountville Subarea suggest long-term groundwater elevations have remained relatively stable with groundwater levels resembling those observed in the Calistoga and St. Helena Subareas (Napa County GSA, 2021). Groundwater elevations in the center of the valley fluctuate seasonally approximately 10 to 25 feet, and near the edge of the valley fluctuate approximately 25 to 35 feet.

In the Napa Subarea the depth to the water table ranges anywhere from 20 to 30 feet during the spring in most years, with elevations in the groundwater fluctuating seasonally 10 to 40 feet. While long-term trends in most portions of the Napa Subarea have been generally stable, the northeastern area has declined by about 20 to 30 feet since monitoring began in 2000 (Napa County GSA, 2021). Over the last decade, however, groundwater levels in the area appear to have stabilized. The decline in groundwater levels during the early 2000s is believed to have been caused by decreasing subsurface inflow into the Napa Subarea from portions of the MST Subbasin due to pumping depressions east of the Soda Creek Fault (Napa County GSA, 2021). Based on data collected from other monitoring wells in the area, it appears as though the extent of the pumping depression beyond the MST Subbasin is limited to the northeastern portion of the Napa Subarea, east of the Napa River. Nonetheless, in recent years Napa County has added three monitoring wells to its monitoring network in the northeast portion of the Napa Subarea as a means of better tracking groundwater levels in the area.

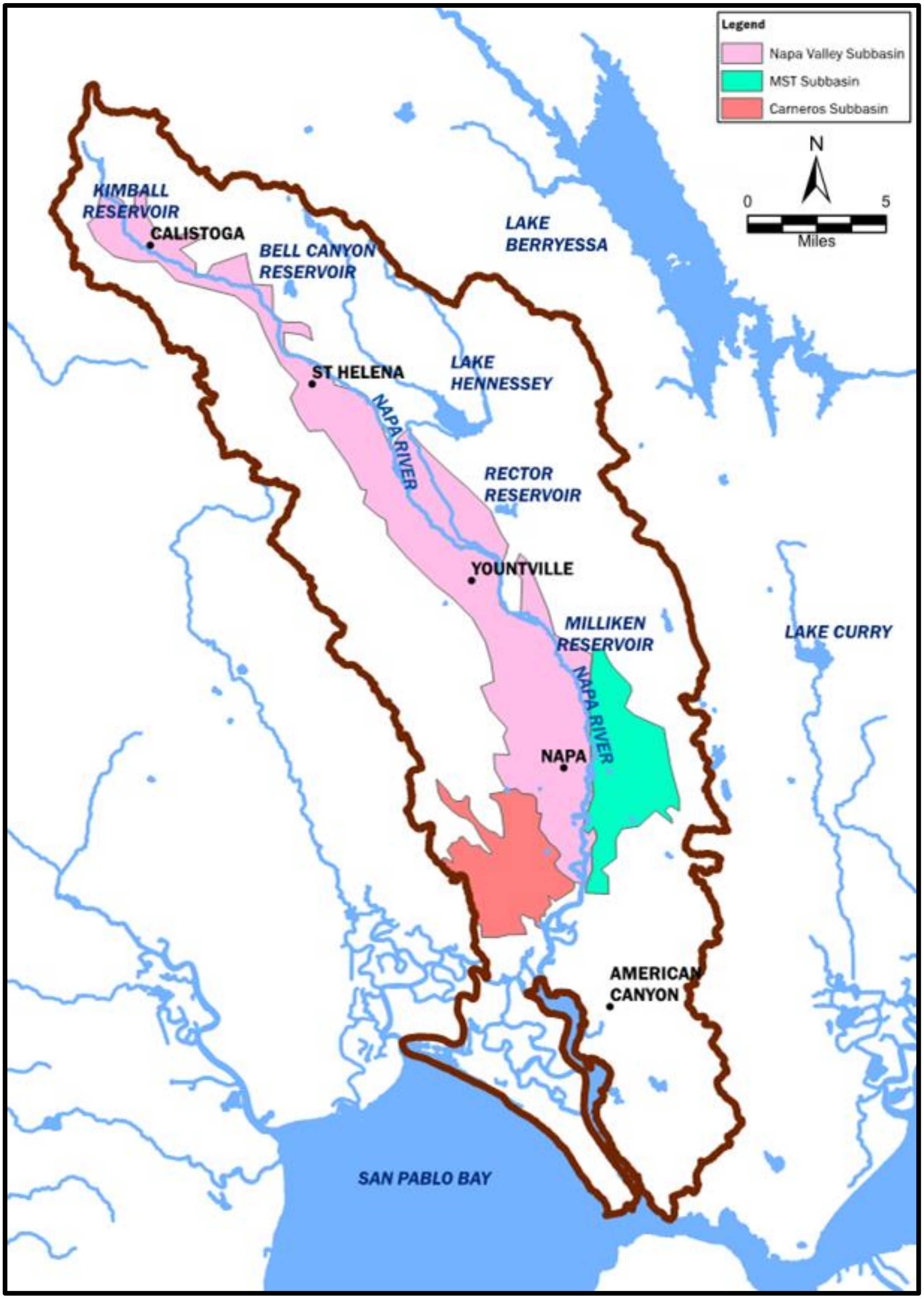

Figure 2-2. Groundwater subbasins of interest in the NVDCP Plan Area

2.2.1.2 Milliken-Sarco-Tulocay Subbasin

The MST subbasin is partially separated from the Napa Valley subbasin by the Soda Creek Fault and, therefore, has characteristics separate from the larger Napa Valley Subbasin. It is located on the eastern half of Napa city limits and is bounded by the west by the Napa River and on the north, east, and south by the Howell Mountains. Although the area was designated for local groundwater planning purposes, most of the area does not contain a groundwater basin as mapped by the California Department of Water Resources (DWR) (WICC, 2021). A detailed study of the MST subbasin was conducted by the United States Geological Survey (USGS) in 1977 and again in 2000–2002. The primary water-bearing areas are alluvial deposits west of the Soda Creek Fault and the tuffaceous member of the Sonoma Volcanics east of the fault (USGS, 2003). The primary source of recharge is precipitation, which increases south to north and with increasing altitude. Average annual precipitation is up to 40 inches in the highest altitudes of the Howell mountains, and about 65 percent more than at lower altitudes (USGS, 2003).

Groundwater levels in the subbasin have steadily declined since the 1970s with some locations having declined up to 250 feet (Napa County GSA, 2021). Hydrographs from the norther portion of the subbasin show that groundwater levels in that area have been relatively stable since 2009. While some wells have shown some decline in water level, this may be a result of recent drought conditions in the region. Depths to groundwater in the northern part of the MST Subbasin currently range from about 60 to 200 feet. Monitoring data over the past decade from the central and southern portions of the MST Subbasin also appear to indicate that the rate of groundwater extraction is being balanced by rates of groundwater recharge (Napa County GSA, 2021). Land use permitting constraints and the continued use of recycled water from NapaSan are expected to help maintain stable groundwater levels within the subbasin.

2.2.1.3 Carneros Subbasin

The Carneros Subbasin is located to the southwest of Napa. The area is primarily used for agriculture and contains the Carneros Creek. The subbasin is categorized by low permeability Huichica formations with small occurrences of volcanic rocks and alluvial deposits. Subareas south of the Napa Valley Floor may be susceptible to seawater intrusion from the San Pablo Bay, and long-term records show total dissolved solids at or above the secondary maximum contaminant level. Limited water quality monitoring and information makes it unclear whether high salinity in the subbasin is a result of saltwater intrusion or interaction of groundwater with geologic units in the area. As of 2020, 12 monitoring wells were in the Carneros Subbasin. The longest period of record among them extended back to October 2011. Data from the wells suggests that groundwater levels have been relatively stable, with seasonal fluctuations of about 5 feet and groundwater elevations ranging anywhere from 30 to -5 feet, relative to sea level (Napa County GSA, 2021).

2.2.2 Local Surface Water

Napa, Calistoga, St. Helena, and Yountville are all reliant on surface water supplies that stem from local surface water reservoirs in the Napa Valley. All of these reservoirs are located on tributaries to the Napa River. There are also surface water diversions that are used for agricultural purposes. Together, these supply sources help meet a portion of the region’s water demands. These supplies are briefly discussed below.

2.2.2.1 Lake Hennessey

Lake Hennessey is the main local surface water source for the Napa water system. It is located about 13 miles north of Napa and was formed in 1946 following the construction of the Conn Dam. The lake has a maximum storage capacity of 31,000 AF and collects runoff from a tributary watershed area of about 35,000 acres. Average yield for the reservoir is estimated at 17,500 AFY

(Napa, 2017). Napa's water rights to Lake Hennessey are secured through a permit with the State Water Resources Control Board (SWRCB) Division of Water Rights. Raw water from Lake Hennessey flows into a cylindrical concrete intake tower and is pumped to the Hennessey WTP. Once treated, the potable water is conveyed into a buried 5-million-gallon clearwell before being conveyed to the distribution system through the 36-inch-diameter Conn Transmission Main. The Conn Transmission Main is approximately 20 miles long and runs parallel to Conn Creek, Highway 128, and Highway 29.

2.2.2.2 Milliken Reservoir

Milliken Reservoir was the first reservoir used when Napa began offering water service in 1923. The reservoir is located approximately 5 miles northeast of Napa and stores water from Milliken Creek, a tributary to the Napa River. Surface water from the reservoir was the sole source of water until Lake Hennessey was created in 1946. Today, surface water from the reservoir is used seasonally in the high-demand periods of summer and early fall when turbidity levels in the reservoir can be effectively treated. The tributary watershed area is about 6,000 acres. Even though Napa is authorized to divert and store up to 2,350 AF of water per year from Milliken Creek, the maximum storage capacity of the reservoir is limited to 1,390 AF due to seismic concerns (Napa, 2017). The maximum yield for the reservoir is assumed to be 700 AFY (Napa, 2017).

Raw water is released into Milliken Creek by a manually operated valve system at the base of the dam, where it is then transported to the Milliken WTP. Treated water is stored in a 2.0-million-gallon clearwell tank located above the WTP site. The treated water is delivered to the distribution system via the Milliken Transmission Line. Napa also holds a permit for direct diversion of 7.74 cubic feet per second from Milliken Creek between November and March; however, due to treatment limitations at the Milliken WTP, the water cannot be properly treated in the winter to meet water quality regulations. Therefore, the allocation goes unused at this time (Napa, 2017).

2.2.2.3 Rector Reservoir

Rector Reservoir and Rector Dam were built in 1946 and are owned and operated by the CDVA. The reservoir is located on Rector Creek, which is a tributary to the Napa River. The reservoir has a maximum capacity of approximately 4,600 AF, with a safe yield of about 1,670 AFY (LAFCO, 2020). The CDVA provides Yountville with an allocation of 500 AFY through an existing contract that will expire in 2024. In addition to serving Yountville, the reservoir provides water to the Veteran's Home of California in Yountville, the California Department of Fish and Wildlife Silverado Fisheries, and other customers in the area. Water from the Rector Reservoir is treated at the Rector Reservoir WTP.

2.2.2.4 Bell Canyon Reservoir

Bell Canyon Reservoir was constructed in 1959 and provides about half of St. Helena's water supply. The reservoir is located about 2 miles upstream of the confluence between Bell Creek and the Napa River. Water right permits allow St. Helena to divert 1,800 AF annually between November 15 and April 15, and additional water rights allow the city to store another 2,000 AF, subject to scheduled releases to protect downstream fish. These diversion amounts, however, exceed the available physical storage. The reservoir has a maximum capacity of 2,250 AF, with an estimated safe yield at about 800 to 1,000 AFY (St. Helena, 2019). Water from the reservoir is conveyed through about half a mile of pipe to the Louis Stralla WTP.

2.2.2.5 Kimball Reservoir

Kimball Reservoir is one of two sources that Calistoga uses to meet its potable water demands. The reservoir collects inflow from a surface drainage area of approximately 3.4 square miles. The reservoir was built in 1939 and raised to increase storage capacity in 1948 to a maximum of 345 AF. According to Calistoga staff, sediment accumulation from runoff and wildfires in the watershed have since reduced the storage amount to approximately 287 AF. The dam is an earthfill structure approximately 300 feet long, 200 feet wide at the base, and about 75 feet high. According to the State of California Division of Dam and Safety, the dam is considered high risk, as the downstream hazard is categorized as high (LAFCO, 2020). The State conducts annual inspections to ensure the dam is in good shape for continued use. Water from Kimball Reservoir is treated at Calistoga's Kimball WTP.

2.2.2.6 Surface Water Diversions

It is estimated that a portion of the agricultural demands in the Napa Valley are met through surface water diversions from the Napa River and its tributaries. These diversions were estimated using the Enhanced Water Right Information Management System (eWRIMS). The eWRIMS is an online computer database that was developed by SWRCB to help track information on water rights in California. The online database went live in 2007 and contains information on water right permits and licenses issued by SWRCB and other claimed water rights, including the Napa River and its tributaries. Using the database, information can be obtained for pending applications, licenses, permits, and statement of diversions or use from the Napa River and its tributaries for use within Napa County. Using the database, the maximum agricultural diversion allowed can be estimated by summing all water right applications, licenses, permits and statement of diversions or use for both direct diversion and storage. It is important to note that this approach does not allow for an accurate account of the actual quantity of surface water diverted annually, since the database only establishes maximum values that a water right holder can divert, but it does afford the opportunity to develop an estimate for the quantity of surface water being diverted and used for agricultural purposes, including irrigation and frost and heat protection on the Napa Valley. It should also be noted that eWRIMS does not include riparian diversions from the Napa River or its tributaries. It is acknowledged that riparian stream diversions do take place; however, these quantities are very difficult to quantify and were assumed to not make a significant difference to the findings of the NVDCP. Moving forward, the water supplies available from the Napa River and its tributaries are expected to remain constant with no increases being anticipated, as the Napa River is considered fully appropriated during the irrigation season.

2.2.2.7 City of Napa Supply

Both St. Helena and Yountville have agreements in place to receive water from Napa. St. Helena's agreement requires them to purchase 600 AF of water per year (St. Helena, 2006). Water is delivered through the Rutherford connection, a metered connection point between St. Helena's and Napa's respective water distribution systems. As part of the agreement, St. Helena has the option to purchase an additional 200 AF of water from Napa (above the 600 AF) if Napa has the water supply available (St. Helena, 2006). While water purchased from Napa tends to be more costly than local supply sources (i.e., water from Bell Canyon or Stonebridge wells), it does provide an increased level of reliability, as Napa is required to deliver the 600 AF regardless of hydrologic conditions.

In 2009, Napa signed a water transfer agreement with Yountville, in which Napa obtains Yountville's total SWP "Table A" entitlement of 1,100 AF per year, along with its NBA conveyance capacity. As part of the agreement, Napa is required to sell up to 25 AF of water to Yountville at retail rates for non-drought emergency and fire flow needs only, with a provision of up to 200 AF during drought conditions that is dependent on Napa's SWP water acquisition (Yountville, 2009). While St. Helena's agreement requires them to purchase a minimum amount of water from Napa each year, Yountville's agreement has no such clause in place.

2.2.3 Imported Water

Imported sources serve a substantial portion of Napa Valley's water demands. These supply sources are briefly described below.

2.2.3.1 State Water Project

The SWP is a state water management project owned and operated by DWR. The SWP collects water from Northern California that flows through the Feather and Sacramento rivers to the Delta. The system conveys water from the Delta to the Bay Area and Southern California, primarily for municipal and industrial purposes, and to the Central Valley for agricultural and municipal uses. As one of the world's largest state-owned utilities, the SWP includes 21 dams and more than 700 miles of canals, pipelines, and tunnels. The District is an SWP contractor and administers the SWP contract for several of the Local Agencies in Napa County, including Napa, American Canyon, and Calistoga. The District is a separate government entity responsible for developing and managing domestic water supplies and managing flood and storm waters in Napa County. Water is diverted from the Delta at the Baker Slough Pumping Plant and delivered to the Cordelia Pumping Plant (Figure 2-3) through the NBA. Most of the water delivered through the NBA is then treated at Napa's Jamieson Canyon WTP and distributed to Napa water users, including Calistoga and others that have standing agreements with Napa. The remainder of this water is treated at American Canyon's WTP or delivered as raw water to American Canyon irrigation customers.

Figure 2-3. Cordelia Pumping Plant and Forebay

Source: DWR website: *https://pixel-ca-dwr.photoshelter.com/galleries/C0000_aU_f8Tq6wU/G0000PMivKbf1gcI/I00004wISFvYRGEQ/Cordelia-PP-8310-318-jpg*

The amount of water available to each contractor is included in Table A of the SWP contract. The original agreement contracted the District for the ultimate delivery of up to 25,000 AFY of water from the SWP on a pre-determined ramp-up schedule (West Yost, 2005). This agreement has since been modified several times. It was last amended in 2009 to accelerate the entitlement schedule that granted Local Agencies' their full entitlement beginning in 2010 (Napa, 2017). As of 2021, the total Table A entitlement for the District is 29,025 AFY. This total includes the 4,025 AF of water that was permanently purchased from the Kern County Water Agency (KCWA) in 2000. The current SWP water entitlement, by Local Agency, is shown in Table 2-2.

Table 2-2. State Water Project Entitlements (AFY)			
Local Agency	Table A Entitlements	Kern County Water Agency Purchase	Total State Water Project Contractual Entitlement
City of American Canyon	4,700	500	5,200
City of Calistoga	1,000	925	1,925
City of Napa[a]	19,300	2,600	21,900
Total	25,000	4,025	29,025

a. Total SWP contractual entitlement includes entitlements Napa purchased from both St. Helena and Yountville, including the entitlements obtained from the KCWA purchase.

Source: Napa,2017; DWR, 2013.

Note: Amounts presented in this table represent the absolute maximum yields of Table A water. Actual deliveries are determined by DWR depending on each year's hydrologic conditions.

The SWP Entitlements presented in Table 2-2 represent the maximum amount of water that could be secured through the SWP. The actual delivered amount is determined by DWR depending on each year's hydrologic conditions. A full Table A entitlement would typically only be available during very wet years. Even so, since 2013 the actual Table A deliveries have been bolstered by the resolution of *Solano County Water Agency et. al. v. Department of Water Resources*, known as the "Area of Origin" settlement that granted the District the ability to obtain more SWP water through the "North of Delta Allocation" and the "Advanced Table A Program" (Napa, 2017).

In addition to the Table A entitlements, the Local Agencies, in certain years, also have the ability to procure additional SWP water through other means, including:

- **Carryover Water.** Carryover water is water from a previous year's entitlement that was available for use but was more than demands and was, therefore, stored for use in the subsequent years. This water is stored in the San Luis Reservoir. The Local Agencies with SWP entitlements frequently use carryover water during the early months of the year. It is important to note that carryover water stored at the San Luis Reservoir is considered the first water to be lost if the reservoir spills.
- **Interruptible Supply Water (Article 21).** Article 21 allows water contractors to take deliveries above approved and scheduled Table A amounts. Article 21 is sometimes called interruptible, unscheduled, or surplus water. It is offered predominantly in wet years and assumes contractors can take delivery of the surplus water during the wet season without interfering with the ability of the SWP to deliver the Table A water to other contractors, and that all environmental and other water requirements have been met. The District uses an annual delivery schedule that maximizes the use of Article 21 prior to consumption of carryover water (Napa, 2017).
- **Turn-back Water Pool Program (Article 56).** The Turn-back Water Pool Programs allow interested SWP contractors to sell their unused entitlement to those agencies that request additional water supplies. According to Article 56 of the SWP Contracts, the State will "establish an annual entitlement water pool (Pool) for contractors wishing to sell or buy project water…" The amount of water available for purchase from the Pool is dependent on the contractor's willingness to sell entitlement in excess of their needs for that given year and could drop to zero in any given year. The District has obtained water through this program before and anticipates doing so again in the future (Napa, 2017).

- **Yuba Accord Dry Year Water Purchase Program.** To settle issues related to in-stream flows in the Yuba River and fisheries habitat, DWR adapted the Lower Yuba River Accord in 2008. As part of that agreement, DWR can purchase water from the Yuba River Water Agency to, in part, offer to participating SWP contractors as a transfer during dry years. During the 2012–2016 drought, American Canyon was able to secure water through this program to meet projected water supply shortfalls (American Canyon, 2016a). The availability and reliability of this potential supply beyond 2020 is unknown, as the District's agreement expired at the end of 2020.

2.2.3.2 Vallejo Supply

American Canyon and the City of Vallejo (Vallejo) have an established agreement (Vallejo Water Agreement) that allows American Canyon to purchase treated water, raw permit water, and emergency water. These supplies are briefly described below.

Vallejo Treated Water. Through the Vallejo Water Agreement, American Canyon was able to purchase 629 AFY of treated Vallejo water supply in 1996. The source of this water is a blend of all of Vallejo's water sources. The agreement included the option for American Canyon to purchase additional potable water at 5-year intervals through 2021, which they did in 2006, 2011, 2016, and plan on doing so in 2021 (American Canyon, 2016a). The total anticipated supply from this agreement is expected to be 3,206 AFY from 2021 onward (American Canyon, 2016a).

Vallejo Permit Water. Vallejo holds an appropriative water right for Delta water from the SWRCB that pre-dates the construction of the SWP (Vallejo, 2016). This water supply, which is commonly referred to as Permit Water, is separate from the SWP Table A allotment but is also delivered through the NBA. As part of the Vallejo Water Agreement, American Canyon can purchase up to 500 AFY of Vallejo's Permit Water (American Canyon, 2016a).

Vallejo Emergency Water. American Canyon amended its water agreement with Vallejo to allow them to purchase up to 500 AFY of untreated water when American Canyon's SWP Table A allotment is curtailed. When American Canyon's Table A allotment is not curtailed, emergency water is not available for purchase.

2.2.4 Recycled Water

While traditional supply sources will remain an important foundation to the region's supply portfolio, the Local Agencies see recycled water as a critical element to future water supplies in the Napa Valley. American Canyon, Calistoga, Yountville, and Napa (through NapaSan) all have existing recycled water programs that distribute recycled water for agricultural irrigation, landscape irrigation, and commercial use within Napa County. Both American Canyon and NapaSan also form part of the NBWRA, which is comprised of eleven public agencies in portions of Marin, Sonoma, and Napa counties that are working together as a region to develop, capture, and put to beneficial use highly treated recycled water that is legally discharged into San Pablo Bay (NBWRA, 2017). Moving forward, the Local Agencies plan on continuing to find ways to further expand non-potable reuse and potentially explore the feasibility of potable reuse in the region. Some of these efforts are described in Section 6 of this plan.

2.3 Regional Water Demand and Water Use Efficiency

The Local Agencies collectively serve more than 140,000 customers by providing water for municipal, industrial, landscape, and agricultural uses. Water use varies year to year depending on many factors, such as weather, regulatory and environmental drivers, and the economy. Despite this annual variability, Local Agencies' collective water use over the last two decades demonstrates a downward trend. More substantial water use reductions over the last decade, and particularly over the last several years, are largely due to recession, drought water use restrictions, and changing culture. Some lasting efficiencies were gained during the recent drought; however, extreme water use reductions over the last several years are due in part to short-term actions taken in response to the emergency drought mandate, such as shorter showers and limited outdoor watering. Based on the Local Agency's 2015 UWMPs (and other available planning documents), water demand projections that are provided in 5-year increments from 2020 to 2035, as well as input from the participating agencies staff during development of the NVDCP, the current and future water demands are presented in this section.

2.3.1 Urban Water Demands

In 2015, the Local Agencies experienced an overall reduction in demand because of their extraordinary water use reductions during the 2012–2016 drought. Water shortage conditions during these prolonged periods of drought can necessitate actions to support short-term emergency water use cutbacks; however, extraordinary cutbacks may be unsustainable and can result in potential unintended consequences, such as long-term economic impacts (e.g., California business climate and residential property values), utility revenue instability, water affordability issues, disincentive for future capital investment to improve local reliability, compromised quality of life, as well as other potential long-term impacts.

A short-term uptick in water demand is expected to reflect the easing of water supply emergency conditions and an increase in long-term water demands, given the population growth expected in the region. Some demand rebound is anticipated in the near term, and regional population growth projections would suggest an overall increase in water demand in the future. The collected water demand data supports this notion. As projected by the Local Agencies in their planning documents, regional water demand is expected to increase by 11 percent between 2015 and 2035 (about 46,000 to 52,000 AFY), while regional population is projected to increase by 7 percent over the same period from about 141,000 to 151,000 people, as shown on Figure 2-4.

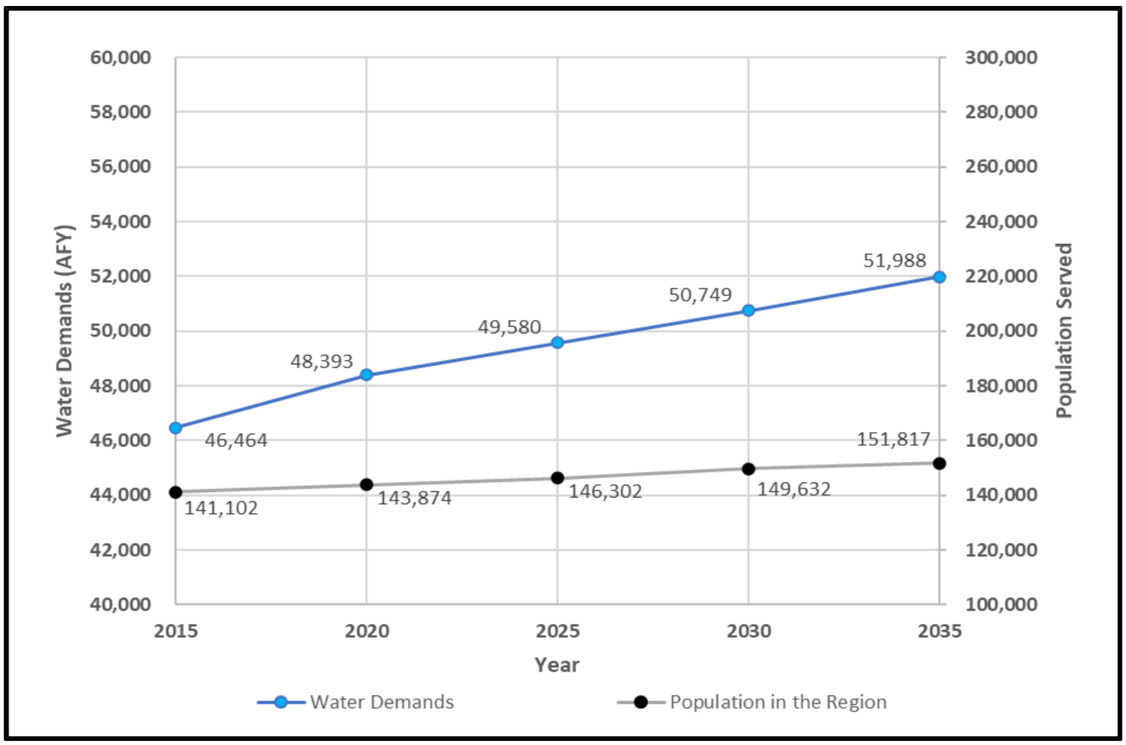

Figure 2-4. Historical and future regional potable demands and population served in the Plan Area

Future water use is currently challenging for the Local Agencies to project. California water management is amid a transformation due in part to state initiatives, legislation, and regulations, such as a new statewide long-term water use efficiency framework, the California Water Action Plan, and Bay-Delta Water Quality Control Plan. Though the effects of these state efforts on future demands and water management are not yet fully defined, the long-term regional trend for water use efficiency is expected to continue.

Agencies regularly revise their demand projections in response to changing conditions, such as new regulations, demographics, city and county general plans, customer behavior, and other factors. The demands presented in 2015 UWMPs and other available planning documents were based on information available to the Local Agencies at that time and are used in this report.

2.3.2 Agricultural Water Demands

As described in the previous sections, water supplies available to agricultural land uses in the Plan Area include groundwater pumped from the local subbasins, recycled water, surface water diverted from the Napa River system, and to a lesser extent surface water diverted outside the Napa Valley Subbasin from the adjacent watershed into Lake Hennessey. Water use by agriculture shows variability from year to year, with an increase in dry years and with less use in wet years when late spring precipitation provides sufficient soil moisture to sustain the crop for a longer period of time into the growing season before irrigation is necessary. The orange shading on Figure 2-5 depicts historical periods of drought. On average from 1988 to 2018, the rate of total water use by agriculture in the Napa Valley Subbasin has decreased slightly from approximately 18,000 AFY to approximately 16,000 AFY, with variations on a year-to-year basis, as shown on Figure 2-5 (LSCE, 2016). Over this same timeframe, there's also been an increase in the amount of vineyard-producing acres from about 30,000 in 1988 to a little more than 43,000 as of 2018. This inverse trend between water use and vineyard-producing acres further exemplifies the region's improving water use efficiency.

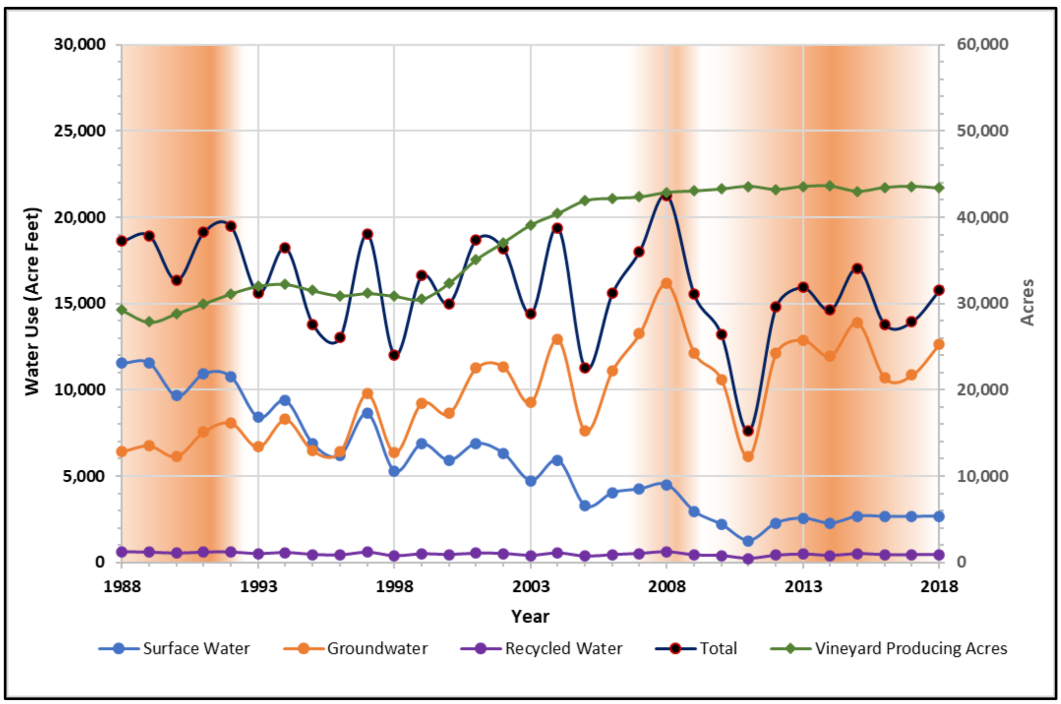

Figure 2-5. Historical agriculture water use in the Plan Area

Note: The orange shading depicts historical periods of drought

2.3.3 Statewide Water Use Policies and Drought Actions

Long-term water use efficiency is ongoing, regardless of hydrologic conditions. When properly designed and implemented, water use efficiency programs result in sustainable potable demand offsets that support the economy, environment, and communities. A statewide public survey sponsored by the Association of California Water Agencies reported that two-thirds of survey participants felt they made "reasonably substantial reductions in their households' water use over the past few years." Most indicated their efforts focused on behavior changes rather than efficiency upgrades, and on outdoor rather than indoor reductions (FM3, 2017).

The Water Conservation Bill of 2009 (i.e., Senate Bill (SB)x7-7) established a regulatory framework to support the statewide reduction in urban per capita water use, with urban water suppliers (i.e., retail agencies serving more than 3,000 connections or 3,000 AFY) achieving a 20 percent reduction in urban per-capita water use by 2020. As directed by specific methodology in the legislation, SBx7-7 required retail water suppliers to establish and report a historical per capita water use baseline (in gallons per capita per day) and targets for 2015 (interim milestone) and 2020 in their 2010 UWMPs. Retail water agencies are in the midst of comparing their actual 2020 water use and their 2020 target to determine if daily per capita water use met the 2020 target as part of their 2020 UWMP update process.

The 2012–2016 drought led to extreme water use reductions, based on policy changes and actions taken at the state and local levels. A timeline outlining these changes and actions are outlined on Figure 2-6. In January 2014, Governor Brown issued an Emergency Proclamation declaring a drought emergency and calling for voluntary conservation. After that time, the governor issued several additional drought-related executive orders (EO) that significantly influenced water use. The SWRCB adopted an Emergency Water Conservation Regulation in May 2015 to address specific provisions of the April 2015 EO, including specific outdoor water use restrictions and a mandatory 25 percent statewide reduction in potable urban water use between June 2015 and February 2016. The SWRCB established tiered water use reduction mandates, using past water use data, for each retail urban water supplier in the state. In February 2016, the SWRCB adopted an updated Emergency Regulation to extend restrictions on urban water use through October 2016 while making modest adjustments for issues raising statewide water use equity concerns. In recognition of improved supply conditions throughout the state, the SWRCB further revised the Emergency Regulation in May 2016, which enabled water suppliers to submit a supply-based self-certification to determine any needed water use reduction standards. The Emergency Regulation was lifted in Spring 2017 because of substantially improved water supply conditions.

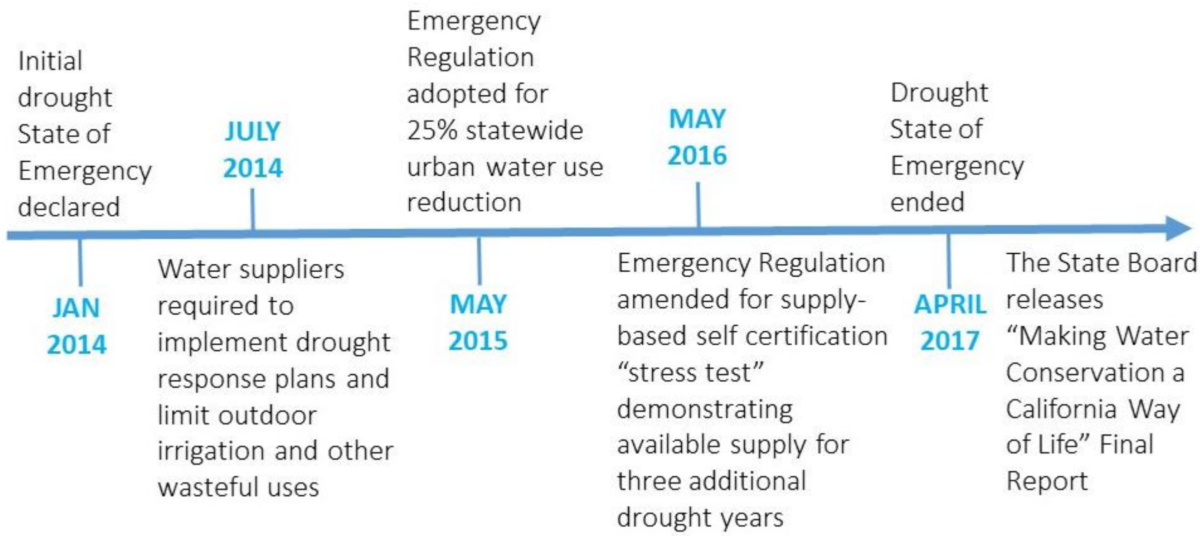

Figure 2-6. Timeline of state drought mandates affecting Napa Valley demands

In addition to directing the SWRCB to update the Emergency Regulation, the Governor's May 2016 EO directed state agencies to develop a long-term water use efficiency framework that builds on SBx7-7 and generates more statewide conservation than existing requirements. The EO stated that "water use targets shall be customized to the unique conditions of each water agency" and directed the DWR and SWRCB to develop a framework for long-term water use efficiency through a stakeholder process. To address the EO, DWR, SWRCB, and other state agencies released the "Making Water Conservation a California Way of Life" final report in April 2017, and proposed legislation that tiers off the state agencies' report has since been adopted. The adopted legislation requires annual water shortage response actions, updated WSCPs with a 5-year drought risk assessment, an annual water budget forecast, permanent prohibitions on wasteful practices, monthly water use reporting, and more robust public participation. Some of the other items listed in the proposed legislation, such as long-term urban water use efficiency standards and certification of innovative water and energy efficiency technologies, are still pending. As part of helping support small water suppliers and rural communities (i.e., retail agencies serving less than 3,000 connections or 3,000 AFY), DWR also recently released the "Small Water Systems and Rural Communities Drought and Water Shortage Contingency Planning and Risk Assessment" report that includes recommendations that would allow small water suppliers and rural communities to meet their drought and water shortage planning needs.

In addition to the long-term water use efficiency framework and some of these other initiatives, implementation of the broader California Water Action Plan and Governor Newsom's Water Resilience Portfolio are also expected to change the way California water is managed. The effects of these state efforts on future demands and water management are not yet fully defined, but one certainty is known: the long-term regional trend for water use efficiency will continue.

Finally, as described previously, the state initiated SGMA, which will put several new requirements on groundwater basins currently in overdraft. The Napa County GSA is in the midst of developing the Napa Valley Subbasin GSP that will generally describe a proactive approach to managing the Napa Valley Subbasin for the long term.

2.3.4 Local Agencies' Commitment to Water Use Efficiency

The Local Agencies have implemented water use efficiency programs over decades to manage demands and effectively reduce per capita demands. As part of this ongoing commitment to water use efficiency, the Local Agencies continue to expand and update their programs to integrate new practices and policies. In addition to their individual programs and initiatives, many of the Local Agencies work together coordinating conservation and other water awareness efforts, including education programs and public understanding of Napa Valley's water challenges and opportunities. Many of these programs and initiatives are shared through the WICC Water Conservation website (https://www.napawatersheds.org/water-conservation). Table 2-3 summarizes the Local Agencies' ongoing water use efficiency programs.

Table 2-3. Local Agencies' Ongoing Water Use Efficiency Programs

Program Type[a]	City of Napa	Napa County	City of St. Helena	City of Calistoga	City of American Canyon	Town of Yountville
Utility Operations Programs						
Water waste prohibitions	✓	N/A	✓	✓	✓	✓
Water loss control	✓	N/A	✓	✓	✓	✓
Metering	✓	N/A	✓	✓	✓	✓
Conservation pricing	✓	N/A			✓	✓
Education and Outreach						
Public information	✓	✓	✓	✓	✓	✓
School education	✓	✓			✓	
Residential						
Indoor water surveys	✓	N/A		✓	✓	
Outdoor water surveys	✓	N/A		✓	✓	
Residential plumbing retrofit	✓	N/A	✓	✓	✓	✓
High-efficiency washing machine rebate programs	✓	N/A			✓	✓
Toilet replacement programs (ultra-low flow/high efficiency)	✓	N/A	✓	✓	✓	✓
Landscape rebate programs	✓	✓	✓	✓	✓	✓
Water use reports	✓	N/A			✓	✓
Commercial, Industrial, and Institutional (CII)						
Conservation programs for CII (e.g., process water use reduction, laundry retrofits, water-efficient commercial dishwashers, etc.)	✓	N/A	✓	✓	✓	✓
Landscape						
Landscape ordinance	✓	N/A	✓	✓	✓	✓
Landscape water surveys/budgets	✓	N/A			✓	
Landscape rebate/grant programs	✓	N/A	✓	✓	✓	✓

a. City of St. Helena, City of Calistoga, and Town of Yountville are below both the required water delivery and urban connections threshold to submit a UWMP; therefore, information may not be complete.

N/A = Not applicable to Napa County but may be implemented by retailers and/or other agencies in the service area.

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Section 3

Drought Monitoring

DWR, Reclamation, and others monitor water supply conditions on a statewide level. The Local Agencies also regularly monitor supply conditions, compare available supplies to projected demands to effectively manage operations and water use, and prepare WSCPs for responding to water shortages. This section describes some of these procedures. The WSCPs, which are described in Section 5, explain how these monitoring procedures are used by the Local Agencies to regularly compare their amount of supply to triggers (thresholds) to determine whether drought conditions exist and, if so, what drought response actions will be taken.

3.1 Statewide Snowpack and Water Supply Monitoring

Supplies stemming from the SWP account for approximately 25 percent of the Plan Area's available water supply in Normal Years. SWP water deliveries are determined by DWR and are dependent on each year's hydrologic conditions. DWR tracks precipitation, estimates mountain snowpack, calculates river flows, and operates storage facilities. DWR sets annual water allocations for SWP contractors based on actual and forecasted precipitation, snowpack, and rate of snowmelt. DWR also coordinates with Reclamation, which manages the Central Valley Project (CVP), and other state and federal agencies on SWP and CVP water operations. Agencies that receive water from the SWP or CVP consider their allocations when evaluating current and future supply availability.

During the 2012–2016 drought, DWR staff provided biweekly reports to the SWRCB on statewide water supply conditions, and DWR and SWRCB staff regularly referenced the U.S. Drought Monitor Index (National Drought Mitigation Center), statewide precipitation (National Oceanic and Atmospheric Administration [NOAA] Regional Climate Center), and DWR California Data Exchange Center monitoring data, including snowpack, snow water equivalents, and reservoir storage.

DWR's Hydrology and Flood Operations Office, part of the Division of Flood Management, estimates runoff for the major watersheds of the Sacramento and San Joaquin River basins based on precipitation, snowpack, runoff, and other hydrologic conditions to forecast reservoir storage, releases, flows, and deliveries under various conditions. These forecasts, typically conducted from February through May each year, provide general guidance for annual water delivery, storage management, and power planning. DWR monitoring over the past water year shows extremely dry hydrologic conditions and very low snowpack levels. Figures 3-1 and 3-2 show cumulative precipitation for the Sacramento and San Joaquin River basins, respectively. The Sacramento and San Joaquin Rivers are the main sources of water for the SWP. As of August 2021, the Sacramento River basin received 46 percent of average rainfall, and the San Joaquin River was at 48 percent of average precipitation levels.

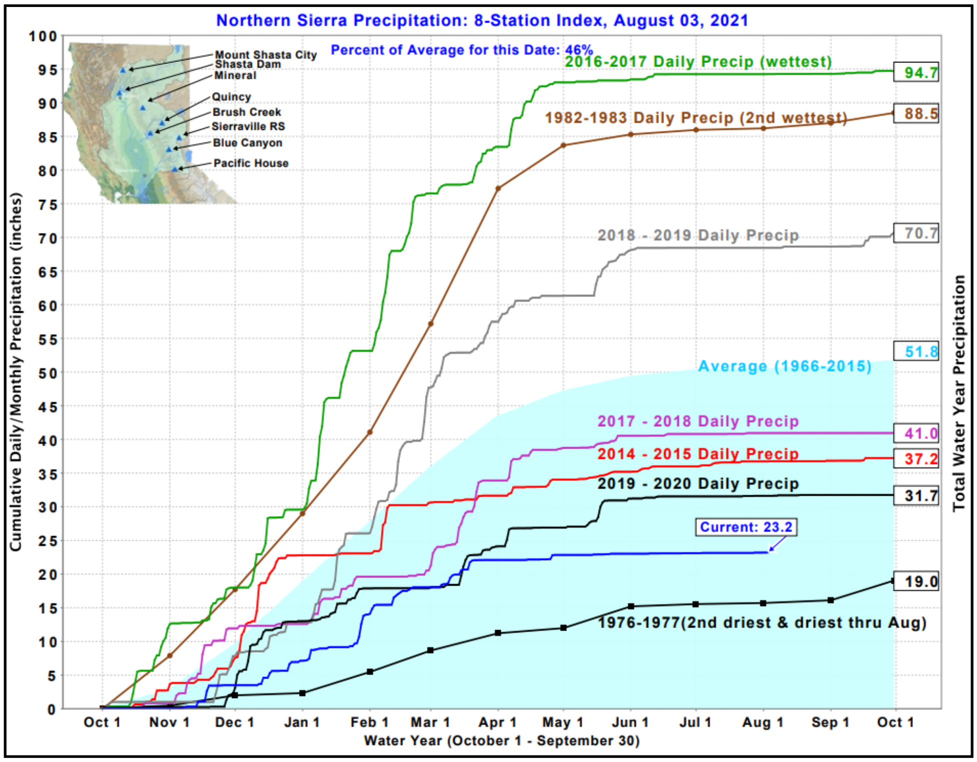

Figure 3-1. Sacramento River basin cumulative precipitation for current water year

Source: https://water.ca.gov/Programs/Flood-Management/Flood-Data/Snow-Surveys

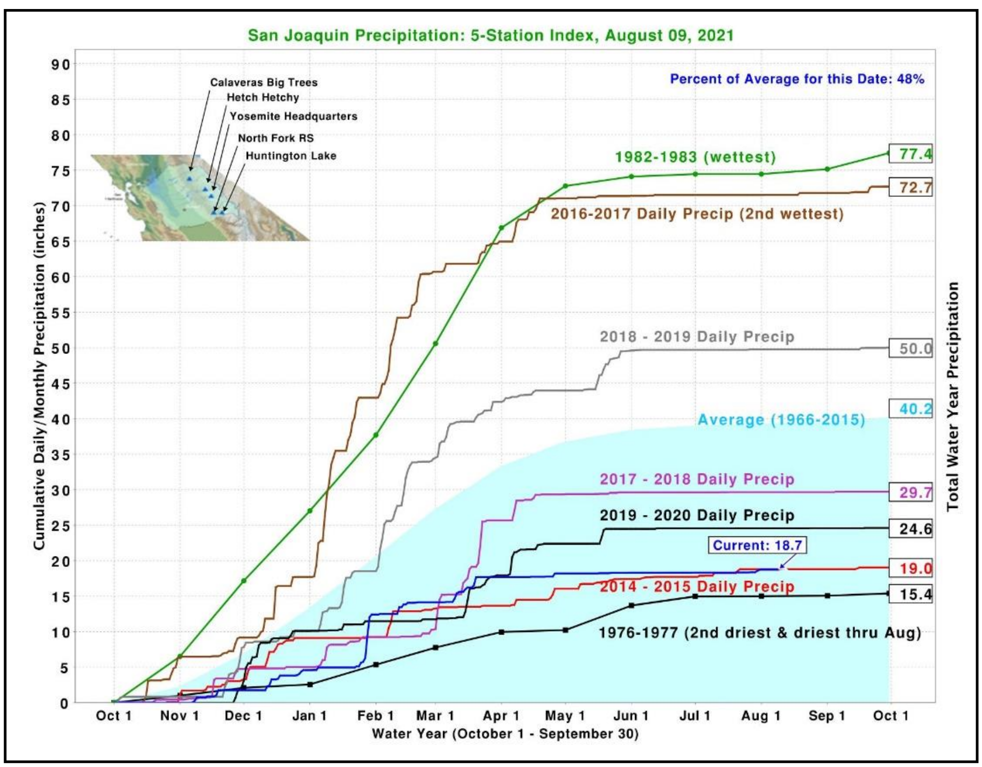

Figure 3-2. San Joaquin River basin cumulative precipitation for current water year

Source: https://cdec.water.ca.gov/reportapp/javareports?name=PLOT_FSI.pdf

Sierra snowpack, which comprises 30 percent of California's water supply, was also well below average. The blue line on Figure 3-3 displays the snow-water content for the 2020 water year in the north, central, and south area of the California Sierras, which correlate to the Sacramento, San Joaquin, and Tulare River basins, respectively. The snow-water content refers to the amount of water that will be released from the snowpack when it melts. As of June 2021, the central and southern regions had already reached 0 percent of average, and the north was slightly higher at 5 percent of average conditions. Overall, relative trends between water years were consistent across all regions of the Sierras. Based on these trends, DWR is anticipating to only deliver 5 percent of the requested SWP supplies this year (DWR, 2021a).

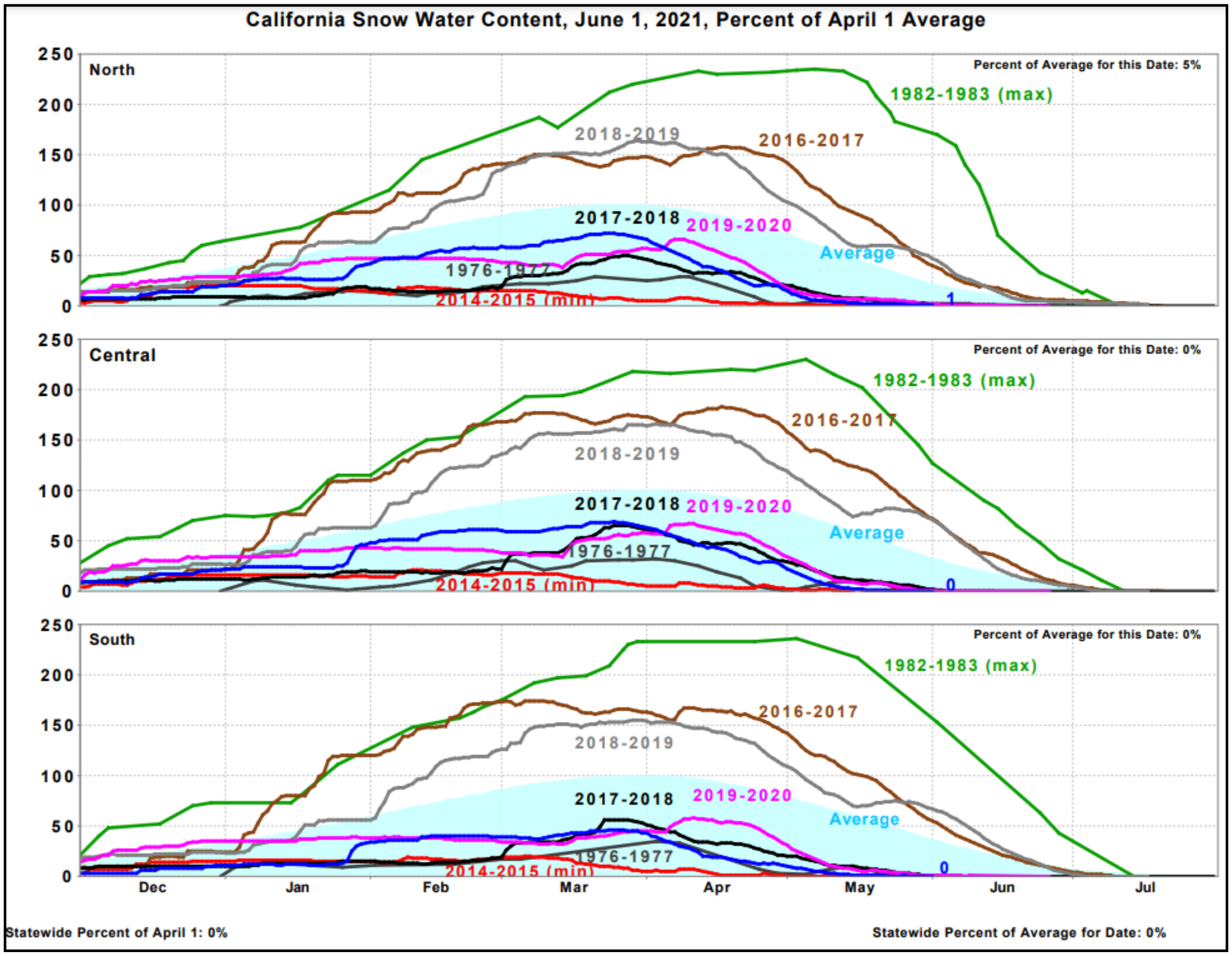

Figure 3-3. California snow water content for current water year

Source: https://water.ca.gov/Programs/Flood-Management/Flood-Data/Snow-Surveys

3.2 Local Supply Monitoring

In addition to the statewide monitoring, the Local Agencies also have their own monitoring procedures for groundwater and local surface supplies. These are described below.

3.2.1 Groundwater Monitoring

The Napa Valley has an extensive network of monitoring wells that have been monitoring groundwater levels, storage, quality, and overall use going as far back as 1918. As of 2020, there are a total of 107 monitoring sites across Napa County (Napa County GSA, 2021). Figure 3-4 shows some of the monitoring locations and 2019 groundwater depths across the Napa Valley Subbasin. These sites form part of monitoring networks that are operated by several entities, including Napa County, DWR, SWRCB, and the USGS. These monitoring networks are briefly described below.

- **Napa County Monitoring Network.** Napa County monitors a network of 96 wells that track short-term and long-term groundwater storage, levels, quality, and overall use. This monitoring began in 1962, and over the years Napa County has continued to add wells to its monitoring network to help gain a better understanding of the subbasins. Most of the wells in the county's network are located in the Napa Valley Subbasin and in the MST Subbasin.
- **California Statewide Groundwater Elevation Monitoring Program Network.** The California Statewide Groundwater Elevation Monitoring (CASGEM) program was developed by DWR to monitor groundwater level data regularly and systematically with the goal of demonstrating seasonal and long-term trends in groundwater elevations. In Napa County, the CASGEM Monitoring Network is a subset of the total wells in the Napa County Monitoring Network. Wells in the CASGEM Network are distributed across the Napa Valley, MST, and Carneros subbasins. As of fall 2020, the Napa County CASGEM Network included 34 monitoring wells (Napa County GSA, 2021).
- **DWR Monitoring Network.** DWR has four monitoring wells distributed across the Napa Valley Subbasin. These wells form part of their voluntary groundwater monitoring efforts. These wells help track groundwater levels and afford the opportunity to manually collect water samples to assess water quality. Monitoring at these sites is typically done monthly.
- **SWRCB Geotracker Network.** Geotracker is a SWRCB-owned online database that stores environmental data, including groundwater levels and groundwater quality, for regulated facilities in the state. The monitoring well network includes seven monitoring wells that are typically monitored on a semi-annual or quarterly basis. The seven wells are spread across Napa County.
- **USGS Monitoring Network.** The USGS has five wells in Napa County that form part of its Groundwater Ambient Monitoring and Assessment Program (GAMA). GAMA is a statewide, comprehensive assessment of groundwater quality designed to help better understand and identify risks to groundwater resources. The USGS last sampled their wells in October 2019 and do not anticipate sampling them again until 2024 as they tend to sample in 5-year cycles (Napa County GSA, 2021).

The data from these monitoring networks are currently being used in developing the Napa Valley GSP to establish a baseline on groundwater and related surface water conditions and to develop a representative monitoring network to track sustainability indicators for the Napa Valley Subbasin.

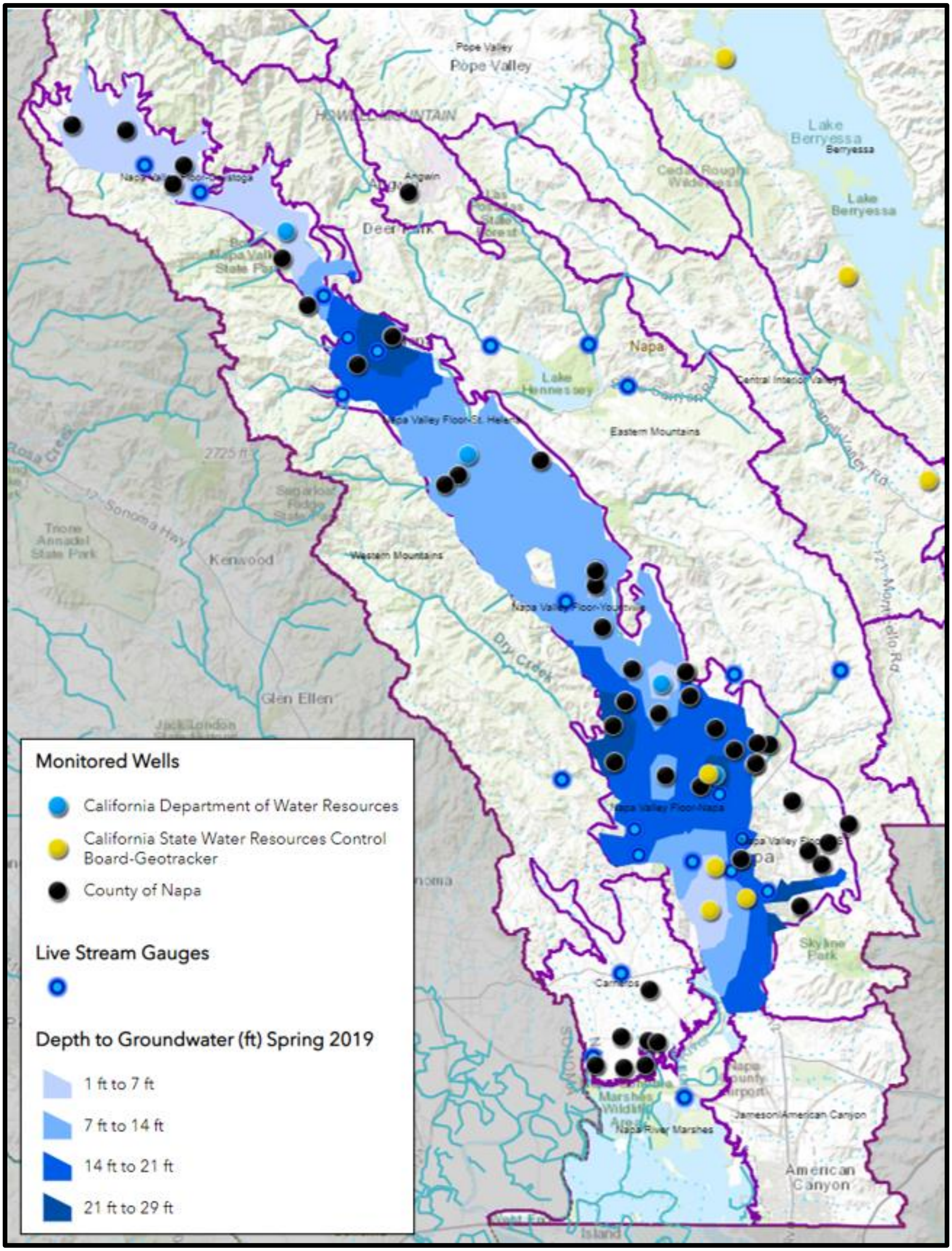

Figure 3-4. Groundwater monitoring sites within Napa Valley

Source: Napa County Interactive Groundwater Map

3.2.2 Local Surface Water Monitoring

Local agencies also monitor their individual local surface water supplies. These monitoring procedures are described below.

- **American Canyon.** Most of American Canyon's water supplies stem from the SWP and Vallejo. American Canyon does not have any local surface water supplies they call their own. As such, monitoring procedures in this sphere are fairly limited beyond the coordination efforts required to ensure delivery of the aforementioned supplies.
- **Calistoga.** Water quality at Kimball Reservoir is monitored year-around. Results from this testing are used to prepare Calistoga's monthly and annual reporting requirements. Since the reservoir is subject to state-mandated bypass requirements, Kimball Creek and the reservoir are closely monitored to ensure flows support fish and other environmental resources in Kimball Creek.
- **Napa.** Napa owns and operates both Lake Hennessey and Milliken Reservoir. Water rights for both supplies are secured through individual SWRCB permits. Water level from both reservoirs is continuously measured and reported through the Napa OneRain website (website is described below). Napa also monitors its supply sources to limit seasonal taste and odor challenges. These issues are due to algal growth as well as episodes of high total organic carbon that increases the formation potential for disinfection byproducts (Napa, 2017). Turbidity also presents some challenges. Raw water from Milliken Creek between fall and spring tends to have high levels of turbidity, which limit the ability to treat the water at the Milliken WTP and meet water quality regulations. Any water quality issues are typically noted in the Consumer Confidence Reports (CCR) Napa prepares and distributes to its customer base annually.
- **Yountville.** As noted previously, Rector Reservoir is owned and operated by the CDVA, which supplies water to Yountville. As the owner and operator of the reservoir, CDVA is responsible for ensuring there is sufficient flow to pass through or over the dam to keep fish downstream of the dam in good condition (Stillwater Sciences, 2020). As such, the CDVA actively monitors upstream and downstream conditions along Rector Creek and is currently conducting studies to identify a flow release schedule to satisfy this requirement. As a water purveyor, the CDVA also prepares state-mandated CCRs that include information on its source water, levels of any detected contaminants, compliance with drinking water regulations (including monitoring requirements), and some educational information. Information from these reports form the basis for the water quality reports Yountville develops for its customer base.
- **St. Helena.** Inflow from Bell Canyon Creek and Bell Canyon Reservoir is monitored year-around. The Bell Canyon watershed is geographically small and contains few contaminant sources. The land around the reservoir is owned by St. Helena. St. Helena also monitors the depth to water, pumping capacities, and annual quantity of water pumped from its groundwater wells. Like the other Local Agencies, St. Helena tests its water quality and publishes annual CCRs.

In addition to these surface water monitoring procedures, the region also maintains the Napa Valley Regional Rainfall and Stream Monitoring System, or Napa OneRain (https://napa.onerain.com/), which is a local collaborative project that provides current and historical monitoring of rainfall, river and stream monitoring, and reservoir levels. The site provides public access to a network of approximately 50 site locations in the Napa Valley using local, NOAA, and USGS data sources.

3.3 Water Use Monitoring and Reporting

The Local Agencies monitor customer water use (Figure 3-5), track the effectiveness of water conservation programs, and provide regular updates to their decision-making bodies (e.g., city councils) on water use trends and projections compared to available supplies. They are also required to develop and submit water use reports to the state, which are described below.

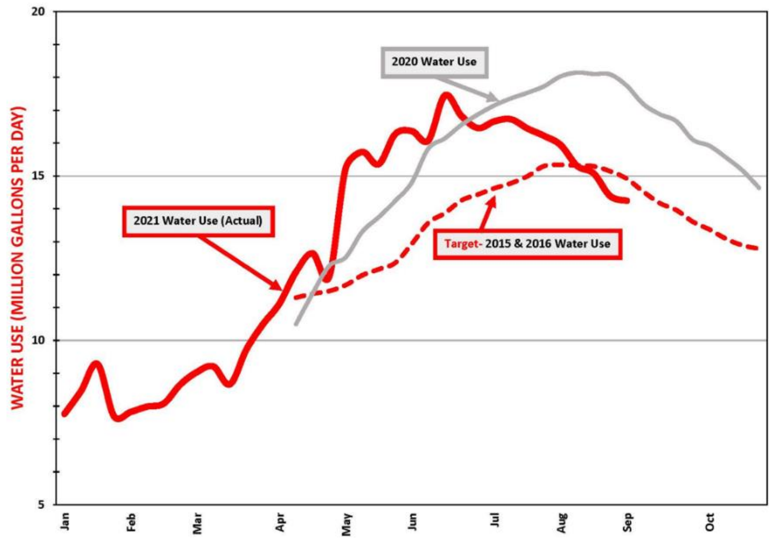

Figure 3-5. City of Napa daily water use

Source: City of Napa website: https://www.cityofnapa.org/1018/Drought-Update

Starting in July 2014, SWRCB adopted a drought emergency water conservation regulation that required urban water suppliers to provide SWRCB monthly water conservation and production reports. SWRCB required the monthly reports until the Emergency Regulation expired in November 2017. Since then, most urban suppliers continued to report voluntarily. In May 2018, Governor Brown signed into law water efficiency legislation (SB 606 and Assembly Bill 1668). This legislation, known as “Making Water Conservation a California Way of Life,” created water use efficiency standards and authorized the SWRCB to require monthly water production, water use, or water conservation reports on a non-emergency basis (DWR, 2018). SWRCB adopted the regulation on Monthly Urban Water Conservation Reporting at its April 21, 2020, board meeting and was subsequently approved by the Office of Administrative Law. The regulation became effective October 1, 2020 (SWRCB, 2021a).

In addition to these monthly reporting requirements, agencies must submit an Electronic Annual Report of urban water usage to the SWRCB Department of Drinking Water, which must include information on total potable water production, water use by sector, total recycled water production, and non-revenue water (SWRCB, 2021b). The SWRCB also requires annual water diversion reporting, which includes water amounts directly diverted, amounts diverted to storage, and amounts used overall.

For groundwater, the Napa County GSA will have to submit reports to DWR annually on April 1 following the completion and adoption of the Napa Valley Subbasin GSP. The annual reports will provide an update on the condition of the subbasin and on water use as required by Section 356.2 of the GSP Regulations.

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Section 4

Vulnerability Assessment

To create a basis for drought contingency planning, specific threats to the region's critical water resources and factors contributing to those threats must be understood. In addition, past climate, water supply, water use trends, and potential future drought conditions and climate change impacts must be considered. In the context of this DCP framework, drought vulnerability is the extent to which Local Agencies and the region are exposed or susceptible to risk. Risk is a combination of frequency of occurrence, magnitude and severity, and consequences. The Local Agencies use the resulting baseline risk assessment to inform potential drought response actions and mitigation measures described in this DCP.

4.1 Future Conditions of Critical Resources for Drought Supply

Drought contingency planning requires assessing the potential for a range of future hydrologic conditions and corresponding risk to critical resources. The significance of the region's critical water resources varies by Local Agency based on their individual supply portfolio.

For this analysis, future conditions are evaluated for Normal Year, Third Consecutive Dry Year, and Critical Dry Year scenarios. California water agencies were required to evaluate the impacts of Normal Years, Single Dry Years, and Third Consecutive Dry Years on their water supply availability for their 2015 UWMPs; however, not all the Local Agencies are required to prepare UWMPs as they fall below water delivery trigger amounts (e.g., don't serve 3,000 customer connections or deliver more than 3,000 AFY of water) specified by the California Water Code (CWC). For consistency of supply evaluation across agencies, the Local Agencies agreed to use Normal Year, Third Consecutive Dry Year, and Critical Dry Year scenarios for this vulnerability assessment.

The Local Agencies' water supply availability by source is quantified and projected under Normal Year, Third Consecutive Dry Year, and Critical Dry Year conditions considering historic reliability and corresponding risks to each supply source. For Napa and American Canyon, this information is from their 2015 UWMPs. For the remaining Local Agencies, this information is from other recent planning documents and input from staff at each respective agency.

Third Consecutive Dry Year and Critical Dry Year future conditions are also appropriate for this analysis because these water year types describe realistic conditions under which the Local Agencies would be vulnerable to supply shortages due to legal, environmental, water quality, and climatic factors.

Future condition scenarios are applied to the remainder of this analysis for:

- Assessing regional potential future supply shortfalls by comparing supply portfolios and demands (as projected for a Normal Year, Third Consecutive Dry Year, and Critical Dry Year in 2020 and 2035).
- Determining significance of supply source to Local Agencies' drought portfolios (as projected for a Critical Dry Year using 2020 supplies).
- Plotting a risk matrix to illustrate the vulnerability of regional drought supplies (as projected for a Critical Dry Year in 2035).

4.2 Potential for Future Supply Shortfalls

The Plan Area's collective supply varies with hydrology in terms of total volume available and diversity of the supply portfolio, as shown on Figures 4-1 and 4-2. Information from the Local Agencies was compiled to quantify potential frequency of occurrence and magnitude of regional supply shortfalls for the collective and individual Local Agencies in 2020 and 2035, based on comparing the region's future direct demands to projected total supplies under future conditions (Normal Year, Third Consecutive Dry Year, and Critical Dry Year conditions).

Despite the minor differences in the Local Agencies' methodologies, Figures 4-1 and 4-2 provide a general sense of potential future supply surpluses and/or gaps for the region. Individual Local Agency assessments can be found in Appendix B. As of 2020, the total available annual supply of about 72.7 thousand acre-feet (TAF) in a Normal Year is expected to reduce to 54.9 TAF in a Third Consecutive Dry Year, and 50.5 TAF in a Critical Dry Year. When additional supply is available in wet and Normal Years, groundwater and surface water storage are typically replenished. These supply totals are expected to increase to 74.9 TAF for a Normal Year, 56.8 TAF in a Third Consecutive Dry Year, and 52.3 TAF in a Critical Dry Year by 2035 due in large part to the continued investment in building up local recycled water programs. When considered from a regional perspective, the region can anticipate meeting Normal Year demands for wet/normal water supply years in the near term (2020) and long term (2035). Discrepancies in the total projected water supplies when comparing Normal Year, Third Consecutive Dry Year, and Critical Dry Year scenarios in the 2020 and 2035 stem mainly from reductions in the SWP supplies. While some reduction in available supply from the other local surface water supplies is anticipated, none is as substantial as the one stemming from the SWP. Thus, in a Third Consecutive Dry Year, reliance on storage increases significantly. Reduced deliveries from the SWP and diversions from the Napa River and its tributaries amplify the importance of local supply sources (e.g., Lake Hennessy, Napa Valley Subbasin, etc.). In a Critical Dry Year scenario, overall storage is expected to be significantly depleted.

Not all the Local Agencies' supplies vary consistently with the cumulative regional perspective. The composition of an individual Local Agency's supplies vary from Normal Year to Third Consecutive Dry Year, and Critical Dry Year scenarios. Some Local Agencies have more significant challenges in dry conditions. While the overall supply numbers suggest regionally that there is enough water across all year types in both the near term (2020) and future scenarios (2035), it is only when water supplies are disaggregated to the individual agencies that you find supply deficits during drought conditions for some agencies. To make up these shortfalls, drought response and mitigation actions (i.e., projects) from a regional perspective will be needed to varying degrees in the region.

4.3 Risks to Critical Resources

Using the supply projections for the Critical Dry Year in 2035, Figure 4-3 illustrates the consequence of a supply reduction based on the relative significance in terms of percent of the direct supply sources to the Local Agencies' overall supply portfolios. The greater the significance of the supply is to an agency, the greater the consequence if it were to be reduced during a drought. Each Local Agency is listed on the first axis and the water supplies are listed on the second axis. For each Local Agency, the water supply portfolio is illustrated by percent of supply source on the third (vertical) axis. For example, on Figure 4-3 water supply from Lake Hennessey is the most significant existing supply source for Napa under the 2035 Critical Dry Year future condition, accounting for 64 percent of Napa's total supply. Similarly, we see that Napa County relies on groundwater from the Napa Valley Subbasin for 68 percent of its total supply during that same Critical Dry Year future condition.

This section describes the uncertainty factors contributing to the potential reduction or loss of water supplies and the vulnerability of drought supplies in the region to these factors.

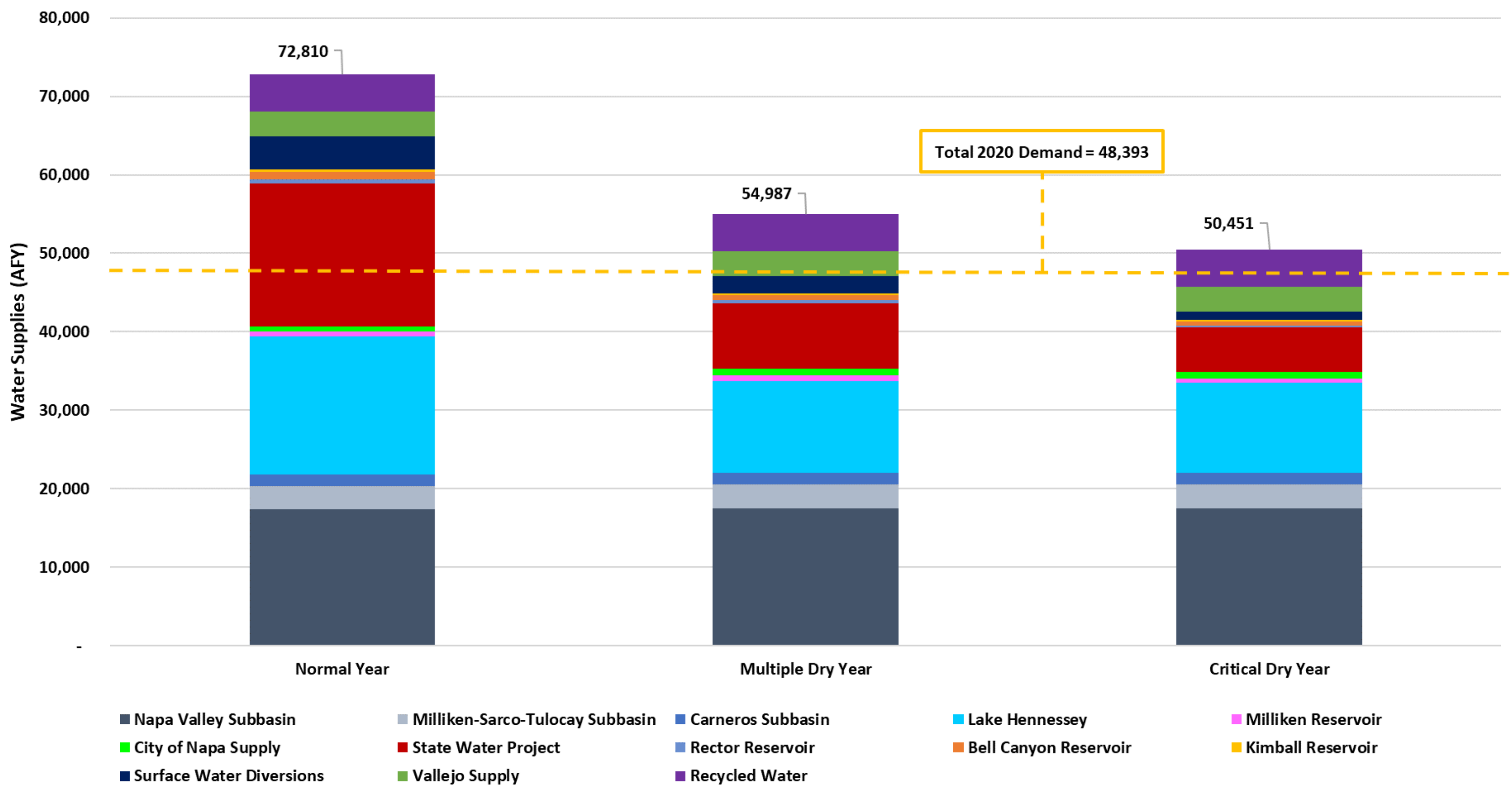

Figure 4-1. Existing Napa Valley regional water supply portfolio (2020)

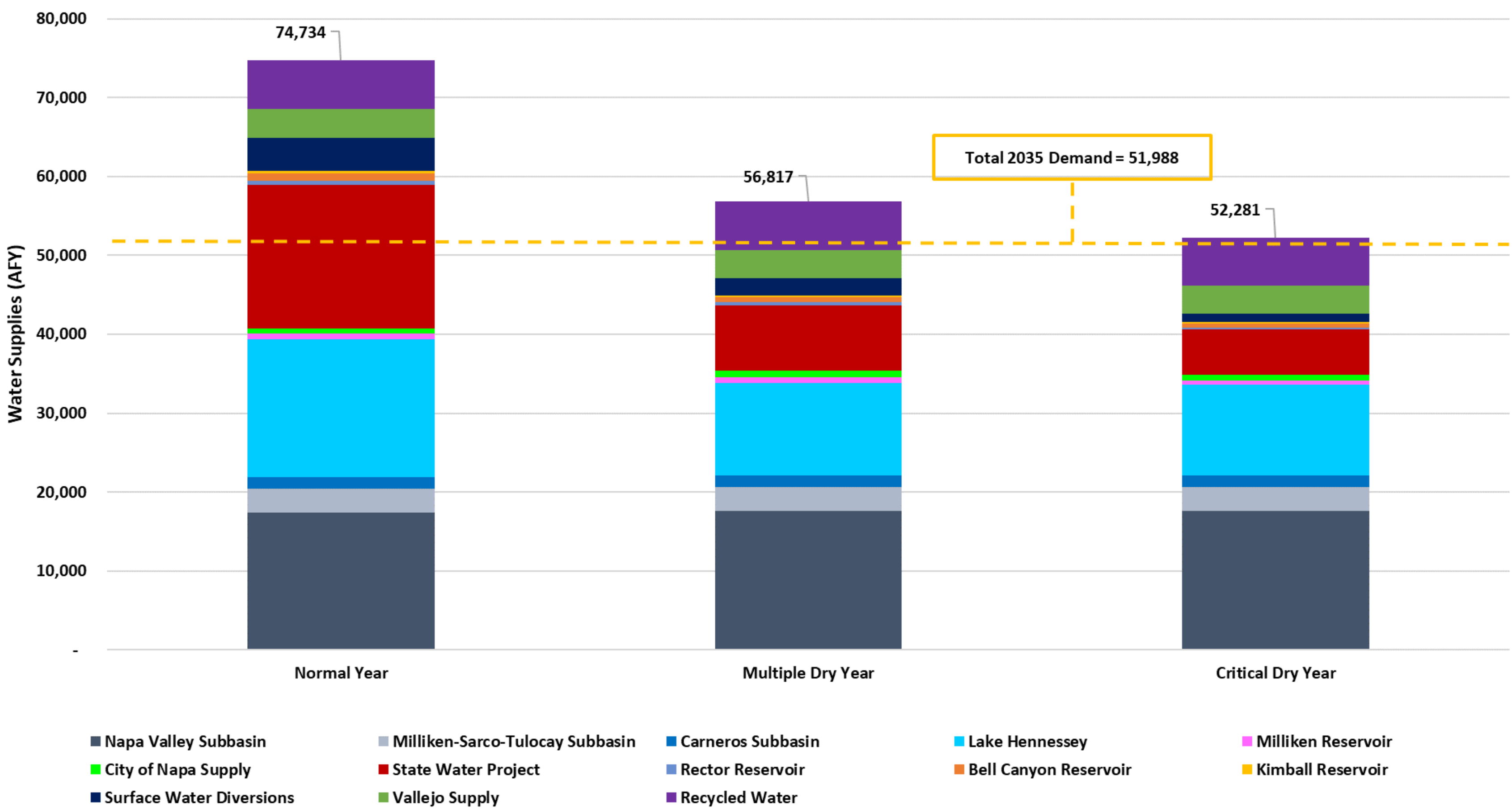

Figure 4-2. Projected Napa Valley regional water supply portfolio (2035)

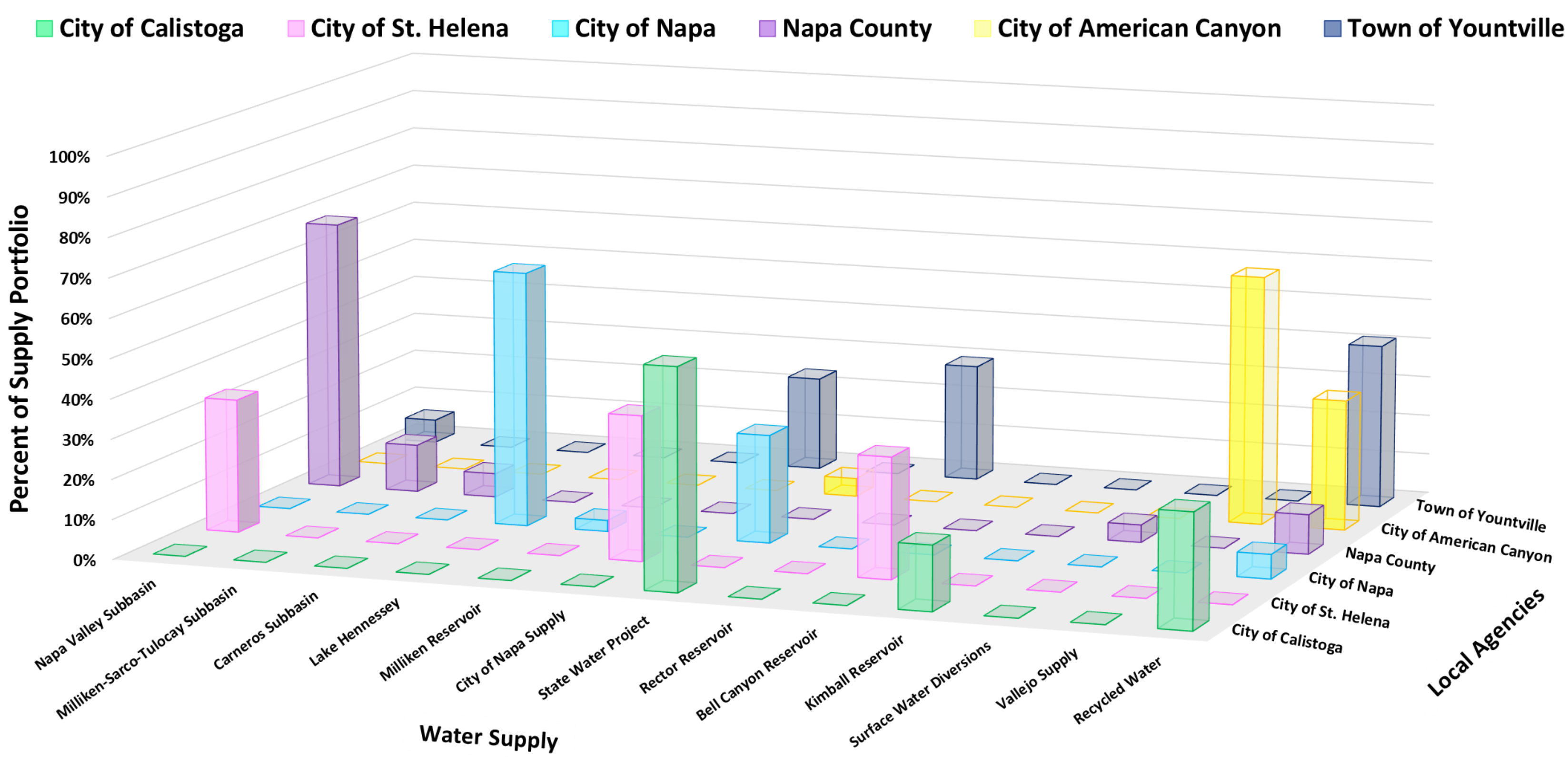

Figure 4-3. Significance of supply sources to Local Agencies' drought portfolios, as projected for a Critical Dry Year in 2035

4.3.1 Uncertainty Factors Contributing to Potential Loss of Water Supplies

Critical water supplies in the region face multiple threats and uncertainties, including impacts associated with climate change; infrastructure susceptibility in the event of an emergency; supply limitations; regulatory, environmental, and water rights constraints; cost constraints and affordability; and source water quality degradation (see Figure 4-4). These factors may reduce availability and reliability of existing and future water supplies to serve the region's population. The Local Agencies assessed the vulnerability of the region's critical water resources due to these uncertainty factors, as summarized by supply source in Table 4-1.

Climate Change – Climate change is one of the most significant and challenging risks to future water supplies. The uncertainty surrounding climate change requires consideration of drought mitigation measures that are resilient to a range of possible climatic conditions.

Infrastructure Susceptibility and Supply Limitations – Local Agencies in the Napa Valley rely upon a diverse network of water-related infrastructure to help convey, treat, and distribute water supplies from local sources. These systems have limitations and are susceptible to damage from floods, earthquakes, fires, or other events.

Regulatory, Environmental, and Water Rights Constraints – New or changing regulations such as SGMA can affect Local Agencies' abilities to access and use supplies (i.e., Napa Valley Subbasin) as they have in the past. New, and often costly, treatment technologies are needed to meet evolving regulations and/or decreasing water quality conditions.

Cost Constraints and Affordability – Addressing aging infrastructure, securing alternative supplies, and complying with evolving regulations are just several examples of factors contributing to the rising cost of water. Local Agencies are obligated to maintain fiscal responsibility and balance increasing costs of maintaining and updating infrastructure.

Source Water Quality Degradation – Water suppliers are responsible for protecting public health. Local Agencies apply a multi-barrier approach to protect public health, starting with protecting drinking water quality at its source, treating the supply, and distributing to customers through a safe, reliable system. The level of risk related to source water quality can vary largely depending on the supply.

Figure 4-4. Uncertainty factors in the Plan Area

4.3.2 Vulnerability of Regional Drought Supplies

As summarized in Table 4-1, a relative ranking of the likelihood a particular supply source may be reduced or lost was assigned. The likelihood score is a qualitative tally based on the cumulative likelihood of the reduction or loss of supply as a result of the uncertainty factors described. The likelihood score ranges from 1 to 5, with 1 being a low likelihood of loss or reduction and 5 being a high likelihood of loss or reduction.

To frame the consequence of reduction or loss of supplies in Table 4-1, the significance of the supply source to the region's supply portfolio was considered (assuming the future condition of Critical Dry Year in 2035). The consequence score is a quantitative tally based on the weighted average of each individual supply source volume to total regional overall supply volume for all sources. A higher percentage indicates a supply that is a larger portion of the region's supply portfolio.

The vulnerability of the region's drought supply sources is assessed using a combination of the likelihood and consequence of supply reduction or loss. The results are illustrated on the risk matrix on Figure 4-5, where water supplies in and around the lighter-shaded areas are considered to be less vulnerable than those located within the darker-red-shaded areas. The significance of sources to individual Local Agencies' drought supply portfolios is shown (as bar charts) on Figure 4-5 as well. Key takeaways from the risk matrix for the 2035 Critical Dry Year are:

- The SWP and Surface Water Diversions supplies have the highest likelihood of loss or reduction due to a litany of uncertainties associated with climate change, potential regulatory constraints, and water quality issues. Combined, these supplies account for approximately 13 percent of the region's drought water supply portfolio.
- The Napa Valley Subbasin has the highest consequence of supply loss or reduction in this region. It accounts for 34 percent of the NVDCPs drought water supply portfolio. The agriculture sector is especially reliant on the Napa Valley Subbasin supply.
- Most of the smaller local reservoirs were found to have a medium to high regional vulnerability. While these supplies account for only a small portion of the regional drought supply portfolio, they provide critical water supply to those respective agencies during drought periods.
- Although still very important to the region's water supply portfolio, most of the other supplies in the region have a medium to low regional vulnerability to loss or reduction. This is due to a lower reliance on these supplies compared to the overall regional supply portfolio combined with a moderate likelihood of loss or reduction of availability of the supply during drought years.

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Table 4-1. Summary of Uncertainty Factors Contributing to Potential Reduction or Loss of Critical Resources

Supply Source	Climate Change	Infrastructure Susceptibility and Dry Year Supply Limitations	Regulatory, Environmental, and Water Rights Constraints	Cost Constraints and Affordability	Source Water Quality Degradation	Likelihood – Cumulative Effect of Factors (scale of 1 to 5, low to high likelihood)	Regional Consequence – Significance to Regional Drought Supply Portfolio (in 2035, Critical Dry Year)
Napa Valley Subbasin	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) • Sea level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	• Special care must be taken to avoid overdrafting, which can lead to subsidence • Facilities and infrastructure susceptible to seismic events	• More stringent water quality regulations that could impact the way agencies operate and manage this supply • Uncertain impacts of the SGMA	• Treatment costs with increasingly stringent water quality regulations • Customer affordability issues with rising cost of water	• Varies by end user and area within basin • Saltwater intrusion due to droughts • Some constituents of concern (e.g., arsenic, iron, manganese, and boron	3	34%
Milliken-Sarco-Tulocay Subbasin	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) • Sea level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	• Special care must be taken to avoid overdrafting, which can lead to subsidence • Facilities and infrastructure susceptible to seismic events	• More stringent water quality regulations that could impact the way agencies operate and manage this supply	• Treatment costs with increasingly stringent water quality regulations • Customer affordability issues with rising cost of water	• Varies by end user and area within basin • Saltwater intrusion due to droughts • Some constituents of concern (e.g., arsenic, iron, manganese, and boron	4	6%
Carneros Subbasin	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) • Sea level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	• Special care must be taken to avoid overdrafting, which can lead to subsidence • Facilities and infrastructure susceptible to seismic events	• More stringent water quality regulations that could impact the way agencies operate and manage this supply	• Treatment costs with increasingly stringent water quality regulations • Customer affordability issues with rising cost of water	• Varies by end user and area within basin • Saltwater intrusion due to droughts • Some constituents of concern (e.g., arsenic, iron, manganese, and boron	3	3%
Lake Hennessey	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	3	22%
Milliken Reservoir	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	3	1%
City of Napa Supply	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality	• Potential dry year curtailments • Reliant on aging infrastructure (susceptible to failure) • Susceptible to Delta water quality disruptions due to earthquake, level failure, sea level rise, etc. • Aging Delta levees and SWP infrastructure vulnerable to seismic events	• Regulatory uncertainties that can change timing of exports, reduce deliveries, and impact transfer capacities	• Infrastructure requirements and operational requirements (e.g., monitoring)	• Saltwater intrusion due to droughts • Levee failure • Sea level rise • Algal by-products/ blooms during drought • Increased levels of total organic carbon/dissolved organic carbon (TOC)/(DOC) and turbidity	3	2%
State Water Project	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher air temperatures/reduced snowpack • Higher water temperatures/degraded surface water quality • Sea level rise (seawater intrusion/water quality impacts and threats to aging Delta levees)	• Potential dry year curtailments • Decreasing reliability due to climate change and environmental restrictions • During drought, limited access to remotely banked supplies due to limited exchange capacity • Reliant on aging infrastructure (susceptible to failure) • Susceptible to Delta water quality disruptions due to earthquake, level failure, sea level rise, etc. • Aging Delta levees and SWP infrastructure vulnerable to seismic events	• Regulatory uncertainties that can change timing of exports, reduce deliveries, and impact transfer capacities • Increased environmental regulations	• Rising costs to address needed infrastructure improvements and regulatory compliance, including subsidence of aqueducts caused by groundwater overdraft • Cost of potential California WaterFix construction • Customer affordability issues with rising cost of water	• Saltwater intrusion due to droughts • Levee failure • Sea level rise • Algal by-products/ blooms during drought • Increased levels of TOC/DOC and turbidity	5	11%

Table 4-1. Summary of Uncertainty Factors Contributing to Potential Reduction or Loss of Critical Resources

Supply Source	Climate Change	Infrastructure Susceptibility and Dry Year Supply Limitations	Regulatory, Environmental, and Water Rights Constraints	Cost Constraints and Affordability	Source Water Quality Degradation	Likelihood – Cumulative Effect of Factors (scale of 1 to 5, low to high likelihood)	Regional Consequence – Significance to Regional Drought Supply Portfolio (in 2035, Critical Dry Year)
Rector Reservoir	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	4	<1%
Bell Canyon Reservoir	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	4	1%
Kimball Reservoir	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	4	<1%
Surface Water Diversions	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality • Wildfire impacts on watersheds and water quality	• Susceptible to supply reductions and changes in timing • Regulatory uncertainty related to in-stream/ downstream flow requirements • Facilities and infrastructure susceptible to seismic events	• Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	• Pumping costs • Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	• Agriculture runoff • Algal blooms (also potentially affect treatability and decrease production capacity) • Turbidity due to extreme weather and/or wildfires	5	2%
Vallejo Supply	• Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) • More frequent and severe droughts • Higher water temperatures/degraded surface water quality	• Potential dry year curtailments • Reliant on aging infrastructure (susceptible to failure) • Susceptible to Delta water quality disruptions due to earthquake, level failure, sea level rise, etc. • Aging Delta levees and SWP infrastructure vulnerable to seismic events	• Regulatory uncertainties that can change timing of exports, reduce deliveries, and impact transfer capacities •	• Infrastructure requirements and operational requirements (e.g., monitoring)	• Saltwater intrusion due to droughts • Levee failure • Sea level rise • Algal by-products/ blooms during drought • Increased levels of TOC/DOC and turbidity	3	7%
Recycled Water	• More frequent and severe droughts, which may reduce wastewater flows and the amount of available recycled water available • Concentrated wastewater flows (with reduced flows) necessitating treatment changes	• Highly reliable local supply in the event of a drought	• Increasingly stringent regulations on recycled water treatment and distribution	• High cost of building and maintaining separate distribution system for recycled water and retrofitting customer sites	• Challenging to provide recycled water quality that meets customers' standards • Salinity could be problematic for sensitive end uses	1	12%

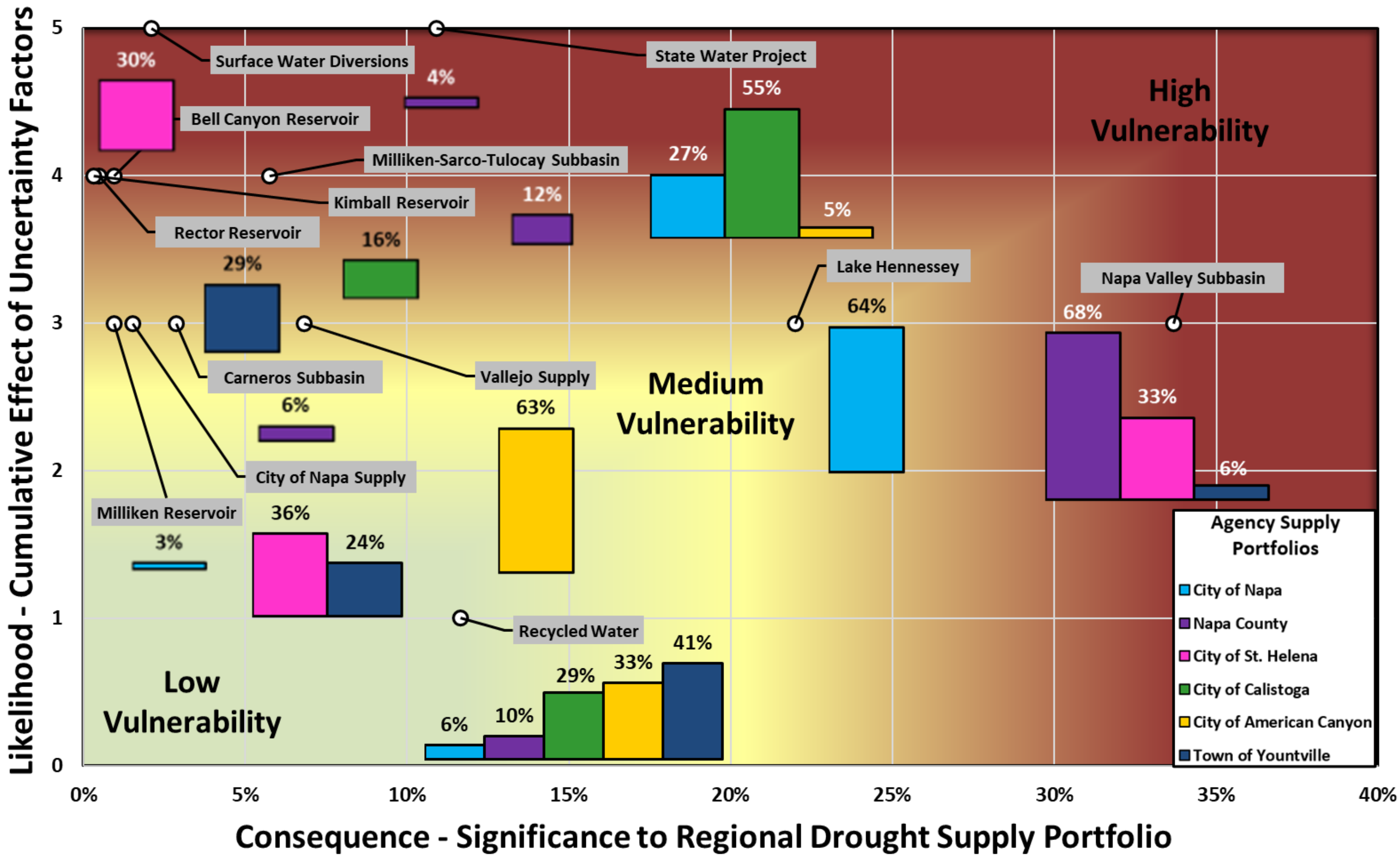

Figure 4-5. Vulnerability of regional drought supplies as projected for Critical Dry Year Conditions in 2035

4.4 Climate Change

Climate change is one of the greatest sources of uncertainty in long-term (more than 50 years) water supply planning. In 2014, the Intergovernmental Panel on Climate Change (IPCC) and Scripps Institute of Oceanography indicated that global temperatures could increase by 4 degrees Celsius (°C) by the end of the century (IPCC, 2014). More recent studies, like California's Fourth Climate Change Assessment released in 2018, support this notion. Climate projections from the state's assessment project an increase in temperature of 2° to 4°C (under a medium-emissions scenario) to 4° to 7°C (under a high-emissions scenario) by the end of this century (Pierce et al, 2018).

Precipitation amounts could also potentially be altered. Historically, California has had a hydroclimate with significant inter-annual variability even in the absence of anthropogenic climate change. Anthropogenic climate change may increase the frequency of extreme hydrologic events such as floods or droughts. Warmer temperatures are expected to result in more of California's precipitation occurring as rain rather than snow, and snowmelt from the Sierra Nevada Mountains and Cascades is expected to shift earlier into the spring. Since a substantial portion of the region relies on the snowpack and surface water supplies (i.e., SWP supplies) from the Sierra-Nevada Mountains and Cascades to meet a notable portion of their demands, these trends are expected to make resolving any future water supply and demand imbalances even more challenging.

California has created several web-based interfaces to help local and regional planners "downscale" climate models for local planning purposes. The Cal-Adapt website is one that provides a geographically based climate model interpretation tool that generates predictive changes to climate variables using two greenhouse gas emissions scenarios: Representative Concentration Pathways (RCP) 4.5 and 8.5.

RCP4.5 represents a mitigation scenario where global carbon dioxide (CO_2) emissions peak by 2040, while RCP8.5 represents a business-as-usual scenario where CO_2 emissions continue to rise throughout the 21st century. Unless otherwise specified, the temperature and precipitation data used for the climate change assessment in this section is drawn from the downscaled daily products included in California's Fourth Climate Change Assessment. The datasets include projections from 32 global climate models (GCM) over California to a spatial resolution of 1/16° (around 6 kilometers, or 3.7 miles). A subset of 10 downscaled GCMs were shown to adequately sample changes across the entire ensemble of 32 models, and results from this 10-member ensemble are used for figures in this section.

4.4.1 Precipitation

While there is a range of forecasts for changes in total precipitation (i.e., wetter or drier), most climate projections indicate that precipitation in the Bay Area will continue to exhibit high year-to-year variability (Ackerly et al, 2018). This same notion is evident when you assess trends for the Plan Area. Data from the Cal-Adapt tool shows that precipitation increases in some projections and decreases in others, with no clear consensus. Many projections show an increase in the variability and extremes. The potential impact of this projected greater variability on supply indicates increased occurrences of floods and droughts even though the average rainfall may not change significantly. Figure 4-6 illustrates the modeling results for precipitation in the Plan Area. The uncertainty surrounding climate change, with the possibility of more frequent and more severe droughts in the future, necessitates consideration of mitigation measures that are resilient to a range of possible climatic conditions.

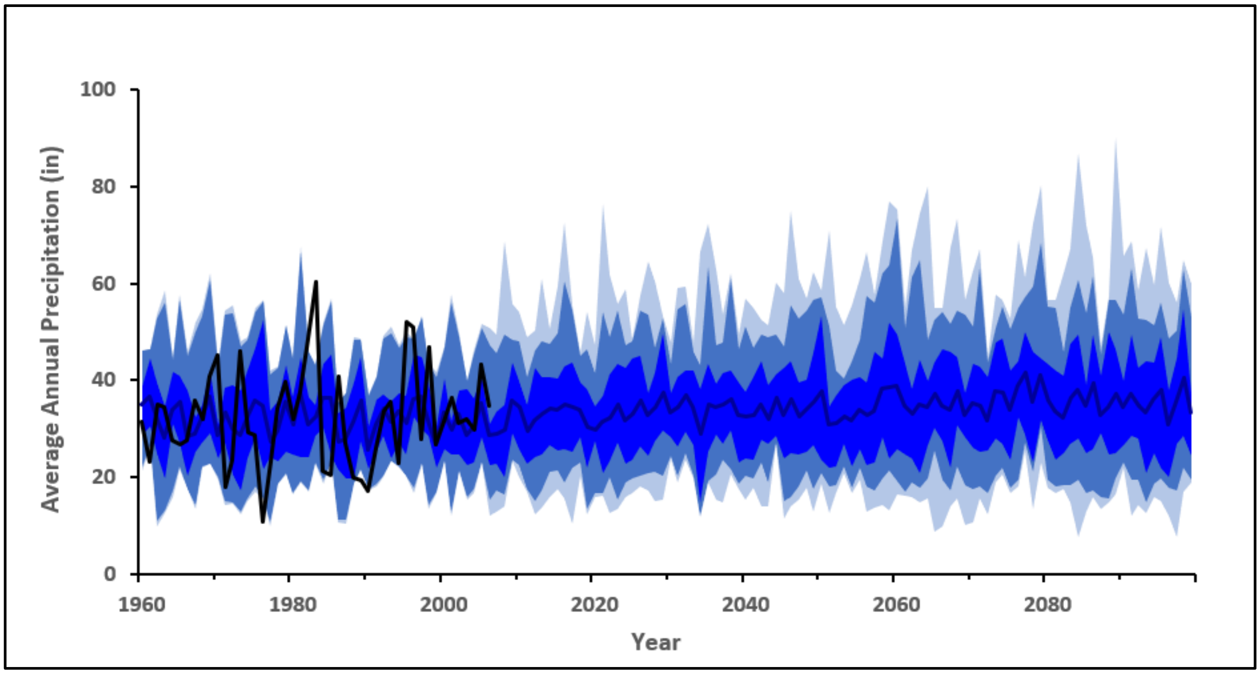

Figure 4-6. Climate change modeling for precipitation in the Plan Area

The high variability of mean annual precipitation in the Napa Valley makes it difficult to detect a strong signal in future projections of annual precipitation. This is evident by the relatively small change in mean annual precipitation relative to variability for mean annual precipitation in the Plan Area, as shown on Figure 4-7. Mean annual precipitation ranged considerably from year to year between 1960 and 2005, from 10.71 inches to 60.22 inches. So even though the multi-model average projections show a small increase in annual precipitation (i.e., 2.5 inches per year in RCP4.5 and 4.7 inches per year in RCP8.5 by end of the century (2070-2100) relative to the baseline period of 1960-2005), these changes are miniscule relative to the high inter-annual variability, with a range of almost 50 inches in total rainfall between the driest and wettest years in the historical record.

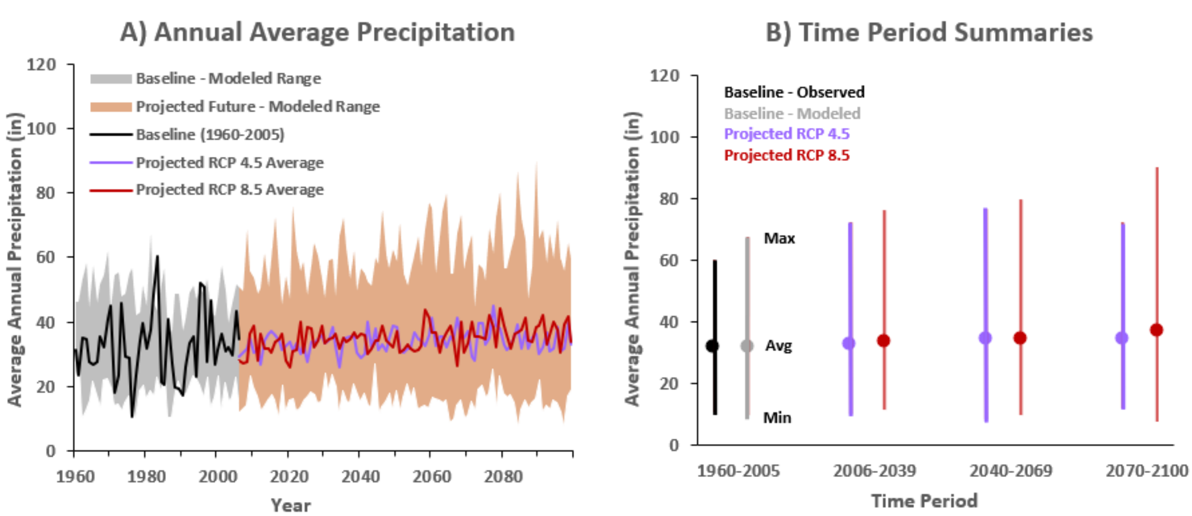

Figure 4-7. Climate change assessment – precipitation

Observed historical (black), modeled historical (grey), and projected future (RCP4.5 - purple, RCP8.5 red) annual average precipitation over the Plan Area. (A) Annual time series of data (future projections begin in 2006), with solid lines representing observed annual mean in the historical period and model averages in the future. Shading represents the spread across models. (B) Summary of multi-year average (circles) and spread (vertical lines) across four time periods: 1960-2005 (historical), 2006-2039 (early-21st century), 2040-2069 (mid-21st century), and 2070-2100 (late-21st century).

4.4.2 Temperature

Unlike the trends observed with precipitation, the multi-model average projections for temperature in the Plan Area predict an increase in temperature with a strong consensus. Many projections also show an increase in variability and extremes, as shown on Figure 4-8. Rising temperatures in the Napa Velley will make the region more arid. This temperature trend is fairly consistent across the state. Rising temperatures could result in an increase on water demands, especially within the agricultural and outdoor sectors.

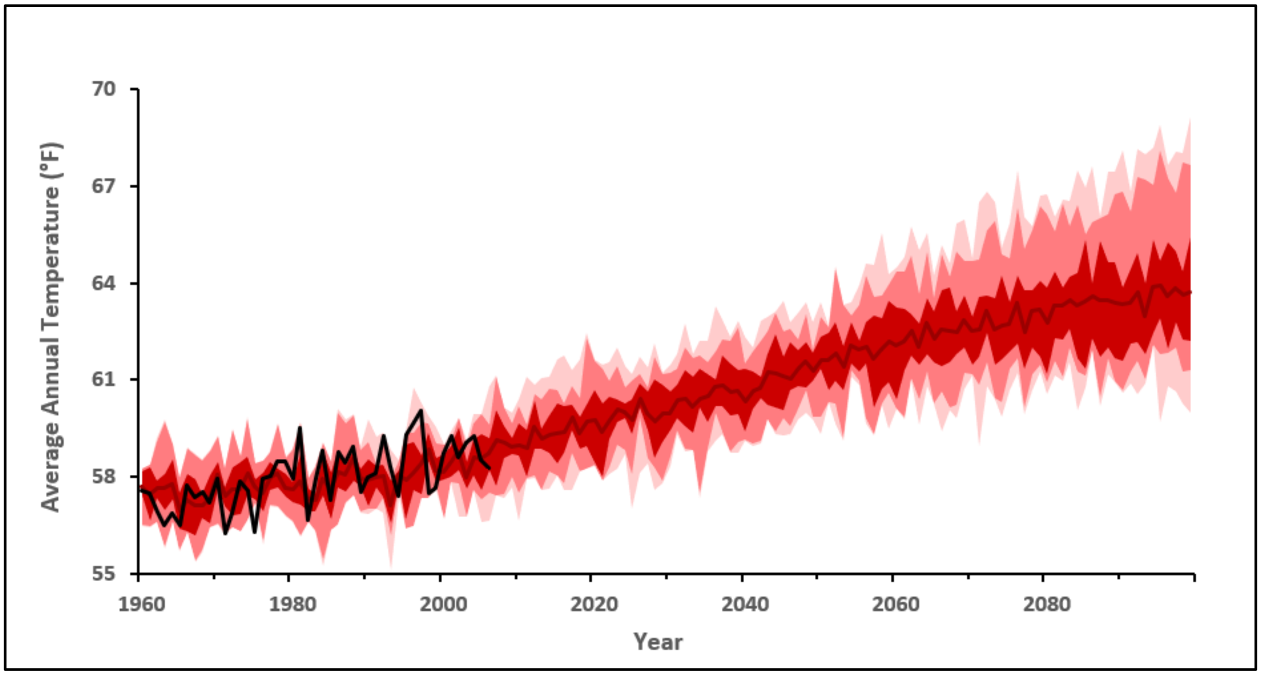

Figure 4-8. Climate change modeling for temperature in the Plan Area

A more detailed breakdown of the annual average temperature trend in the Napa Valley is presented on Figure 4-9. Annual average temperatures remained within a relatively narrow range of 56.3 degrees Fahrenheit (°F) to 60.1°F between 1960 and 2005, with an overall average temperature of 58°F. The observed upward trend in the region over this timeframe is consistent with the global mean temperature change attributable to anthropogenic influences over a similar timeframe (Ackerly et al, 2018). Based on the forecasts, by mid-century (2040–2069) the projected mean annual temperature for the Plan Area is expected to exceed the historical annual mean, regardless of which emissions scenario is chosen. This means that even with significant efforts to mitigate climate change (RCP4.5), the Napa region will likely see annual mean warming on the order of approximately 3.5°F. This increment jumps to 4.6°F when looking at projections under the high-emissions RCP8.5 scenario. These differences continue to grow and become more apparent by the end of the century (2070-2100) when the multi-model average shows warming on the order of 4.6°F for RCP4.5 and 7.4°F for the RCP8.5 scenario.

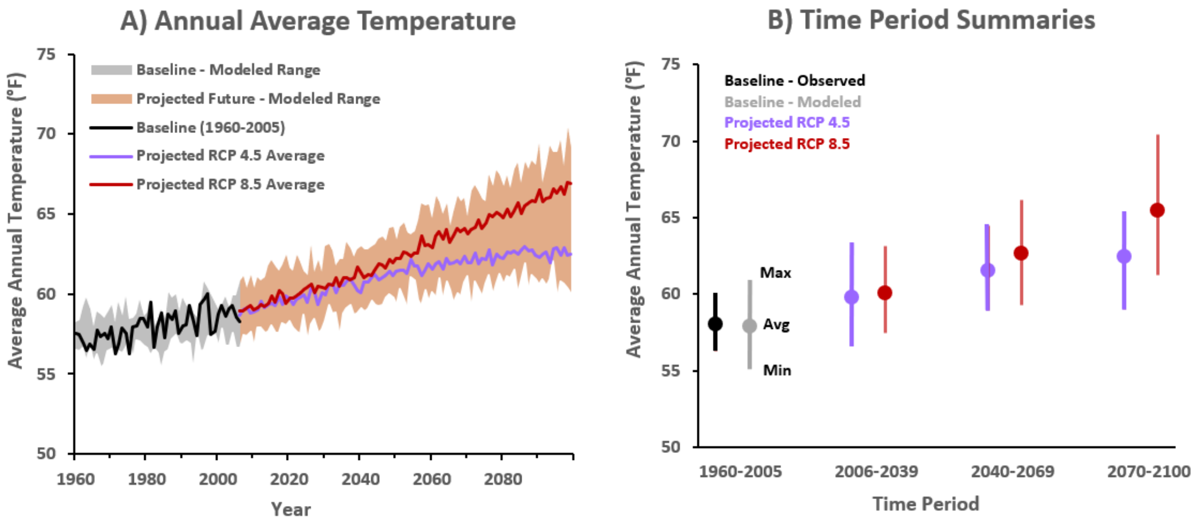

Figure 4-9. Climate change assessment – temperature

Observed historical (black), modeled historical (grey), and projected future (RCP4.5 - purple, RCP8.5 red) annual average temperature over the Plan Area. (A) Annual time series of data (future projections begin in 2006), with solid lines representing observed annual mean in the historical period and model-averages in the future. Shading represents the spread across models. (B) Summary of multi-year average (circles) and spread (vertical lines) across four time periods: 1960-2005 (historical), 2006-2039 (early-21st century), 2040-2069 (mid-21st century), and 2070-2100 (late-21st century).

4.4.3 Water Demands

While typical customer response in the Plan Area has shown that customers adapt to using less water by converting to drought-tolerant landscaping and reducing turf irrigated areas, other potential issues are likely to persist. While grapevines have the ability to survive and even thrive with limited water, agriculture water use in general is expected to increase to offset higher temperatures and increased evaporative losses. Higher temperatures could also result in longer growing seasons, which would contribute to increased demands. A rise in water demands would also likely be accompanied by increases in the use of groundwater, which has the potential to cause significant reductions in the base flow of the Napa River and cause many shallow wells in the area to dry up. It is also important to consider that existing water treatment and distribution systems may not be designed to accommodate significant increases in maximum day demand.

4.4.4 Surface Water Resources

Changes in climate that affect the amount and frequency of local rainfall can have dramatic impacts on available local surface supplies. Decreased inflow from more flashy or more intense runoff, increased evaporative losses, and warmer and shorter winter seasons can reduce the amount of water stored in surface water reservoirs and groundwater subbasins.

Water supplies stemming from the SWP depend on snowpack in, and runoff from, the Sierra Nevada Mountains and Cascades. To help assess the reliability of the water supply, the SWP produces a biannual report to evaluate the reliability of the supply. The analysis conducted as part of the 2019 State Water Project Delivery Capability Report predicted a reduction of SWP Table A deliveries compared to the amounts forecasted in the 2017 report. This decreasing trend in deliveries has been observed over the last several iterations of this biannual evaluation and align with findings from other recent reports on the SWP. A study completed as part of California's Fourth Climate

Change Assessment on the impacts of climate change on the SWP found that a shift in seasonal flow patterns and sea level rise could lead to 500,000 AF of Delta export reduction as well as a roughly 25 percent decrease of North-of-Delta carryover storage by around 2060 (Wang et al, 2018). The study also found that added runoff from early snow melting and more precipitation falling as rain during the winter and early spring would not be conserved in reservoirs and thus would not be available to help curve higher summer demands in the current SWP system. The extra water would be released during the winter and early spring as flood water and be lost as Delta outflow (Wang et al, 2018).

4.4.5 Groundwater Resources

Reductions in local and imported surface water supplies, combined with changes in hydrology, could lead to less water available to recharge local groundwater subbasins. Changes to the region's hydrology could affect natural recharge patterns and the quantity of groundwater that could be pumped sustainably over the long term in some areas. While recent monitoring reports suggest groundwater levels in the local subbasins have been stable in recent years, any sustained period of drought could lead to over-pumping, which would be detrimental to the long-term sustainability of the regional subbasins. There are also potential modifications to water rights and environmental regulations that influence management and operations of water resources (e.g., SGMA).

4.4.6 Sea Level Rise

Sea level in the Bay Area has risen more than 8 inches in the last 100 years (Ackerly et al, 2018). Modeling efforts conducted as part of California's Fourth Climate Change Assessment project median sea level rise of 29.1 inches (RCP4.5) and 53.9 inches (RCP8.5) along the California coast by 2100 (Ackerly et al, 2018). Low-lying areas that have been historically susceptible to flooding are likely to see an increase in the incidence of floods. This means Napa and those communities surrounding the Napa-Sonoma Marshes, which are the most heavily affected by flooding events in the county, will likely need to continue looking for ways to bolster their flood mitigation procedures to keep the local communities out of harm's way.

Projected sea level rise could increase seawater intrusion into the Delta, thus increasing Delta salinity. Increased Delta salinity could reduce water supplies in two ways: (1) Delta water may need to be blended with other less salty sources to achieve water quality delivery goals, and (2) SWP supplies may be reduced because they are required to meet water quality objectives at various locations in the Delta as defined by State Board Decision 1641 (D-1641). Increased Delta salinity could necessitate a reduction in Delta exports or increased releases from upstream reservoirs to meet regulatory water quality objectives. Such changes to SWP operations could mean less water is available for other beneficial uses.

Rising sea level could also increase the risk of levee failure in the Delta and, therefore, increase the risk of water supply disruption. The Delta levee system is vulnerable to sea level rise and provides conveyance for SWP supplies pumped at the export facilities. The Delta Levee Investment Strategy Risk Analysis Methodology Report indicates that the annual probability of levee failure will increase because of sea level rise (Delta Stewardship Council, 2016). The incremental increase in the likelihood of levee failure associated with sea level rise depends on many factors, including levee location upstream of the Golden Gate and river inflow. At this juncture, research suggests that even with high levels of emissions reductions, at least 78 inches of sea level rise is inevitable over the next several centuries due to time lags in response to increasing global temperatures (Ackerly et al, 2018). Many state, federal, and local efforts are underway to evaluate and upgrade the integrity and resilience of the Delta levee system.

Sea level rise may also increase salinity intrusion into local groundwater. Historically, the presence of saline groundwater in the south portion of the Plan Area has been monitored primarily through the assessment of available chemical indicators, including chloride, total dissolved solids electrical conductivity, and sodium concentrations in the groundwater. While the specific location of the seawater and freshwater interface in the southern portion of Napa Valley has yet to be determined, the magnitude and timing of these fluctuations point to a close connection between tidal-surface water-river water where mixing of fresh and saline waters can occur (LSCE, 2016). As sea level rises it may become increasingly difficult to maintain a positive groundwater level gradient to keep saline waters from intruding into the subbasins.

4.4.7 Water Quality

Should periods of drought increase, so too could the concentration of agricultural and urban stormwater runoff that make their way into the Napa River. Since surface flows within the river would be reduced during intensified periods of drought, pollutants discharged to the river would be more concentrated and may cause serious adverse impacts in downstream environments, including critical habitat for Chinook Salmon and steelhead spawn as well as other sensitive habitats.

Warmer temperatures may increase algae growth in the Delta and other surface water reservoirs, which can increase the frequency of taste and odor events, increase TOC, and increase the formation of disinfection by-products. Algae growth already presents a problem in several key reservoirs throughout the state. For example, when water levels in the San Luis Reservoir (jointly owned and operated by CVP and SWP) reach very low levels during late summer and early fall months, the high temperatures foster growth of an algae layer, as much as 35 feet thick, on the reservoir's surface. The presence of algae combined with the low water levels in the reservoir can interrupt water deliveries during the peak demand season, which affects the ability of water agencies to provide a reliable supply of healthy, clean drinking water. During the 2012–2016 drought, many water suppliers experienced water quality problems because of increased algal growth in the Delta and surface water reservoirs.

Increases in flash floods may increase surface water turbidity in imported and local water supplies. A drier climate may also lead to an increase in wildfires, which can degrade surface water supplies and result in reduced groundwater recharge.

4.4.8 Climate Change Supply Reduction Analysis

Quantifying the effects of some of these climactic uncertainties on existing water supplies can be challenging; however, based on some of the projected temperature and precipitation trends one can infer that the amount of water supply from existing sources may be adversely impacted in the future. There's also the ongoing development of the Napa Valley GSP. While groundwater levels in the region seem to indicate that the Napa Valley Subbasin has been adequately managed, a scenario where restrictions on the amount of water that can be withdrawn from the subbasin are levied could be an outcome of the State-required GSP that is currently being developed by the Napa County GSA.

Using the collected data for the 2035 Critical Dry Year, Figure 4-10 presents the impact that a range of potential reductions to water supply could have on the Local Agencies' ability to meet projected demands. The conceptual reductions ranged from 5 percent to 20 percent and were applied to all groundwater, local surface water, and SWP water supplies to illustrate potential impacts to Local Agencies. The value at the top of each supply/demand bar chart represents the difference between the supply and demand for each Local Agency. Negative values indicate that supply cannot meet the demand.

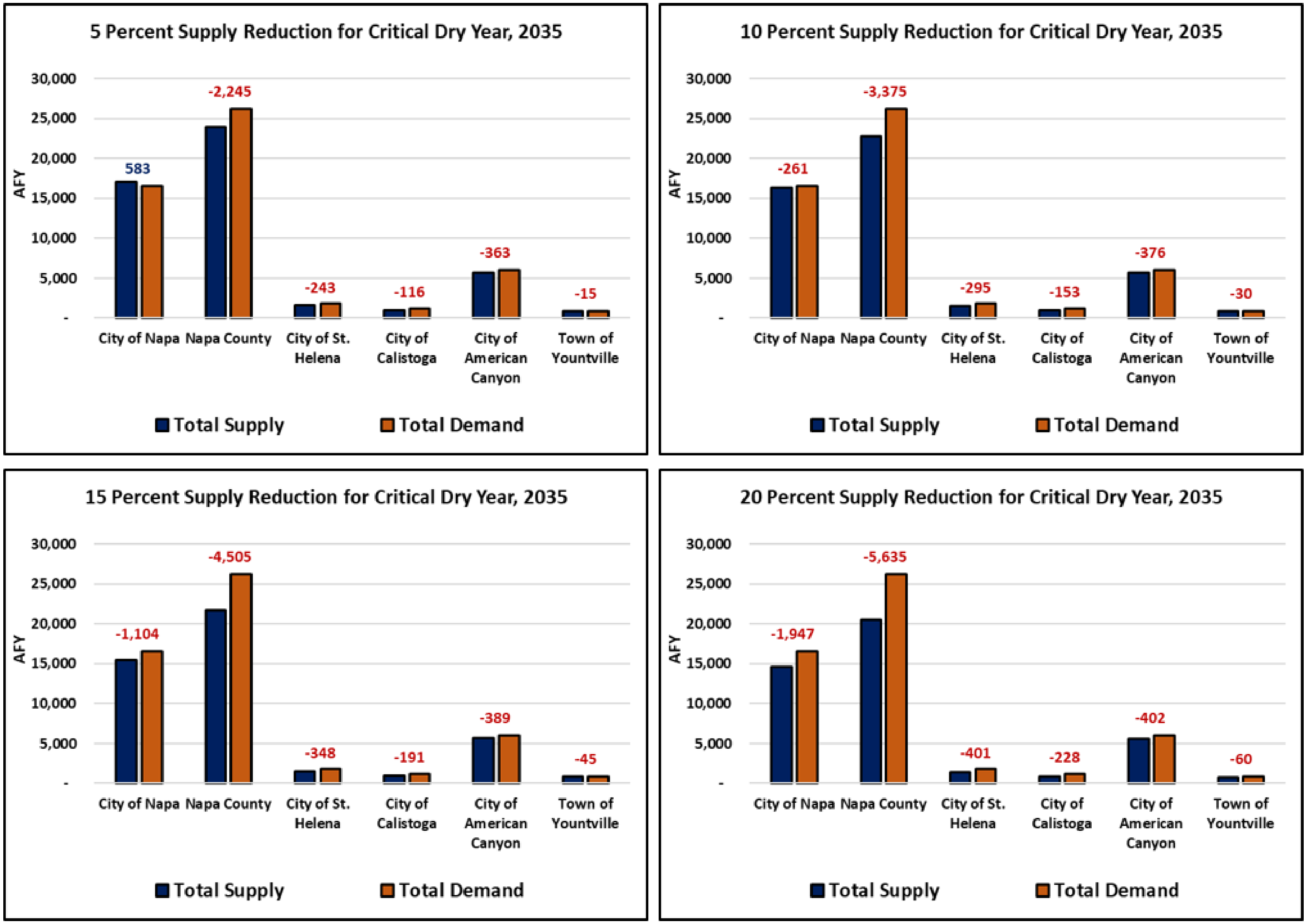

Figure 4-10. Climate change assessment – supply reduction analysis

4.5 Impacts of Drought Across Various Sectors

Potential drought impacts extend beyond the supply sources themselves. A lack of water can trigger impacts to various sectors across the region, as summarized in Table 4-2. These impacts include those experienced by the Local Agencies during the 2012–2016 drought as well as impacts that are likely to occur in a future drought in the region. For context, according to California's Fourth Climate Change Assessment Report, the 2012–2016 record-low snowpack resulted in an estimated $2.1 billion in economic losses and 21,000 jobs lost in the agricultural and recreational sectors statewide and exacerbated an ongoing trend of groundwater overdraft (Ackerly et al, 2018). Although not every Local Agency is affected to the same degree, all are susceptible to most if not all of these impacts.

Table 4-2. Drought Impacts Across Sectors

Potential Drought Impact	Agriculture	Energy	Environmental (Fish/Wildlife)	Local Business	Public Health	Recreation	Residential	Tourism
Increased water temperatures	X		X					
Increased nutrient levels, harmful algal blooms			X	X	X	X		X
Increased salinity in water and soil	X	X	X	X				
Reduced reservoir levels	X	X	X	X	X	X	X	X
Reduced stream flow	X	X	X	X	X	X	X	X
Reduced groundwater supply	X	X	X	X	X		X	
New development limitations/moratorium				X			X	
Loss of vegetation, wetlands, crops	X		X	X	X		X	X
Air quality degradation			X	X	X	X		X
Land subsidence	X		X	X			X	
Increased soil erosion	X		X	X	X	X	X	X
Increased evapotranspiration	X		X	X		X	X	
More frequent and intense wildfires		X	X	X	X	X	X	X

Many of the impacts discussed below are interconnected and may result in a positive feedback cycle, which would increase the intensity of drought impacts on other sectors. For example, the death of forest, meadows, and other vegetation increases wildfire intensity, which causes additional erosion and worsens water quality, which impacts the aquatic food chain, which impacts recreational and commercial fisheries.

In addition, the Local Agencies acknowledge that many drought impacts, especially those related to public health and residential impacts, fall disproportionately on low-income communities, communities of color, and other frontline communities (e.g., disabled and or homeless populations), thereby exacerbating environmental justice issues.

4.5.1 Agriculture

Stakeholders: Farmers/ranchers, processors, farm workers, agricultural equipment suppliers, grocery stores, consumers

Napa County's economy depends on a strong agricultural industry, which provides the foundation for the second-largest industry in the county, tourism. During drought conditions, soil salinity can increase because there is less water available to leach salts from the soil. This can significantly reduce agricultural production since many crops are sensitive to salinity levels. Drought can also lead to higher soil erosion because dry soil is more easily swept away by wind. When topsoil erodes, the land becomes less fertile. Overall reduced water supply can limit crop production. All of these factors can lead to higher consumer costs for agricultural products and loss of income for the supply chain.

Prolonged periods of drought also have the potential to extend the wildfire season. What was once a four-month season is now extending to well beyond six. The damages brought on by these fires go well beyond the loss of buildings, trees, and other local vegetation. Lingering smoke can impart certain compounds into the skins of wine grapes, which results in unpleasantly smoky flavors and aromas in the finished wine. This phenomenon, called "smoke taint," can ruin entire wine vintages. These effects are particularly distressing when you consider that the Napa Valley region is known across the globe for its wine industry. The local wine industry and related businesses provide an annual economic impact of more than $9.4 billion locally and nearly $34 billion in the U.S., and directly and indirectly provide 46,000 full-time-equivalent jobs in Napa County and nearly 190,000 nationwide (Napa Valley Vintners, 2021).

4.5.2 Energy

Stakeholders: Local businesses and residents, water agencies, wastewater agencies, electricity providers

Lower stream flow and reservoir levels lead to a decrease in available hydropower and a potential increase in use of non-renewable energy sources, which would result in greater greenhouse gas emissions. Lower groundwater levels require more energy for pumping, and wildfires may impact energy transmission lines.

In addition, higher salinity in source water may increase the energy required for water treatment (e.g., reverse osmosis can remove salinity, but it is an energy-intensive treatment method).

4.5.3 Environmental (Fish/Wildlife)

Stakeholders: Wildlife, ecosystems, tribal communities, environmental non-governmental organizations (NGO)

The endangered Chinook Salmon and steelhead spawn in the Napa River and its many tributaries. The river supports a diverse population of native and non-native fish species and an active recreational fishery. Drought can degrade habitat and trigger holistic ecosystem impacts and system failures. Low stream flow, higher temperatures, and degraded water quality affect aquatic ecosystems as well as terrestrial wildlife that rely on surface water, floodplains, wetlands/marshes, and surrounding soil and vegetation. The rate and extent of soil erosion and wildfires increase with drought and can further degrade water quality. In addition, low groundwater levels can impact stream flows by causing reduced baseflow.

4.5.4 Local Business (Commercial/Industrial) and Regional Economy

Stakeholders: Businesses, employees

Drought may affect local businesses, employment rates, and the region's economy directly and indirectly. Water use restrictions can directly affect businesses and industries that provide water-related services (e.g., power-washing). Degraded water quality can affect industrial users and limit specific applications. In addition, drought impacts to other sectors (e.g., agriculture and energy) can increase product costs and potentially reduce discretionary consumer spending (e.g., entertainment, dining, and retail). Water rates may increase as agencies rely on supplemental/alternative supply sources or incur increased operation and maintenance (O&M) costs. Supply limitations can also lead to land development restrictions.

4.5.5 Public Health

Stakeholders: Residents, visitors, businesses, hospitals, other health-related facilities, environmental NGOs

Increased soil erosion and wildfires can lead to degraded air quality that can cause respiratory health problems and increase health clinic visits and hospital admissions. Degraded source water quality can impact public health due to increased harmful algal blooms and toxins in water bodies. Blooms have been observed in some of the local water bodies and are caused by slow-moving warm water containing high nutrient levels. Blooms can move, grow, or shrink depending on conditions. Lower stream flows can also cause vector issues, such as mosquitos and rodents. Personal hygiene can be impacted during drought as people wash their hands less frequently. In addition, a lack of water can contribute to higher stress and anxiety levels.

4.5.6 Recreation

Stakeholders: Residents, visitors, businesses, environmental NGOs

Lower stream flows and reduced reservoir/lake levels can impact recreational activities, such as rafting, kayaking, boating, and fishing, and access to boat launches. Just this year (2021), Napa was forced to close the boat launch at Lake Hennessey due to low water levels to protect public safety and the lake's water quality. Degraded water quality can compromise the safety of swimming or fishing. Harmful algal blooms may also increase and can cause illness or death if ingested. Increased evapotranspiration and soil erosion can make it harder to maintain playing fields and hiking trails. Wildfires can cause closures of recreation areas and impact the user experience. This was particularly evident during the 2020 wildfire season, when the Glass Fire burned more than 60,000 acres and destroyed numerous homes, commercial buildings, and structures in Napa County.

4.5.7 Residential

Stakeholders: Residents, businesses

Water rates may increase as Local Agencies rely on supplemental/alternative supply sources or incur increased O&M costs. Supply limitations can also lead to land development restrictions. This is a common practice among all of the Local Agencies when facing water shortages. Additionally, drought can adversely affect residential landscapes or tree health due to outdoor watering restrictions and lead to a decrease in property values. In some locations, residential land and properties also become more vulnerable to damage from wildfires.

4.5.8 Tourism

Stakeholders: Visitors, businesses

The tourism industry is an incredibly important economic engine of the region, which is threatened by unreliable water supplies, climate change, and drought. Drought can affect local scenery (e.g., through wildfires, soil erosion, and algal blooms), causing certain tourist attractions to be less desirable or inaccessible. Loss of aquatic species and reduced environmental flows lead to less fishing, boating, hiking, and recreational activities.

The countywide nonprofit destination marketing organization Visit Napa Valley conducted a study with Destination Analytics, which found that Napa Valley had 3.85 million visitors in 2018, one-third of whom stayed overnight, with hotel guests spending on average $446 per person per day (Visit Napa Valley, 2018). According to the study, Napa Valley's visitor industry generated $85.05 million in tax revenues for government entities in Napa County and generated $2.23 billion in total visitor spending inside the county, most of which was generated from local hotel guests. On an average day in 2018, visitors spent $6.10 million (Visit Napa Valley, 2018). The tourism industry also supports an estimated 15,872 jobs with a combined payroll of $492 million.

4.6 Opportunities to Reduce Regional Drought Vulnerability

The Local Agencies aim to cooperatively develop regional projects to strengthen Napa Valley's long-term water supply reliability and drought resilience. This effort focuses on combining and integrating existing assets and resources and exploring new operations strategies to improve resilience for emergencies and droughts.

As a guiding principle, all drought strategies in this DCP engage two or more Local Agencies and provide increased regional water supply reliability during water supply shortages. For this DCP, drought strategies are defined in two distinct ways:

- **Drought response actions** are specific actions triggered during specific drought stages to manage the limited water supply and decrease the severity of immediate impacts (e.g., curtailing lawn watering). Drought response actions use temporary, short-term infrastructure and activities that agencies and the public can implement quickly and that provide expeditious benefits. Section 5 includes further discussion on the drought response actions identified by the Local Agencies.
- **Drought mitigation measures** are actions, programs, and strategies implemented during non-drought periods to address potential risks and reduce potential drought-related impacts when the event occurs. Many drought mitigation measures identified by the Local Agencies involve leveraging/expanding existing assets and/or potentially constructing new facilities—such as conveyance, storage, and treatment—which typically require thoughtful and often lengthy planning and implementation. Potential drought mitigation measures are described in more detail in Section 6.

Section 5

Regional Drought Response Actions

The Local Agencies acknowledge the distinction between long-term water conservation (ongoing water use efficiency) and short-term emergency water use reductions (temporary cutbacks) and the difference between actions to appropriately support each. Water shortage conditions, such as what transpired during the last drought, can require actions to support short-term emergency water use cutbacks. These drought response actions are near-term actions triggered during specific stages of drought to manage the limited supply and decrease the severity of immediate impacts. Drought response actions can be quickly implemented and provide expeditious benefits.

Each Local Agency has its own unique set of drought response actions, established for specific stages of drought and guided by corresponding triggers and goals. During the 2012–2016 drought, the Local Agencies implemented their WSCPs and expanded their conservation efforts to increase public awareness, restrict specific water uses, prohibit wasteful water practices, and increase conservation rebate program funding. This section describes the Local Agencies' WSCPs and/or general procedures during water shortages and includes triggers for stages of drought and their associated supply shortage reductions. Also discussed are regional initiatives for drought response coordination in the Plan Area, and future drought response actions.

5.1 Water Shortage Contingency Plans

The Local Agencies regularly compare their amount of supply to triggers (thresholds) to determine whether drought conditions exist and, if so, what drought response actions will be taken. Retail and wholesale urban water suppliers in California are required to adopt and submit a WSCP every 5 years to DWR. WSCPs are required under the Urban Water Management Planning Act, which is in the CWC, Section 10608 and Sections 10610 through 10656. UWMPs document anticipated supplies and demands over a 20- to 25-year planning horizon under different hydrologic conditions and support long-term water supply planning.

Not all of the Local Agencies are required to prepare WSCPs. Calistoga, St. Helena, and Yountville fall below the water delivery trigger amounts (e.g., don't serve 3,000 customer connections or deliver more than 3,000 AFY of water) specified by the CWC and thus are not required to maintain a UWMP or WSCP. Even though these agencies do not have formal UWMPs or WSCPs, they do in fact have procedures in place that form part of their Municipal Codes to deal with water shortage conditions. These procedures are described in Section 5.1.2 and summarized in Table 5-1.

5.1.1 Water Shortage Contingency Plan Elements

Governor Brown's May 2016 EO directed state agencies to "strengthen local drought resilience" by establishing a long-term framework for water use efficiency and drought planning. The EO specifically called for updating WSCP requirements to include "adequate actions to respond to droughts lasting at least five years" and to remain "customized according to local conditions." In April 2017, DWR and SWRCB released the final framework report, which describes the state agencies' recommendations for updated requirements for water use targets, monthly reporting, permanent water use prohibitions, and water loss reductions. WSCPs document water suppliers' plans for responding to water shortages, per the 2020 UWMP Guidebook, are now required to include the following elements:

- **Water supply reliability analysis.** Summary of the water supplier's water supply reliability analysis and drought risk assessment, as described in the CWC Section 10632(a)(1)). The water supplier must list key scenarios that could potentially lead to a water shortage stage condition.
- **Annual water supply and demand assessment procedures.** Develop an Annual Water Shortage Assessment Report that includes evaluation criteria and decision-making processes as outlined in CWC Section 10632.1. The report will include anticipated shortage, triggered shortage response actions, compliance and enforcement actions, and communication actions consistent with the supplier's WSCP. The WSCP must include specific procedures that describe steps to complete the annual assessment, which has to be submitted to DWR every July 1 starting in 2022.
- **Six standard water shortage stages.** Six standard water shortage levels corresponding to ranges of up to 10, 20, 30, 40, 50, and greater than 50 percent shortages. Water suppliers shall define these shortage levels as progressively increasing variation from the normal supply reliability (CWC Section 10621(a)(3)).
- **Shortage response actions.** Shortage response actions that align with the defined water shortage levels in the WSCP (CWC Section 10632(a)(4)). Actions may include demand reduction actions, supply augmentation actions, operational changes, locally appropriate mandatory prohibitions against specific water use practices, and consideration of state mandated prohibitions. Shortage levels shall also apply to catastrophic interruption of water supplies, including a regional power outage, earthquake, or other potential emergency event. The WSCP must also include a seismic risk assessment and mitigation plan to assess the vulnerability of facilities in the water system. A copy of the most recently adopted local hazard mitigation plan is sufficient to meet the CWC seismic requirement. Water suppliers may also include their Emergency Response Plan as developed under the America's Water Infrastructure Act of 2018, which details response strategies and procedures to prepare for and respond to natural or man-made threats.
- **Communication protocols.** Specific communication procedures to inform customers, the public, interested parties, and local, regional, and state governments of any current or anticipated shortages or shortage response actions as determined by the annual water supply and demand assessment (CWC Section 10632(a)(5)).
- **Compliance and enforcement.** Description of how the water supplier will ensure compliance with and enforce provisions of the WSCP. Measures may include customer service and education programs, water-waste patrols, warning and citation protocols, fines and surcharges, policies on irrigation malfunctions, and others. Applies only to retail agencies.
- **Legal authorities.** A description of the legal authorities that empower the water supplier to implement and enforce its shortage response actions that may include statutory authorities, ordinances, resolutions, and contract provisions (CWC Section 10632(a)(7)). The water supplier must also provide a statement that they will coordinate with the appropriate city or county within which it provides water supply services for the possible proclamation of a local emergency.
- **Financial consequences of WSCP.** Overall anticipated economic impacts to the supplier from implementing the WSCP. The water supplier must describe potential revenue reductions and expense increases associated with shortage response actions as well as mitigation actions to reduce impacts and the cost of compliance.

- **Monitoring and reporting.** Description of monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements (CWC Section 10632(a)(9)).
- **WSCP refinement, adoption, submittal, and availability.** The reevaluation and improvement procedures for monitoring and evaluating the functionality of the WSCP to determine if the shortage risk tolerance is adequate and appropriate and the shortage mitigation strategies are implemented as needed (CWC Section 10632(a)(10)). The WSCP must be made available to the public and submitted to DWR no later than 30 days after adoption.

5.1.2 Drought Response Actions in Existing Water Shortage Contingency Plans

There are no overall Plan Area regional stages and triggers, but rather each Local Agency's WSCP or Municipal Code guides actions to be taken during drought. It is unlikely that the region will work toward one set of uniform stages and triggers because the planning approaches vary based on multiple factors, such as each agencies water supply portfolio, customer base, and policies and ordinances adopted by their decision-making bodies (e.g., city councils). Although each of the Local Agencies have varying stages and triggers, a key objective of continuing drought contingency planning efforts resulting from this DCP is a regional coordinated effort to drought response actions to mitigate impacts of water shortages during times of drought as discussed in Sections 5.2, 5.3, and Section 7.

The Local Agencies' current WSCPs or drought response levels range from one to five stages of drought with various supply shortage triggers, based on factors affecting each agency's unique portfolio of supplies. Each Local Agency uses different water supply reduction indicators and triggers to define each stage of action as shown in Table 5-1. The indicators reflect each agency's basis for monitoring when demand reductions are necessary. Most agencies have specific triggers that are clearly defined and can be assessed frequently.

In responding to water shortages, most agencies begin with voluntary conservation encouraged by public outreach, often with restrictions on outdoor water use. During the 2012–2016 drought, all of the Local Agencies experienced some degree of water shortage and triggered varying stages of their WSCPs or water shortage procedures. The agencies vary in their responses to increasing shortages with mandatory water use restrictions, allowances, and/or penalties implemented, as follows:

- **City of American Canyon has Stage 1-4 drought levels.** Stage 1 has voluntary water conservation measures. Stage 2 restricts landscaping, washing, and decorative water features. Stage 3 limits any new landscaping except for native drought-tolerant species. Stage 4 prohibits all water use outside of a home or business (City of American Canyon, 2016). All mandatory water shortage stages are subject to increased water rates.
- **City of Calistoga has Stage 1-3 drought levels.** Stage 1 calls for water conservation measures on a voluntary basis. If there is a need to proceed to Stage 2 and 3, water use regulations that all water customers are required to adhere by are declared. These declarations typically include best management practices (BMP) for water conservation as well as water use limitations and restrictions. Violations of the water conservation BMPs are subject to monetary penalties and surcharges (Calistoga, 2021).
- **City of Napa has Stage 1-5 drought levels.** Response actions elevate from voluntary to mandatory between Stage 1 and 2. Restrictions on landscape irrigation and overall water use grow as the level of drought increases. Violations are subject to penalties between $100 and $500 (City of Napa, 2017). Napa may also choose to implement or modify their rate structure or surcharge during State 4 or 5 of a drought.

- **City of St. Helena Stage 1-3 drought levels.** St. Helena has permanently adopted many water use efficiency measures to promote water conservation. During Stage 1 many of the voluntary measures become mandatory. This includes restrictions on potable water use, particularly as it pertains to landscape irrigation. During Stages 2 and 3, landscape irrigation is further restricted, and the city will start implementing specific water use restrictions and allotments for each connection based on water use category (St. Helena, 2021).
- **Town of Yountville has Stage 1-4 drought levels.** Similar to Napa, response actions elevate from voluntary to mandatory between Stages 1 and 2. Water use limitations, particularly those pertaining to landscape irrigation, increase during Stage 2. The town will start implementing specific water use restrictions and allotments for each connection based on water use category during Stage 2 as well. These restrictions are increased in Stages 3 and 4. Noncompliance could result in a discontinuance of water services (Yountville, 2021).

5.1.3 Water Shortage Contingency Planning in the Future

In addition to the new WSCP requirements introduced during the 2020 UWMP update cycle, CWC Section 10635(b) requires agencies preparing UWMPs to also develop a drought risk assessment (DRA) as part as part of the information considered in developing its demand management measures and water supply projects and programs. The DRA is meant to help agencies consider how to manage their water supplies during stressed hydrologic conditions in relation to variations in demand. The assessment is meant to help the agencies identify risks and take proactive steps before the next actual drought lasting at least 5 consecutive years. The DRA helps a supplier evaluate the functionality of its WSCP shortage response actions and understand the type and degree of response that is appropriate for managing water supplies. Moving forward, it is recommended that the Local Agencies coordinate as they develop their Annual Water Shortage Assessment Reports (described in Section 5.1.1) as well as their UWMP and WSCP updates. This will help develop consistent information and data that will be used for the next NVDCP update, described in Section 7.

This approach is consistent with recent guidance that was released by DWR to improve water conservation and water shortage planning among smaller water suppliers and rural communities. As part of Assembly Bill 1668, DWR was directed to both identify communities at risk of drought and water shortage vulnerability and to develop recommendations for improving drought contingency planning for those areas (DWR, 2021c). Calistoga, St. Helena, and Yountville are considered small water suppliers and were identified as such by DWR. The recurring theme of DWRs report recommendations is the notion of seeking opportunities to incorporate water shortage contingency planning into existing planning documents (such as this DCP) and to leverage and extend existing processes, when possible.

Table 5-1. Summary of Local Agencies' Drought Response - Drought Stages, Indicators, and Triggers

	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5	
Agency	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger
City of American Canyon	10%	Water supply and delivery estimates from the City's water suppliers (SWP and City of Vallejo) indicate that there may be a shortfall of up to 10% compared with the estimated demand.	20%	Water supply and delivery estimates from the City's water suppliers (SWP and City of Vallejo) indicate that there may be a shortfall of 20% to 30% compared with the estimated demand.	30%	Water supply and delivery estimates from the City's water suppliers (SWP and City of Vallejo) indicate that there may be a shortfall of 30% to 50% compared with the estimated demand.	50%	Water supply and delivery estimates from the City's water suppliers (SWP and City of Vallejo) indicate that there may be a shortfall of more than 50% compared with the estimated demand.	N/A	N/A
City of Calistoga	10%	Whenever the Council, by resolution, declares that a Stage I water emergency exists, the Mayor shall issue a proclamation urging citizens to institute such water conservation measures on a voluntary basis as may be required to reduce water demand to coincide with available supply. The City Clerk shall publish such proclamation at least once a week for four weeks in a newspaper of general circulation within the City for the purpose of giving notice to the City's water customers. (Ord. 464 § 3, 1991).	20%	If it is found that the Stage I program does not achieve the required water use reduction, the Council, by resolution, may declare that a Stage II water shortage exists. The Stage II program shall be on an economic basis. The percentage of the water reduction shall be applied to the quantity value of the City's water rate structure. The rate rationing schedule shall be adopted from time to time by Council resolution. (Ord. 464 § 3, 1991).	N/A	If it is found that the Stage II program does not achieve the required water use reduction, the Council, by resolution, may declare that a Stage III water shortage exists. The Stage III program shall be on an economic basis. The percentage of the water reduction shall be applied to the quantity value of the City's water rate structure with the actual percentage to be determined by the Director of Public Works. (Ord. 464 § 3, 1991).	N/A	N/A	N/A	N/A
City of Napa	0-10%	Combined supply reductions totaling up to 3,200 AF, or insufficient carryover storage and projected supplemental water to provide for 90% of normal supplies for the next 2 years.	10% to 20%	Combined supply reductions totaling between 3,200 AF and 6,400 AF, or insufficient carryover storage and projected supplemental water to provide for 75% of normal supplies for the next 2 years.	20% to 35%	Combined supply reductions totaling between 6,400 AF and 11,200 AF, or insufficient carryover storage and projected supplemental water to provide for 60% of normal supplies for the next 2 years.	35% to 50%	Combined supply reductions totaling between 11,200 AF and 16,000 AF, or insufficient carryover storage and projected supplemental water to provide for 50% of normal supplies for the next 2 years.	>50%	Combined supply reductions totaling more than 16,000 AF.
City of St. Helena	N/A	1) The supply/usage balance, calculated at the beginning of the fiscal year, is in deficit; or 2) Water deliveries from City of Napa will not exceed 400 AF in a fiscal year; or 3) The anticipated water supply prior to the next November 1st is not sufficient to meet the projected demand through the next November 1st without implementing demand reduction measures; or 4) The conditions requiring the establishment of a Phase II water emergency appear to be imminent.	N/A	1) The supply/usage balance, calculated at the beginning of the fiscal year, is in deficit after including Phase I reductions; or 2) The water level at Bell Canyon Reservoir dropping below a certain point, where the trigger level is adjusted monthly to reflect the capacity of groundwater and water delivered by the City of Napa at that time; or 3) The conditions requiring the establishment of a Phase III water emergency appear to be imminent.	N/A	1) The supply/usage balance, calculated at the beginning of the fiscal year is in deficit after including Phase II reductions; or 2) The water level at Bell Canyon Reservoir dropping below a certain point, where the trigger level is adjusted monthly to reflect the capacity of groundwater and water delivered by the City of Napa at that time.	N/A	N/A	N/A	N/A
Napa County	10%	Up to 10% reduction, or insufficient carryover storage and projected supplemental water to provide for 90% of normal supplies for the next 2 years	15%	10% to 20% reduction, or insufficient carryover storage and projected supplemental water to provide for 75% of normal supplies for the next 2 years	20%	20% to 35% reduction or insufficient carryover storage and projected supplemental water to provide for 60% of normal supplies for the next 2 years	35%	35% to 50% reduction or insufficient carryover storage and projected supplemental water to provide for 50% of normal supplies for the next 2 years	50%	More than 50% reduction

Table 5-1. Summary of Local Agencies' Drought Response - Drought Stages, Indicators, and Triggers

	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5	
Agency	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger	Supply Reduction (%)	Water Supply Condition/Trigger
Town of Yountville	10%	1) The water available from all sources is projected to be less than 120% of the projected demand as determined from the Town engineer; or 2) Conditions requiring the establishment of a Phase II water emergency appear to be imminent.	15%	1) The water available from all sources is projected to be less than 100% of the projected demand as determined from the Town engineer; or 2) Conditions requiring the establishment of a Phase III water emergency appear to be imminent.	25%	1) The water available from all sources is projected to be no more than 90% of the projected demand as determined from the Town engineer; or 2) Conditions requiring the establishment of a Phase IV water emergency appear to be imminent.	35%	1) The water available from all sources is projected to be no more than 80% of the projected demand as determined from the Town engineer; or 2) The sources of water storage, supply, production, and replenishment appear to be insufficient to furnish the necessary water to service the minimum requirements of the Town's customers, thereby constituting an immediate hazard to the safety and welfare of the Town, its residents, and its customers.	N/A	N/A

Note: NapaSan is not included in this table as they are a wastewater agency and do not purvey water. The recycled water supply they provide is assumed to remain largely unaffected during periods of drought.

5.2 Regional Drought Response Coordination

Local Agencies offer their customer base a variety of conservation tips, financial incentives, and educational opportunities. These conservation measures tend to form part of year-around conservation activities but become of particular focus when Local Agencies enter Stage 1 of a drought. While the water conservation measures are individually managed for each respective service area, similar programs are offered regionally. The following response actions are currently available:

- **Cash for Grass.** This program offers cash rebates to water customers who replace traditional lawn grass with native, low-water-use, and permeable landscaping. Customers can receive refunds based on the square feet of turf removed, with maximum limits for single-family residential and multi-family/commercial/institutional property. In addition to financial incentives, many of the Local Agencies have compiled water conservation tips for outdoor landscaping and indoor activities with an emphasis on switching to low-flow appliances around the house.
- **Plumbing Retrofits and Free Water Saving Devices.** Toilet flushes and leaks can use nearly 40 percent of an indoor water budget. All cities in Napa Valley offer an incentive to reduce water waste, either through free installation or rebates ranging between $100 and $300 per new toilet. The new toilets must be high-efficiency toilets, which use 1.28 gallons per flush compared to many older toilets, which use between 3.5 to 7 gallons. Most cities are giving out free water conservation devices to customers, such as low-flow showerheads, shower timers, faucet aerators, garden hose meters/nozzles/timers, and toilet dye tabs for leak detection.
- **Public Education Campaigns.** Napa has initiated water conservation campaigns to classrooms and the public. Teachers can gain access to Project WET (Water Education for Teachers) for hands on, action-packed training that promotes awareness, appreciation, and stewardship of water resources for grades K-12. The Napa Water Division is also offering hour-long interactive presentations at schools on fresh water supplies affecting Napa with a brainstorming contest on how to save water at home. Napa has hosted a drive-up event for community members titled "Drive Up to a Greener You" that supplied information and tools for conservation.

  As part of local public education efforts, American Canyon offers a variety of free educational materials, including worksheets, activity books, posters, videos, and curriculum guides to classroom teachers, homeschoolers, and non-formal educators. NapaSan also provides tours of their WWTP and offers classroom presentations for elementary school students to educate them on what they can do to protect water quality and community health.

  The Local Agencies all participated in and sponsored a water conservation video contest for high school students.
- **Greywater systems and rainwater harvesting.** St. Helena is offering a $100 rebate each for greywater and rainwater harvesting systems. Greywater systems require a building permit for water collected from showers and bathroom sinks. Rainwater harvesting systems must have a minimum of 100 gallons of storage and a building permit if connected to a potable water line.

In addition to the regional coordination that took place to complete the LAFCO MSR and the ongoing coordination by the Napa County GSA to complete the Napa Valley Subbasin GSP, the Local Agencies are also coordinating regionally through the following efforts:

- **San Francisco Bay Area Integrated Regional Water Management Plan.** The Bay Area Integrated Regional Water Management Plan (IRWMP) is a multi-stakeholder, nine-county roadmap to coordinate and improve water supply reliability, protect water quality, manage flood protection, maintain public health standards, protect habitat and watershed resources, and enhance the overall health of San Francisco Bay.

- **North Bay Water Reuse Program.** The NBWRA provides administrative management and oversight of the North Bay Water Reuse Program (NBWRP). The NBWRP is a regional water recycling initiative encompassing more than 350 square miles in portions of Marin, Sonoma and Napa counties surrounding northern San Francisco Bay, known as San Pablo Bay. It is a coordinated effort of 11 municipal, water, and wastewater agencies working collaboratively to develop recycled water to build capacity and resiliency into the region's water supply. As stated previously, this DCP is an outgrowth of the work completed by the NBWRA.

5.3 Future Regional Drought Response Actions

There are currently no region-wide drought response actions. Each Local Agency in the Napa Valley has its own unique set of drought response actions, which are established for specific stages of drought and guided by corresponding triggers and goals, as summarized in Table 5-1. While the Local Agencies maintain individual WSCPs or guidance used to address water shortages, there are some issues of regional concern that are better addressed through a unified, regional response. The following drought response actions may be implemented on a regional scale:

- **Regional Water Conservation Program:** A Regional Water Conservation Program (RWCP) would help water utilities in the Napa Valley work together to help their customers use water efficiently and to meet BMPs for urban water conservation. Elements of a RWCP could include coordinated public outreach campaigns, outreach materials, conservation devices, and community events and workshops. Consistent regional messaging through a coordinated outreach campaign (e.g., press releases, social media, radio, billboards, and television announcements) may improve public involvement in water conservation. Regional programs and materials would also expand eligibility for participation beyond an individual agency's service area. The RWCP would lead regional water conservation efforts and provide the public with consistent messaging and useful tools designed to ensure efficient use of Napa Valley water resources.
- **Putah South Canal Intertie:** This project could be viewed as both a drought response action and a mitigation action depending on how it is implemented and the frequency of use. It would involve Installing a pipeline that connects the Putah South Canal of the Solano Project to the NBA of the SWP to provide an urgent water supply to agencies in Napa Valley. The intertie would afford agencies in Napa Valley access to water supply from the Solano Project during emergency situations. The actual amount of water that could be made available is not known at this time; discussions during the last drought suggested transfers of up to 10,000 AF. As a drought response action, the intertie would only be used during critical drought periods. As a mitigation action, its use could be integrated into the overall approach to building drought resiliency in the Plan Area.

Although both of these response actions show promise for potential regional implementation, the RWCP is more likely to be implemented, as it would be triggered whenever multiple Local Agencies are experiencing a supply shortage. Implementing the Putah South Canal Intertie would require substantial logistical coordination among several agencies. Additionally, the need for these responses may evolve based on future conditions. For example, as drought mitigation measures (identified in Section 6) are implemented, the need for response actions will be reduced. Furthermore, implementation of drought mitigation measures may lead to further opportunities for regional drought response actions. For example, further interconnected systems may allow for emergency supply transfers.

Section 6

Regional Drought Mitigation Measures

Drought mitigation measures are actions, programs, or strategies implemented to address potential risks and impacts and reduce the need for response actions when drought occurs. The drought mitigation measures are intended to decrease sector vulnerabilities to drought. To address the vulnerabilities described in Section 4, the Local Agencies developed a list of potential drought mitigation measures that will mitigate risks posed by drought. This section describes the process used to identify drought mitigation measures for the Plan Area, presents an overview of the Local Agencies' potential drought mitigation measures, and the process used to evaluate and prioritize the drought mitigation measures that will help to build long-term resiliency to drought and will mitigate the risks posed by drought in the region.

6.1 Goals and Objectives for the NVDCP

The findings of the vulnerability assessment were critical to identify and develop potential mitigation and response actions (i.e., projects). As the NVDCP transitioned to this stage, the DCP Task Force recognized that having a clear set of goals and objectives was paramount in helping to formulate projects that had a high degree of economic, social, and institutional benefits and that have a greater chance of funding support.

During the January 2020 task force meeting, the DCP Consultant team outlined some of the desired project outcomes the Local Agencies had identified during the project kickoff meeting and shared some of the guidance Reclamation offers as part of its DCP framework. This information was used to facilitate a discussion meant to help identify project goals and objectives that are to assist in screening mitigation and response actions. The refined list of desired outcomes gathered during the discussion was captured and is summarized in Table 6-1. Note that the order in which items are presented does not imply a distinct preference over the other items included in the list.

Table 6-1. Desired Outcomes for the NVDCP

Item	Outcome
1	Improve local, regional, and SWP supply reliability
2	Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.)
3	Reduce dependence on the SWP
4	Identify and increase water reuse opportunities
5	Identify and increase stormwater capture opportunities
6	Identify regional intertie opportunities
7	Interface with the Napa County GSA to help support ongoing groundwater basin management
8	Alignment with the State's Water Resilience Portfolio principles
9	Enhance water use efficiency and conservation in the Napa Valley
10	Enhance climate change adaptation and mitigation
11	Address multiple resource management strategies
12	Incorporate multiple agencies and stakeholders
13	Maintain and protect public health and safety
14	Enhance local and regional ecosystems
15	Cost effectiveness ($/AF)
16	Ease of implementation/readiness to proceed
17	Encourage regional approaches among DCP Task Force members to help with funding and acceptance

As the DCP Consultant team reviewed feedback from the DCP Task Force, the team felt it was important to separate the "Why" from the "How." Wanting to "reduce dependence on the SWP" and "enhancing water use efficiency and conservation in the Napa Valley" are more in line with project objectives and the "Why" we are working on this DCP. Other items, such as a desire to "identify and increase water reuse opportunities" and "incorporate multiple agencies and stakeholders," form part of the "How" discussion. These concepts played a bigger role in the types of mitigation and response actions that were identified and developed. Both ends of the spectrum are important and both feed into the development of strategies that aim to address the needs and concerns of the region as shown on Figure 6-1.

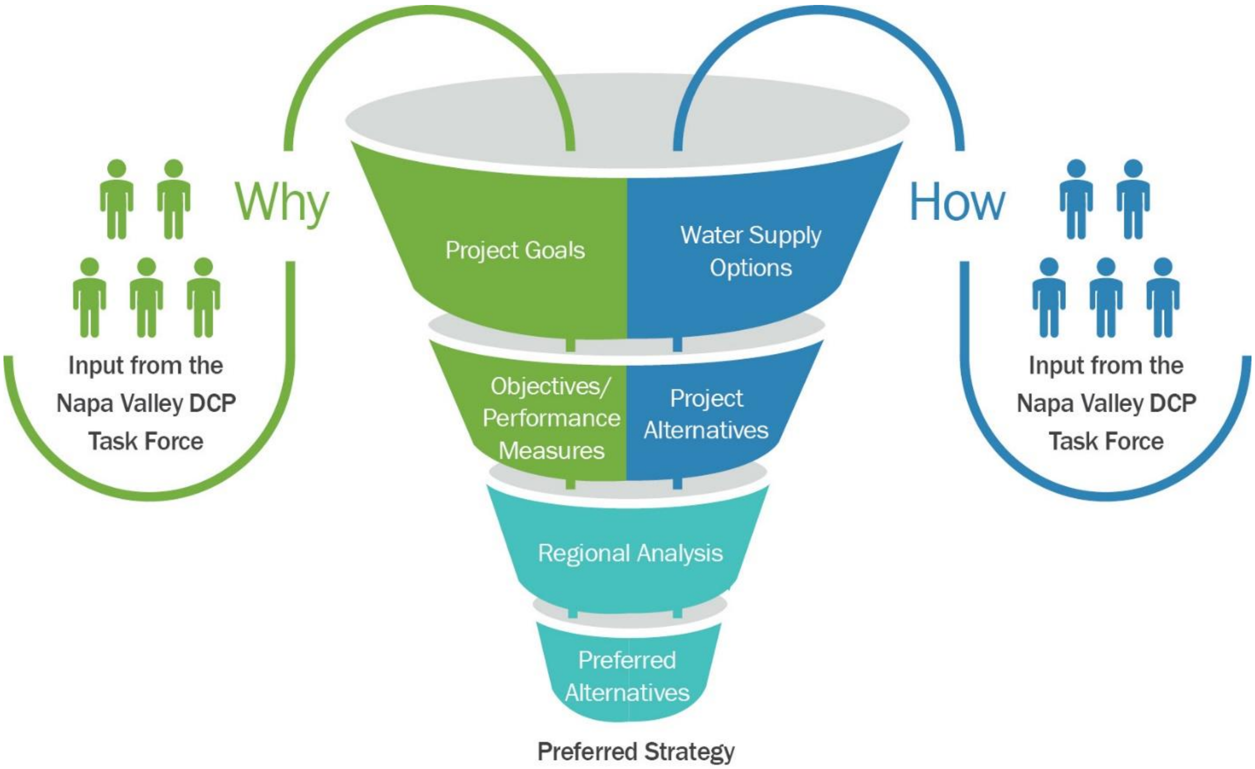

Figure 6-1. Mitigation and response actions development process

Using the feedback shown in Table 6-1, the DCP Consultant team and the DCP Task Force developed a set of project goals and objectives that helped satisfy both local needs and broader federal guidelines (Table 6-2). The project goals are more general, while the objectives help define the goals in more specific terms.

Table 6-2. NVDCP Goals and Objectives

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives	Weighting Factor
Supply Reliability and Flexibility	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project in dry years	35%
Watershed Approach	• Interface with Napa County GSA to help support ongoing groundwater basin management • Align with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	20%
Environmental Enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems	15%
Economic Feasibility and Financial Viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	30%

It's expected that the project goals will generally not be equally important to each of the Local Agencies (i.e., some goals being more relevant for some decision makers than others). For example, "Supply Reliability and Flexibility" may be more important for a given Local Agency over "Environmental Enhancement." Thus, the proposed goals were weighted to better reflect the values and preferences of the Local Agencies. This weighting discussion was conducted at the June 2020 Task Force Meeting. The established weighting factor for each goal formed the basis for the evaluation and prioritization of the mitigation and response actions.

6.2 Approach to Developing Drought Mitigation Measures

With a clear set of goals and objectives to guide the process, the DCP Task Force and DCP Consultant team turned their focus to finding projects that aimed at mitigating some of the supply shortfalls and vulnerabilities identified during the water supply and demand analysis and vulnerability assessment for the region. Because this region has a significant number of available studies and data, the NVDCP aimed to leverage regional efforts that had been or were being conducted, rather than recreate work already completed. Many of the Local Agencies in the region have individually or collaboratively identified projects that can help build drought resiliency. These projects are in the planning, design, or even implementation phases. The NVDCP provides a mechanism by which to develop a regional understanding of all the projects underway, identify where potential vulnerabilities exist, and collaboratively plan and build support for projects that build long-term resilience to drought.

6.2.1 Development of Drought Mitigation and Response List

The first step to identifying potential mitigation projects was working with the Local Agencies to identify regional projects that had been previously developed and considered for implementation, regardless of the project's level of planning and development. A comprehensive search was conducted to collect documents, studies, maps, and data through conversations with Local Agency staff, review of Local Agencies' and regional stakeholder websites, and internet searches. The NVDCP Study efforts reviewed existing relevant studies, including but not limited to:

- UWMPs
- General Plans
- San Francisco Bay Area IRWMP
- North Bay Water Reuse Authority studies
- LAFCO MSR
- Napa Valley GSA documents
- Annual Groundwater Monitoring Reports
- Environmental assessments/ project environmental impact reports
- Project engineering reports
- Feasibility/planning studies
- Stormwater resource plans
- Subbasin maps, project maps, etc.

From these sources a preliminary list of potential mitigation and response actions/projects was developed. The comprehensive list of potential projects was developed to identify those projects that:

- Build long-term resiliency to drought
- Mitigate risks posed by drought
- Decrease regional vulnerabilities
- Reduce the need for drought response actions

For each identified project, details relevant to the NVDCP effort, including project descriptions, engaged agencies, location, cost, potential yield of water, readiness to proceed, timing, and status of the project, were developed and compiled into an overall table of potential mitigation and response measures. The projects were presented to the DCP Task Force at a work session on September 14, 2020, to solicit input on the identified projects. During the work session, the project list was refined and was subsequently distributed for further review and comment. As a follow-up, individual Local Agencies were contacted, via email and follow-up phone calls, to discuss specific projects to review and confirm details of specific projects. This provided the most accurate and up-to-date information for the NVDCP mitigation and response action list.

6.2.2 Potential Drought Mitigation Measures

Following the September 2020 work session with the DCP Task Force, the mitigation and response action list was updated and is presented in Table 6-3. While most of the projects included in the list are considered drought mitigation measures, the table does include the two potential drought response actions that were presented in Section 5, the Putah South Canal Intertie (project number 18 in Table 6-3) and the RWCP (project number 21 in Table 6-3). These projects were included in the project list as there was an interest in evaluating how these compared with the other identified mitigation measures. Additionally, as noted previously, the Putah South Canal Intertie project could be viewed as both a drought response action and a mitigation action depending on how it is implemented and the frequency of use. As a drought response action, the intertie would only be used during critical drought periods. As a mitigation action, its use could be integrated into the overall approach to building drought resiliency in the Plan Area. Overall, the table focuses on projects that would find ways to incorporate conservation, bring in new water supplies, and diversify the region's current water supply portfolio with drought-resilient sources.

These drought mitigation measures are at various stages of implementation ranging from concept level to construction/implementation. Many of the drought mitigation measures identified are specific projects with implementation plans; however, some are in the concept phase and may not proceed to implementation without further study. The measures considered in this NVDCP are based on current knowledge and the NVDCP planning objectives, which may evolve over time. During each update to the NVDCP, new mitigation measures should be added and already-identified mitigation measure project details should be updated (including implementation timing). This will provide the region with a dynamic DCP that can address continually evolving conditions.

The projects are sorted into five drought mitigation project "categories" that while individually provide a mitigation benefit, when combined can provide for a balanced water supply portfolio to help the region mitigate for drought impacts and risk. Drought mitigation project categories include:

- **Groundwater Management:** Projects that focus on aquifer storage, aquifer recovery, and groundwater basin recharge.
- **Conveyance:** Projects that look to expand existing distribution systems, such as to augment current use of recycled water.

- **Storage:** Projects providing storage of existing or potential new water supplies to provide for drought resiliency through storage for future use.
- **Treatment:** Projects that look to expand and or upgrade existing treatment facilities.
- **Operations:** Projects that provide for infrastructure improvements necessary to improve operational efficiency and flexibility.

The projects in Table 6-3 are summarized by mitigation category. Each of the identified projects feature shared benefits, including reduction in regional vulnerability to drought, directly or indirectly providing a yield of water under future conditions, and wherever possible, using existing resources, facilities, and infrastructure to reduce both the overall cost and the environmental footprint of the measure.

Based on feedback from the September work session and to help facilitate the evaluation and comparison of projects, the projects were broken out into one of two stages or tracks. Certain projects were deemed to fall under the **Implementation Ready** stage, which includes projects that are thought to be well-defined and physically implementable. The **Planning** stage includes more concept-level projects and or implementable studies. This distinction is identified in Table 6-3 as well. Regardless of stage designation, the Local Agencies consider the entire list of 22 measures viable possibilities, depending on need and timing.

Figure 6-2 presents the general locations of the proposed drought mitigation measures. The projects are denoted by category and project reference number (see Table 6-3).

Table 6-3. Drought Mitigation and Response Measures

No.	Drought Mitigation Measure	Stage	Engaged Agencies	Description	Reduction in Regional Vulnerability	Cost	Project Yield	Readiness to Proceed	Implementability and Timing
Groundwater Management – Aquifer storage, aquifer recovery, and groundwater basin recharge.									
1	Aquifer Storage and Recovery	Planning	All DCP Task Force Agencies	This project concept applies to all agencies in the Napa Valley. The project would look to inject raw water into the Napa Valley groundwater subbasin for later recovery and use. The source water would be excess raw from each respective agency during winter and spring seasons. Stormwater could also potentially be utilized as a viable source. Injection wells would introduce the water into the aquifer for later extraction at the same site during dry months or emergency situations. Specific locations for injection or spreading and recovery will need to be identified and evaluated.	This project would use available water during winter months to meet summer month demands. This project has low vulnerability to climate change impacts to water supply and demand since the project uses excess water during winter and spring seasons for aquifer recharge and augmenting water supply during the high-demand summer months.	Capitol: TBD O&M: TBD	TBD	TBD, early conceptual level for discussion. Would need to coordinate with the Napa GSA and the Napa Valley GSP to assess project feasibility.	TBD
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	Planning	All DCP Task Force Agencies	This project concept would explore the capability to increase the region's water supply through IPR. This reuse concept is characterized by use of an environmental buffer prior to becoming a potable water supply. IPR can be accomplished through GWR via surface spreading, GWR via direct injection, or SWA. Permitting requirements differ across specific types of IPR. In many cases, these differences are linked to the existence and size of an environmental buffer. As the buffer diminishes in size, regulatory requirements for other project components increase. Environmental buffers provide myriad benefits—less stringent wastewater and advanced water purification facility treatment requirements (due to the attenuation of contaminants in the environment), dilution to minimize potential chemical contaminant peaks, and/or decreased monitoring requirements due to increased response time.	Project would help augment existing surface water and/ or groundwater supplies. It would establish a drought-proof water supply for the region.	Capitol: TBD O&M: TBD	TBD	TBD, early conceptual level for discussion. Would need to coordinate with the Napa GSA and the Napa Valley GSP to assess project feasibility.	TBD
3	Integrated Water Supply Wells	Planning	All DCP Task Force Agencies	This project concept would look to assess the feasibility of developing and integrating groundwater wells to augment local water supply and imported water in a way that does not impact other groundwater users.	Project would help augment existing surface water and/or groundwater supplies.	Capitol: TBD O&M: TBD	TBD	TBD, early conceptual level for discussion. Would need to coordinate with the Napa GSA and the Napa Valley GSP to assess project feasibility.	TBD
Conveyance – Expansion of existing distribution systems to augment current use of recycled water.									
4	Phase 1 Recycled Water Distribution System Expansion	Implementation Ready	American Canyon, Napa County	The City of American Canyon identified several pipeline extensions of the existing recycled water system to deliver recycled water to existing landscaping and industrial users on potable water and convert them to recycled water for non–potable uses. Phase 1 expansion includes six recycled water pipeline extensions located within existing built roadways and new roadway projects.	This project would efficiently use existing assets and extend the existing system to increase the distribution of recycled water.	Capitol: $3.1M O&M: $0.03M	102 AFY. The customer demands associated with these extensions would be met directly from the WRP during the peak month. No seasonal storage would be needed.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	The City of American Canyon is currently awaiting Integrated Regional Water Management (IRWM) funds to begin constructing a reduced version of this project. Completing the remaining portions of the project will be determined based on available public and developer funding and clear need for the infrastructure.
5	Phase 2 Recycled Water Distribution System Expansion	Implementation Ready	American Canyon, Napa County	Like Phase 1, this project includes additional pipeline extensions from the existing recycled water system. These pipelines would be implemented after the Phase 2 Treatment Plant Upgrades described below for Project No. 13.	This project would efficiently use existing assets to increase the distribution of recycled water.	Capitol: $2.9M O&M: $0.03M	25 AFY. The customer demands associated with these extensions would be met directly from the WRP during the peak month. No seasonal storage would be needed.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine project timing and implementability.
6	Milliken-Sarco-Tulocay Northern Loop	Implementation Ready	NapaSan, Napa County	This project would include constructing 26,100 LF of pipelines, primarily located within existing roads, to expand the existing NapaSan recycled water distribution system.	Expanding the recycled water distribution system would allow NapaSan to supply recycled water to more customers, thereby reducing reliance on groundwater.	Capitol: $7.6M O&M: $0.05M	350 AFY of recycled water available for reuse based on the full looped system distributing up to 2,000 AFY.	Feasibility-level design (NBWRP). Level of analysis likely satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine project timing and implementability.
7	Milliken-Sarco-Tulocay Eastern Extension	Implementation Ready	NapaSan, Napa County	This project consists of constructing 14,500 LF of pipelines to extend the existing NapaSan recycled water distribution system to the east. Pipelines would primarily be located within existing roadways.	Like the Northern Loop, expanding the recycled water distribution system would allow NapaSan to supply recycled water to more customers, thereby reducing reliance on groundwater.	Capitol: $4.1M O&M: $0.03M	150 AFY of recycled water available for reuse based on the full looped system distributing up to 2,000 AFY.	Feasibility-level design (NBWRP). Level of analysis likely satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine project timing and implementability.

Table 6-3. Drought Mitigation and Response Measures

No.	Drought Mitigation Measure	Stage	Engaged Agencies	Description	Reduction in Regional Vulnerability	Cost	Project Yield	Readiness to Proceed	Implementability and Timing
Storage – Development of storage facilities used to store winter effluent for summer use and or optimize daily recycled water supply.									
8	Additional Soscol WRF Covered Storage	Implementation Ready	NapaSan, Napa County	The project consists of constructing a 10-AF operational storage pond at the Soscol WRF to store tertiary filtered and disinfected recycled water that would be used to meet daily peak customer demands.	The additional storage would increase operational flexibility, thereby increasing the availability of recycled water, particularly in the high demand summer irrigation periods.	Capitol: $2.9M O&M: $0.04M	240 AFY of additional recycled water available for reuse based on the ability to fill and empty the storage tank at least once a week during the irrigation season.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine project timing and implementability.
9	Napa State Hospital Storage Tank	Implementation Ready	NapaSan, Napa County	The project consists of a new 5-million-gallon operational storage tank. The storage tank would be located at approximately 270 feet above sea level to assist with pressure and peak demands in the MST recycled water distribution system. Pipelines would be constructed to connect the existing recycled water transmission main to the storage tank located near the Napa State Hospital.	The project would increase availability of recycled water during high demand periods and improve operation of the existing recycled water distribution system.	Capitol: $7.4M O&M: $0.07M	429 AFY of additional recycled water available for reuse based on the ability to fill and empty the storage tank at least once a week during the irrigation season.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	Implementation considerations include funding and the need for land acquisition and right-of-way access for pipeline segments and the storage tank, which would need to be located on land that is not owned by NapaSan.
10	NapaSan Seasonal Storage	Implementation Ready	NapaSan, Napa County	This project would involve potentially raising the level of the existing levees at the Soscol WRF or constructing new seasonal storage ponds at the Somky Ranch Site or Jamison Ranch Site.	This project would allow for increased secondary effluent storage from the Soscol WRF during the winter to increase the availability of tertiary-treated recycled water supply in the summer.	Capitol: $7.4M - $30.4M O&M: $0.09M - $0.23M	300 to 1,100 AFY of additional recycled water available for reuse based on the ability to fill the seasonal storage pond in the winter to provide additional recycled water to meet peak summer demands.	Feasibility-level design (NBWRP). Level of analysis likely satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine project timing and implementability.
11	Lake Curry Purchase (Vallejo Lakes System)	Implementation Ready	All DCP Task Force Agencies	This project would involve the purchase of Lake Curry. The lake is the largest lake in the Vallejo Lakes System and is located in southern Napa County. It was used as a water supply source for the City of Vallejo as well as customers in the Lakes area until the early 1990s, but closure of the Gordon Water Treatment Plant at Lake Curry meant that water could no longer be pumped and treated from the lake. The lake and the surrounding land are owned by the City of Vallejo.	Purchase of the lake would provide a new source of water supply and storage.	Estimates suggest the lake would cost $20M to $30M to purchase, but this does not account for additional costs needed for conveyance infrastructure.	Based on the City of Vallejo's UWMP, Lake Curry has a storage capacity of 10,700 AF and a safe yield of 3,750 AFY.	TBD	TBD
12	Sites Reservoir Allocation Purchase	Implementation Ready	All DCP Task Force Agencies	This project would explore the possibility of potentially buying additional storage at the new Sites Reservoir. The City of American Canyon recently purchased a 2,000-AFY allocation. This project would explore the opportunity to buy more storage for the benefit of the entire Napa Valley region.	Purchase of Sites Reservoir allocation would provide a new source of water supply and storage.	The City of American Canyon recently purchased a 2,000-AF allocation for $1.2M. This equates to $600 per AF.	TBD	TBD	TBD

Table 6-3. Drought Mitigation and Response Measures

No.	Drought Mitigation Measure	Stage	Engaged Agencies	Description	Reduction in Regional Vulnerability	Cost	Project Yield	Readiness to Proceed	Implementability and Timing
Treatment – Expansion and or upgrades of existing treatment facilities.									
13	WRF Phase 2 Treatment Plant Upgrades	Implementation Ready	American Canyon, Napa County	This project would include facility upgrades at the existing American Canyon WRF to increase tertiary treatment process to improve water quality for existing and future recycled water users.	This project would efficiently use existing assets to increase recycled water supply.	Capitol: $6.0 M O&M: $0.1 M	168 AFY. The proposed upgrades would greatly benefit existing and new recycled water customers by reducing the concentration of effluent total dissolved solids and providing the necessary facilities for concentrate disposal through modified evaporation ponds.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine timing and implementability of the project.
14	Soscol WRF Phase 2 Treatment Plant Upgrades	Implementation Ready	NapaSan, Napa, Napa County	The project would include facility upgrades at the existing Soscol WRF to increase tertiary treatment capacity by 1.7 mgd.	This project would efficiently use existing assets to increase recycled water supply.	Capitol: $2.2 M O&M: $0.27 M	571 AFY of additional tertiary recycled water available for reuse based on the additional peak production of 1.7 mgd, providing an average annual production of 0.51 mgd.	Feasibility-level design (NBWRP). Level of analysis satisfies CEQA and NEPA requirements.	Conceptually, the project is ready to proceed. Funding and clear identified need for the recycled water will determine timing and implementability of the project.
15	Purified Water Feasibility Study	Planning	Napa, American Canyon, NapaSan	The proposed study would look at evaluating the viability of incorporating purified water into the region's water supply portfolio through raw water augmentation and treated water augmentation.	Production of purified water would establish a drought-proof water supply for the region.	Studies like this are typically conducted for $500 K.	TBD	This study could start immediately based on existing information.	This study could start immediately. Similar studies typically take 9 to 12 months to complete.
16	Mitigation Strategies for Boron Reduction	Planning	Calistoga, Napa County	This project would look to assess mitigation strategies to help Calistoga reduce Boron concentrations in its effluent.	Existing Boron levels limit the amount of recycled water that is used by the local vineyards. By reducing the amount of Boron in its effluent, Calistoga would be able to increase recycled water use and reduce the amount of effluent that is discharged into the Napa River.	Capitol: TBD O&M: TBD	TBD	TBD	TBD
Operations – Infrastructure improvements that improve operational efficiency and flexibility.									
17	Dwyer Road Pump Station Project	Implementation Ready	Calistoga, Napa, St. Helena	The Dwyer Road Pump Station Project is a joint project supported by the cities of Napa, Calistoga, and St. Helena. The project entails reinstating and upgrading the existing brick pump station building, roof, and associated utility system. The facility was historically used as a pumping facility and a flow control station depending on operations and the direction of water flow in the potable drinking water system.	The project would create an "up-valley pressure zone" designed to emulate the pressure created when the City of Napa's Hennessey WTP is running. This "up-valley pressure zone" would provide Napa with more operational control and consistent up-valley pressure no matter which supply Napa wants to feed the up-valley agencies from.	Capitol: TBD O&M: TBD	The pump station would help improve the reliability of the water being supplied Napa to both Calistoga and St. Helena.	Design is complete. Level of analysis satisfies CEQA and NEPA requirements.	Ready to proceed to construction. Funding will likely determine project timing and implementability.
18	Dunaweal Pump Station Replacement Project	Implementation Ready	Calistoga, Napa	This project is looking to design a new pump station capable of providing redundancy and increase supply, while also improving the current operation and resiliency of Calistoga's critical water infrastructure from flooding, wildfire, and other hazards.	Project improvements would lessen the chance of critical water pumping infrastructure failure in the event of flood and improve water supply for wildfire, thereby ensuring adequate water resources for Calistoga.	Capitol: TBD O&M: TBD	The pump station would help improve the reliability of the water being supplied by Napa. This portion of supply accounts for more than 60% of Calistoga's total water supply.	Currently undergoing 30% design.	Project is currently undergoing 30% design and will likely proceed with final design and ultimately construction.
19	Putah South Canal Intertie	Implementation Ready	All DCP Task Force Agencies	Project would involve installing a pipeline connecting the Putah South Canal of the Solano Project to the NBA of the SWP to provide an urgent water supply to Napa Valley agencies.	The intertie would afford agencies in the Napa Valley access to water supply from the Solano Project during emergency situations, such as a salinity gradient issue or pipeline/pump station failure.	Capitol: TBD O&M: TBD	TBD; during the last drought there were talks to transfer up to 10,000 AF.	Would need to engage Solano County Water Agency to establish a more permanent agreement.	Conceptually, the project is ready to proceed. Funding and clear identified need for the intertie will determine project timing and implementability.

Table 6-3. Drought Mitigation and Response Measures

No.	Drought Mitigation Measure	Stage	Engaged Agencies	Description	Reduction in Regional Vulnerability	Cost	Project Yield	Readiness to Proceed	Implementability and Timing
20	North Bay Aqueduct Expansion	Planning	All DCP Task Force Agencies	DWR completed an engineering study to evaluate alternatives for increasing NBA capacity to meet current obligations and projected demands. One of the main alternatives consists of parallel pipelines from Barker Slough to the Travis tank and from Cordelia Forebay to Napa. One other alternative would be to relocate the NBA intake from Barker Slough to the Sacramento River to improve the quality of the raw water delivered through the NBA. This alternative would still require modifications, like the parallel pipeline concept described above, to increase capacity.	The proposed improvements would afford the region more conveyance capacity and thus enhanced access to their imported water supplies.	Capitol: $125 M (capacity improvements); $155 M (intake relocation) O&M: TBD	Would increase actual NBA conveyance capacity.	DWR completed an engineering study to evaluate alternatives. No further action has been taken.	TBD
21	Regional Water Conservation Program	Implementation Ready	All DCP Task Force Agencies	A RWCP would help water utilities in the Napa Valley work together to help their customers use water efficiently and to meet BMPs for urban water conservation. Elements of an RWCP could include public outreach campaigns, outreach materials and conservation devices, and community events and workshops.	The RWCP would lead regional water conservation efforts and provide the public with consistent messaging and useful tools designed to ensure efficient use of Napa Valley water resources.	Capitol: TBD O&M: N/A	Would help conserve water during drought conditions.	All agencies in Napa Valley have existing water conservation programs.	Conceptually, the program is ready to proceed.
22	Integrated Supply and Operations Study	Planning	All DCP Task Force Agencies	Acknowledging that current hydrologic conditions result in the basin as a whole having sufficient water supply but that it is not always available to those who need it, an integrated study would examine operational flexibilities and opportunities throughout the system as a whole.	By finding ways to optimize existing water supply and integrate new ones, the region could dramatically reduce the vulnerability of individual communities to future droughts. From an operations standpoint, having a better understanding of a reservoir's firm yield (i.e., the amount of water a reservoir can reliably supply during a drought) affords agencies an opportunity to better plan for future drought.	Studies like this are typically conducted for $500 K.	The aim would be optimization of available water, not necessarily an increase in total combined yield.	This study could start immediately based on existing information.	This study could start immediately. Similar studies typically take 9 to 12 months to complete.

TBD = To be determined.
N/A = not available.

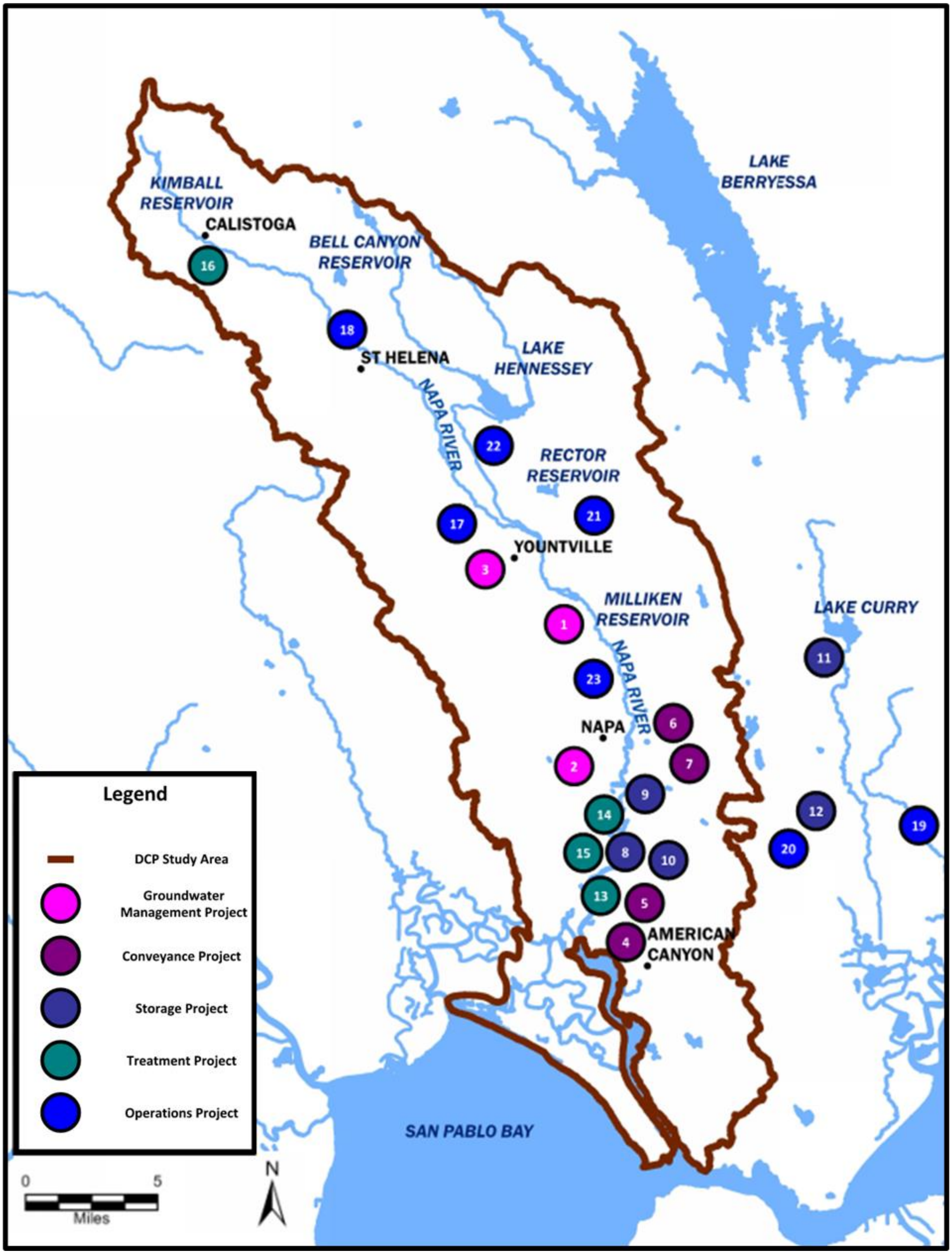

Figure 6-2. Potential drought mitigation and response measures for the NVDCP

6.3 Evaluating and Prioritizing Drought Mitigation Measures

The goals, objectives, and weighting shown in Table 6-2 were used to conduct the evaluation and prioritization analysis and identify which drought measures may be best suited to build long-term drought resiliency and mitigate drought risks. To develop a relative evaluation of the mitigation and response measures identified for the NVDCP with respect to the ability of each to satisfy the NVDCP goals, a set of quantitative and qualitative criteria for the NVDCP objectives was developed. These criteria were used to assign raw scores based on each project's ability to satisfy each respective objective. These raw scores were normalized, and the weighting factors applied to develop a composite score for each assessed project. Implementation Ready projects were compared to one another, and the same approach was used for Planning projects. The DCP Task Force was guided through the approach used to evaluate and prioritize the list of mitigation and response actions at the November 9, 2020, DCP Task Force meeting. The DCP Task Force members were afforded the opportunity to update and refine the approach, so it aligned with their respective agency's expectations. A detailed breakdown of the evaluation and prioritization methodology is included in Appendix C.

6.3.1 Project Timing

Potential drought measure implementation timing is shown in Table 6-4. Timing was categorized as either near term (0-5 years), medium term (5-10 years), or long term (beyond 10 years) based on project status and other project-specific details. Most identified mitigation measures are anticipated in the near and medium terms; however, as noted previously, the Local Agencies consider the entire list of 22 measures to be viable prospects.

6.3.2 Results of Evaluation

Results of the project evaluation and prioritization are summarized for Implementation Ready (Figure 6-3) and Planning Projects (Figure 6-4). These figures illustrate each project's overall score and its performance against each goal (shown by the length of each color in the bar). The order in which projects are shown in the figures should not be interpreted as the order in which they should occur. To develop drought resiliency for the region, a portfolio of many measures must be implemented both in the near and long term. The NVDCP is intended to be a living document that is updated regularly to ensure implementation status and project details are up to date. Those measures in concept or development need to continue to be further developed out so their overall scores can be updated in the future once more information is known. This will provide the region with a dynamic DCP that can address continually evolving conditions.

6.4 Regional Resilience of Drought Mitigation Measures

The drought measures defined and characterized in Section 6.2 reduce potential risks of drought, climate change, infrastructure/Delta levee failures, and other emergencies (e.g., earthquakes) by reducing the consequence of these factors on the Local Agencies. Many of the drought measures leverage existing infrastructure and water supply sources and increase the flexibility to move and share supply sources among the Local Agencies by using water system facilities already in place. Table 6-5 summarizes how each drought mitigation measure improves regional water supply resilience, thus reducing the need for drought response actions.

Table 6-4. Potential Timing for Mitigation Measure Implementation

Project Category	Number	Drought Mitigation Measure	Project Timing: Near Term (0-5 years)	Project Timing: Medium Term (5-10 years)	Project Timing: Long Term (>10 years)
Groundwater Management	1	Aquifer Storage and Recovery		■	
	2	IPR via GWR or SWA			■
	3	Integrated Water Supply Wells		■	
Conveyance	4	Phase 1 Recycled Water Distribution System Expansion	■		
	5	Phase 2 Recycled Water Distribution System Expansion		■	
	6	Milliken-Sarco-Tulocay Northern Loop	■		
	7	Milliken-Sarco-Tulocay Eastern Extension	■		
Storage	8	Additional Soscol WRF Covered Storage		■	
	9	Napa State Hospital Storage Tank		■	
	10	NapaSan Seasonal Storage		■	
	11	Lake Curry Purchase (Vallejo Lakes System)			■
	12	Sites Reservoir Allocation Purchase	■		
Treatment	13	WRF Phase 2 Treatment Plant Upgrades		■	
	14	Soscol WRF Phase 2 Treatment Plant Upgrades		■	
	15	Purified Water Feasibility Study	■		
	16	Mitigation Strategies for Boron Reduction			■
Operations	17	Dwyer Road Pump Station Project	■		
	18	Dunaweal Pump Station Replacement Project	■		
	19	Putah South Canal Intertie		■	
	20	North Bay Aqueduct Expansion			■
	21	Regional Water Conservation Program	■		
	22	Integrated Supply and Operations Study	■		

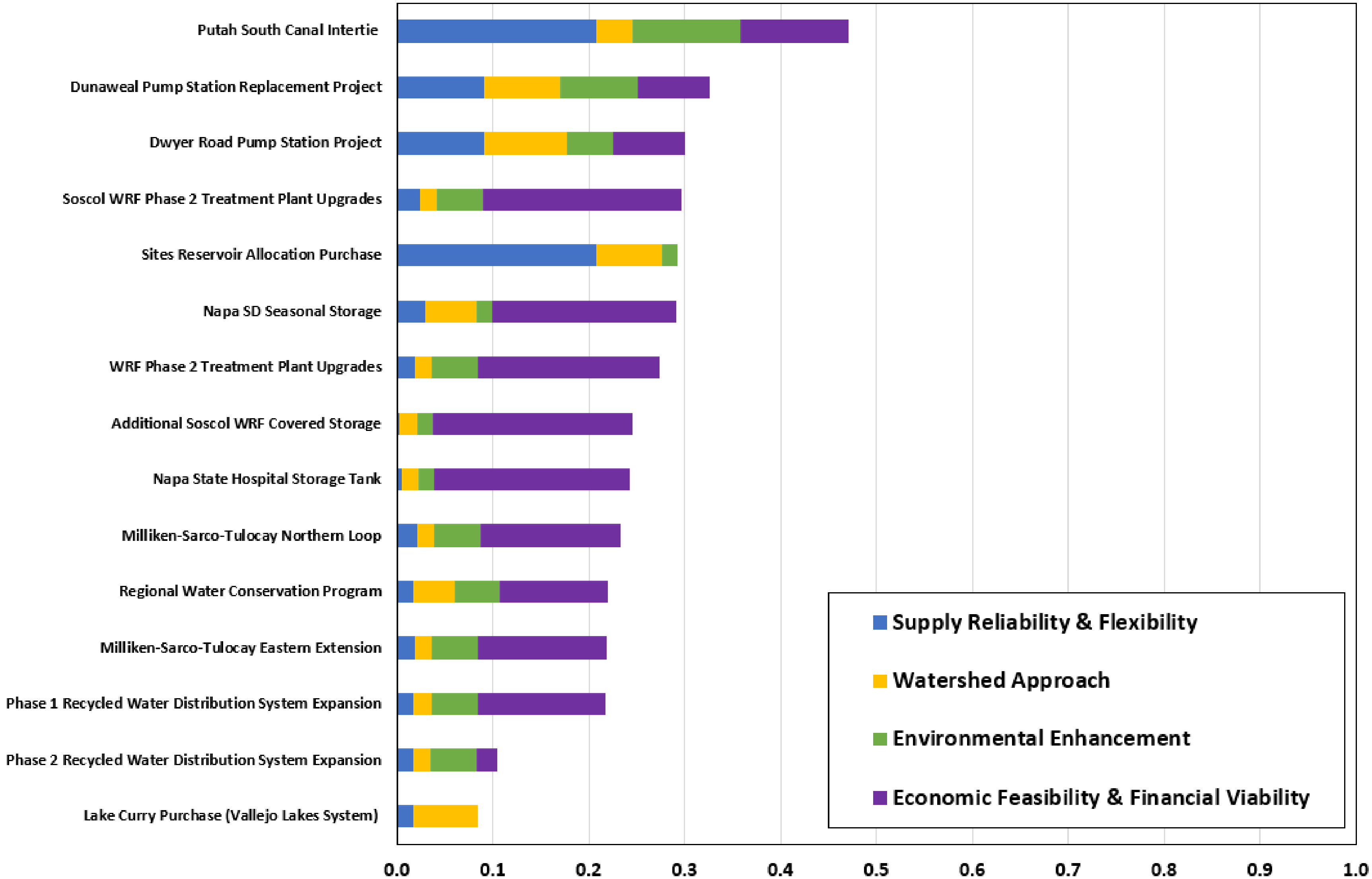

Figure 6-3. Implementation Ready projects evaluation results – Goal Level

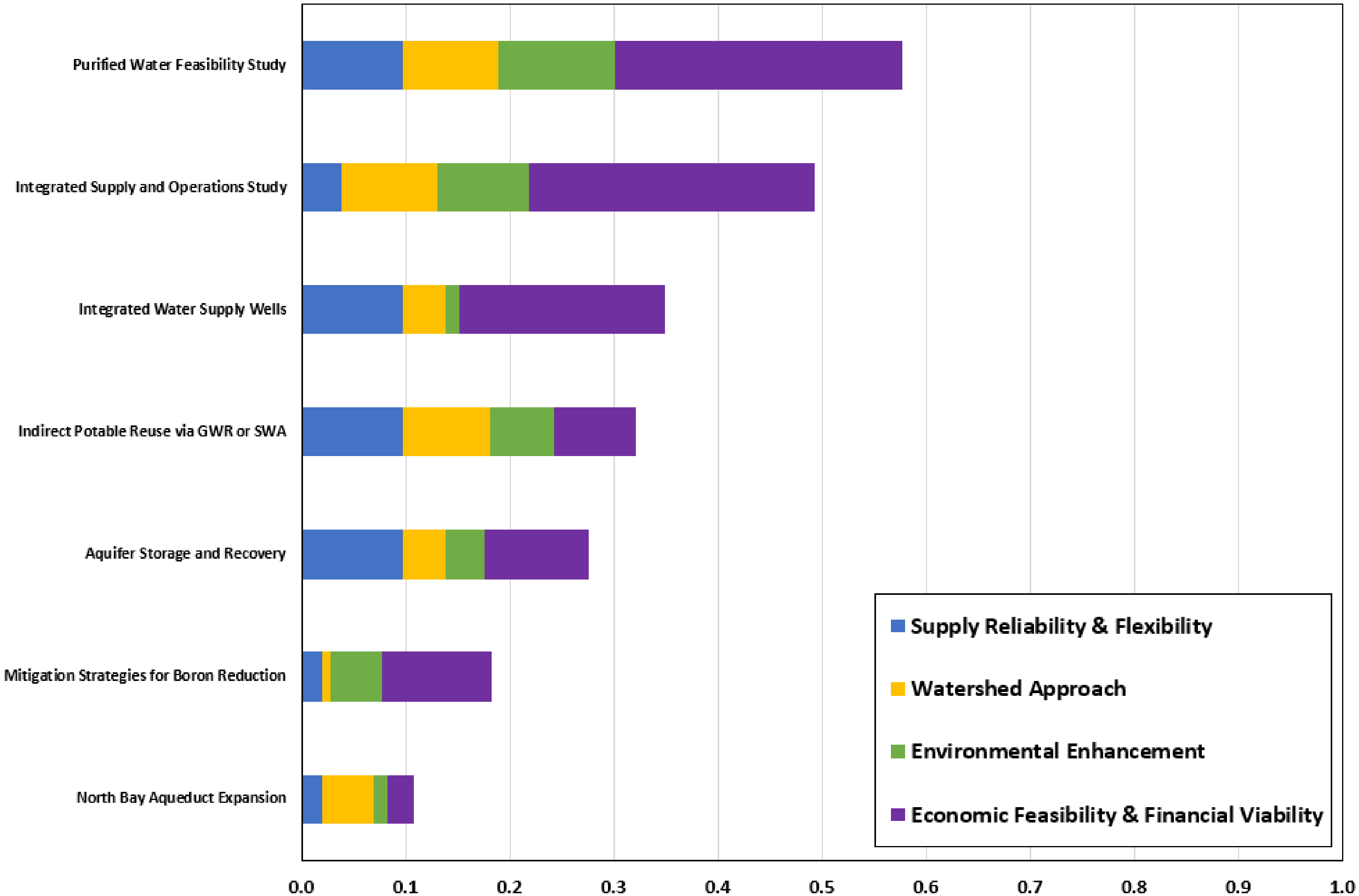

Figure 6-4. Planning projects evaluation results – Goal Level

Table 6-5. Drought Mitigation Measure Improvement to Regional Water Supply Resilience			
No.	Drought Mitigation Measure	Engaged Agencies	Improvement in Regional Water Supply Resilience
1	Aquifer Storage and Recovery	All DCP Task Force Agencies	• Improves water supply reliability by storing surplus water during normal/wet years for use in dry years • Increases opportunities for conjunctive use • Augments groundwater supply, which reduces groundwater over drafting and improves groundwater quality
2	IPR via GWR or SWA	All DCP Task Force Agencies	• Potentially augments groundwater and/or surface water supply, which reduces groundwater over-drafting and improves groundwater quality • Mitigates the consequences of failure by providing a highly reliable local source of water • Increases opportunities for conjunctive use
3	Integrated Water Supply Wells	All DCP Task Force Agencies	• Potentially increases supply in emergencies and droughts • Mitigates the consequences of failure by providing a local source of water • Increases opportunities for conjunctive use
4	Phase 1 Recycled Water Distribution System Expansion	American Canyon, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Distributes a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
5	Phase 2 Recycled Water Distribution System Expansion	American Canyon, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Distributes a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
6	Milliken-Sarco-Tulocay Northern Loop	NapaSan, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Distributes a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
7	Milliken-Sarco-Tulocay Eastern Extension	NapaSan, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Distributes a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
8	Additional Soscol WRF Covered Storage	NapaSan, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Helps capture and distribute a highly reliable local source of recycled water that is minimally affected by drought conditions
9	Napa State Hospital Storage Tank	NapaSan, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Helps capture and distribute a highly reliable local source of recycled water that is minimally affected by drought conditions
10	NapaSan Seasonal Storage	NapaSan, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Helps capture and distribute a highly reliable local source of recycled water that is minimally affected by drought conditions
11	Lake Curry Purchase (Vallejo Lakes System)	All DCP Task Force Agencies	• Reduces reliance on diversions from the Delta and SWP during emergencies/drought conditions • Diversifies the water portfolio and reduces reliance on groundwater supplies
12	Sites Reservoir Allocation Purchase	All DCP Task Force Agencies	• Reduces reliance on diversions from the Delta and SWP during emergencies/drought conditions • Diversifies the water portfolio and reduces reliance on groundwater supplies

Table 6-5. Drought Mitigation Measure Improvement to Regional Water Supply Resilience			
No.	**Drought Mitigation Measure**	**Engaged Agencies**	**Improvement in Regional Water Supply Resilience**
13	WRF Phase 2 Treatment Plant Upgrades	American Canyon, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Treats a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
14	Soscol WRF Phase 2 Treatment Plant Upgrades	NapaSan, City of Napa, Napa County	• Diversifies the water portfolio and reduces reliance on groundwater supplies • Treats a highly reliable local source of recycled water that is minimally affected by drought conditions • Improves water supply redundancy and offsets potable water usage
15	Purified Water Feasibility Study	City of Napa, City of American Canyon, Napa County	• Recovers a local water resource otherwise discharged to the San Pablo Bay • Provides a supplemental, local, drought-resistant supply for the Napa Valley
16	Mitigation Strategies for Boron Reduction	City of Calistoga, Napa County	• Helps improve water quality • Potentially helps augment available recycled water supply
17	Dwyer Road Pump Station Project	City of Calistoga, City of Napa, City of St. Helena	• Improves the reliability of critical infrastructure • Increases greater flexibility in water deliveries by connecting existing infrastructure among multiple agencies • Provides dry-year reliability by facilitating water transfers seasonally/during drought conditions • Facilitates water transfers during emergencies
18	Dunaweal Pump Station Replacement Project	City of Calistoga, City of Napa	• Improves the reliability of critical infrastructure • Increases greater flexibility in water deliveries by connecting existing infrastructure among multiple agencies • Provides dry-year reliability by facilitating water transfers seasonally/during drought conditions • Facilitates water transfers during emergencies
19	Putah South Canal Intertie	All DCP Task Force Agencies	• Increases greater flexibility in water deliveries by connecting existing infrastructure among multiple agencies • Provides dry-year reliability by facilitating water transfers seasonally/during drought conditions • Facilitates water transfers during emergencies
20	North Bay Aqueduct Expansion	All DCP Task Force Agencies	• Expands water quality benefits to regional partners and provides protection from future declines in Delta water quality • Improves water operations of regional partners, which increases operational flexibility and interagency coordination • Has potential to improve operation of the SWP and improve its ability to meet regulatory requirements
21	Regional Water Conservation Program	All DCP Task Force Agencies	• Improves regional response to drought • Helps develop and deliver consistent messaging and useful tools designed to ensure efficient water use
22	Integrated Supply and Operations Study	All DCP Task Force Agencies	• Lays the foundation for broader water sharing • Improves water operations of regional partners, which increases operational flexibility and interagency coordination

6.5 Drought Mitigation and Response Actions of Special Interest

Based on the evaluation of the mitigation and response actions, the DCP Task Force was interested in having the DCP Consultant team further examine three of the identified mitigation measures. The projects of interest included the Sites Reservoir Allocation Purchase, the Integrated Supply and Reservoir Operations Study, and exploring what a purified water project might look like in the region. The following section delves into these measures and describes potential next steps should the Local Agencies elect to move forward with any of these mitigation actions.

6.5.1 Sites Reservoir Allocation Purchase

Figure 6-5. Future Sites Reservoir site

Source: Sites Project Authority, 2020

The Sites Reservoir Project involves constructing a new reservoir to capture surplus flows from the Sacramento River. These captured flows would not infringe on any existing water rights or regulatory requirements. The water would be stored in a new off-stream reservoir with a capacity ranging somewhere between 1.3 and 1.5 million AF for release during drought years to help meet environmental flows and deliver water to communities, farms, and businesses across the state (Sites Project Authority, 2020). The reservoir will be situated on the west side of the Sacramento Valley, approximately 10 miles west of Maxwell in Glenn and Colusa Counties (Sites Project Authority, 2017) (see Figure 6-5). When operated in coordination with other CVP and SWP reservoirs from Northern California (e.g., Shasta, Oroville, and Folsom), the Sites Reservoir is expected to increase flexibility, reliability, and resiliency of statewide water supplies in drier periods. Overall, the main project objectives are to help improve water supply reliability for participants and the environment and to provide opportunities for recreation and flood damage control.

Currently, the project is expected to cost around $3.3 billion and has 29 active participants (Sites Project Authority, 2020). Once constructed, the reservoir is expected to provide an average annual supply of about 230,000 AF, with about 190,000 AF allocated for public water agencies and the remaining 40,000 AF allocated for the state. The goal is to have the project completed by December 2030. If this schedule holds, the Sites Power Authority would likely look to start filling the reservoir in 2029. Deliveries would likely start shortly after depending on the state’s hydrology.

Among the Local Agencies, only American Canyon is currently engaged with the project; they became a partner in 2017. However, there may be opportunities in the near future for other Local Agencies to get involved. Potential next steps are discussed below.

6.5.1.1 Potential Next Steps for Local Agencies with Sites Reservoir

Local Agencies looking to become involved with the Sites Reservoir project would be responsible for two sets of costs. The first covers planning and engineering project costs that total $508 per AF, of which $208 would cover project-related effort through the end of 2021 and $300 would cover project costs through July 2023. This $508 is a one-time cost.

The second cost is an annual project cost. Based on current estimates, this cost is expected to range between $600 and $700 per AF. It is important to note that this range does not include costs associated with pumping and conveying water from the Delta to the corresponding agency nor does it account for any treatment costs of the potential supply. The project has secured bank financing that is set to kick in July 2023. It's expected that participating agencies likely won't start paying debt service until the reservoir is operational. Each agency's share of the debt service will be based on whatever storage allotment it has on the project.

Agencies looking to engage with the project would do so during periods of "rebalancing." These rebalancing exercises are conducted to confirm how much storage allotment each participating agency has and to adjust these allotments if needed. The last rebalancing happened in September 2020, with the next likely to occur in January 2022. During these rebalancing periods, existing project participants are allowed to adjust their allotments before any outside agency looking to get involved is allowed to buy into the project. Once existing participants have made their desired adjustments, the Sites Project Authority will be able to determine if space is available and potentially bring in new participants.

If any of the Local Agencies desire to become involved with the Sites Project, it would be best to work through American Canyon. As an existing Sites Project participant, American Canyon would be able to increase its existing allotment before other outside agencies could buy into the project. There would likely need to be some type of MOU or other form of agreement between American Canyon and those interested in getting involved, but this appears to be the best path forward. A decision for involvement would need to happen by July 2023, which coincides with the last anticipated rebalancing event. After July 2023, bank financing is initiated, and each participating agency will be responsible for paying its share of the debt service.

6.5.2 Integrated Supply and Reservoir Operations Study

As noted in Section 2, all of the Local Agencies are linked by water. Having a firm understanding of these linkages is critical to addressing drought response, and it's likely that future modeling will be needed to adequately assess these linkages. However, based on the water supply and demand assessment conducted as part of this DCP, we can surmise that current hydrologic conditions result in the Napa Valley (as a whole) having sufficient water supply but that it is not always available to those who need it.

6.5.2.1 Integrated Supply Assessment

As a first step, a desktop assessment was conducted as part of this NVDCP to identify projects that help maximize and optimize the use of existing water supplies. In reviewing the list of drought mitigation and response actions (Table 6-3), the following projects were identified:

- Dwyer Road Pump Station Project
- Dunaweal Pump Station Replacement Project
- Integrated Water Supply Wells

The pump stations both bolster the reliability of critical infrastructure and improve the flexibility and efficiency for water deliveries. The ability to maximize that flexibility and improve the reliability of the entire water supply portfolio is desired for the Plan Area. Both pump stations help accomplish that. In reviewing both existing and new potential sources of supply for the region, it appeared that a substantial portion of them originate in the southern part of the valley. These pump stations will afford the region the opportunity to better distribute these supplies to other areas in the valley, thus helping to maximize available supplies.

Even though groundwater is predominantly used to help meet agricultural demands, new integrated water supply wells could offer an opportunity for conjunctive use that may improve water management with minimal impact on existing groundwater users. This project would require a bit more coordination with the Napa County GSA and ongoing Napa Valley Subbasin GSP efforts, but it merits further consideration.

6.5.2.2 Future Modeling Effort

An Integrated Supply and Reservoir Operations Study would examine operational flexibilities and opportunities throughout the system as a whole. Questions that could be addressed through modeling include:

- Can existing interconnection infrastructure be used to augment other supplies in times of need? Where are the gaps? How feasible/cost effective is it to address the gaps?
- Can Local Agencies rely more on groundwater resources without harming current users or uses based on current or increased volume of recycled water being supplied to agricultural users?
- Could regional groundwater supplies be used more intermittently for municipal users to provide drought buffering without affecting other groundwater users?
- Can current agreements be reconsidered to promote holistic management of water supplies as a region?
- Does rethinking the supply sources as an integrated system provide additional buffering to future climate patterns in addition to current supply needs?
- Is there a subgroup of communities and users in the Napa Valley who could benefit from integrated supply operations while others continued to function more independently (that is, not all independent, and not fully integrated, but a hybridization)?

The study would be accomplished with an integrated system model that incorporates existing information on supply dynamics, climate, hydrology, and current constraints, and also integrates information and modeling capabilities from the Napa Valley Subbasin GSP. The integrated supply model then explores “what if” questions about how individual sources might be better used as regional resources through revised agreements, optimizing use of imported water/surface water /groundwater/recycled water, and more flexible use of existing interconnections. As part of this effort, the model would be used to identify and evaluate observed and projected changes to surface water availability and discern implications to reservoir operations arising from climate change. Having a better understanding of a reservoir’s firm yield (i.e., the amount of water a reservoir can reliably supply during a drought) affords agencies an opportunity to better plan for future periods of drought. This would be an exploratory model, not a prescriptive tool focused on one unique recommendation. The principal aim of this study would be to identify options to redefine individual supply sources as regional resources, recraft water agreements, and help balance the surplus water effectively to municipal and agricultural users throughout the valley. If it can be shown that regional distribution of surplus water is plausible both physically and institutionally, rethinking the operations within the Napa Valley could dramatically reduce the vulnerability of individual communities to future droughts.

6.5.3 Purified Water in the Napa Valley

While traditional supply sources will remain an important foundation to the region’s supply portfolio, the Local Agencies view non-potable and potable water reuse as critical elements to future Napa Valley supplies. As such, Napa, American Canyon, and NapaSan would like to evaluate the viability of incorporating purified water into the region’s water supply portfolio through raw water augmentation (i.e., planned placement of purified water into a raw or untreated water distribution system) and treated water augmentation (i.e., planned placement of purified water into the treated water distribution system). The proposed feasibility study, which is included in Table 6-3 as Drought Mitigation Measure number 15, would look at identifying and evaluating potential project alternatives that would take available treated wastewater effluent from American Canyon and NapaSan and purify it through a multi-barrier treatment process to determine an approach that satisfies regulatory requirements while minimizing cost and maximizing water produced. The study would help identify potential infrastructure needs, identify likely major processes and systems for full-scale design, and assess the concept's overall feasibility. If viable, implementation of a purified water facility would establish a new drought-resilient water supply for the region to increase water supply reliability, resiliency, and diversity for years to come. A preliminary assessment was completed as part of the NVDCP and is included in Appendix D.

6.6 Implementation of Drought Mitigation and Response Actions

Through the NVDCP, the Local Agencies have created a new regional water management platform that has the potential to forge new regional approaches and more fully optimize use of existing assets and resources to collectively strengthen reliability and resilience. Many of the drought measures included in the NVDCP aim to use existing infrastructure and water resources to produce greater efficiencies and improve water supply reliability for the Napa Valley. Applying Local Agency goals and objectives to evaluate a range of potential projects and studies provides context and insight as the Napa Valley looks to address future water supply challenges. Since not all Local Agencies are engaged in every project, some subset of the Local Agencies may proceed with individual projects outside of the NVDCP framework. It is anticipated that the DCP Task Force members will work with their respective elected officials to review the NVDCP output and determine potential future steps as it pertains to specific projects' implementation.

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Section 7

DCP Implementation: Administrative and Organizational Framework

An Administrative and Organizational Framework is critical for supporting implementation of the drought mitigation or response actions and to identify who is responsible for undertaking the actions necessary to implement various DCP elements. This section describes the ownership of the administrative framework and approach to implementing and updating the components of this DCP into the future.

7.1 Reclamation's Drought Response Framework

Reclamation's Drought Response Program Framework (Program Framework) was developed to incentivize planning and preparedness for western drought rather than reacting with a crisis response. The Program Framework supports a proactive approach that includes consideration of risks and uncertainties due to changing hydrologic conditions and identifies actions that will build long-term drought resiliency.

This approach is supported by the National Drought Mitigation Center, which emphasizes the benefits of preparedness planning and drought mitigation to decrease the cost and impacts of responding to drought emergencies:

> *One frequently cited estimate from FEMA is that "mitigation" – taking steps ahead of time to prevent known impacts from a natural disaster – saves $4 for every $1 expended. Planning ahead is generally seen as more efficient and more effective than measures taken in crisis mode. Drought researchers have found that after-the-fact assistance to farmers, for example, is expensive and doesn't necessarily reach the right people.*

The DCP is a cornerstone of the Program Framework in that it establishes a stakeholder-driven planning process to consider risk and uncertainty of changing hydrologic conditions and identifies potential drought mitigations or response actions that build drought resilience.

A key aspect of the DCP process is the Administrative and Organizational Framework that identifies what is required to respond to a drought emergency. This task requires anticipating and preparing efficient responses for drought, taking actions as required under a drought crisis, and identifying responsibilities for implementing each element of the DCP, including communicating with the public about these actions. At a minimum, the Administrative and Organizational Framework should identify the roles, responsibilities, and procedures necessary to:

- Conduct drought monitoring
- Initiate response actions, including emergency response actions
- Initiate mitigation actions
- Describe a process and schedule for monitoring, evaluating, and updating the DCP

7.2 Key Considerations for Local Agencies

The DCP Task Force members have a long history of successfully working together which has provided the foundation for the diverse and robust water management program emerging from the NVDCP planning process. Given the established, collaborative working relationship of DCP Task Force members, there are logical, next-step planning activities for studies and tasks associated with implementing the mitigation and response actions identified in the NVDCP.

The DCP Task Force has demonstrated a commitment to continued collaboration while learning more about future needs for managing the region's water resources. How this future work will be undertaken by DCP Task Force members is the focus of the questions and responses included in Table 7-1.

Table 7-1. Local Agencies' Preferences for the DCP Framework

Questions	Responses
General Questions	
Do you want the efficiencies of a single management entity?	General consensus. An MOU or Joint Powers Authorities (JPA) could be formed as a high-level entity to support regional collaboration and project implementation. Give consideration to specific municipal water resource management programs due to respective budgets, supply sources, and drought triggers in the region.
Do you want to partner on drought mitigation projects, actions and manage water beyond established service areas?	General consensus. The MOU or JPA should be tasked with providing clear project benefits, costs, and equitable decision-making structure to all members.
Do you want financial assistance, ability to secure and manage project grants and or/financing?	General consensus. Consideration should be given to costs of securing and managing grants relative to the amount of funds received.
Refining Projects for Implementation	
Would your agency generally support regional approaches that provide additional benefits as long as infrastructure identified in the DCP was the foundational project?	General consensus. Projects should not be limited to those identified in the DCP and decisions should be made with respect to local priorities and budget constraints.
Does your agency have any specific priorities or preferences for securing funding assistance (grants) for the entire region, individual agencies, or a sub-group of agencies?	Two priorities identified: 1) Specific support for both the Integrated Supply and Operations Study and Purified Water Feasibility Study and, 2) recognition that some grant programs may be specific to/benefit different sub-regions.
Future Work of the Task Force	
Does your agency see future DCP activities continuing by a lead local agency with existing staff and/or supported with outside consultants?	Responses were mixed: Most agreed that local agencies should retain autonomy but could work under a lead agency, MOU, or JPA supported by a mix of staff and consultants. Recognize that continued regional planning efforts have cost issues to be addressed.
For your agency to be engaged, the Water Resources Technical Advisory Committee (Water TAC) would need to meet regularly. Would meeting on a bi-monthly or quarterly basis meet your agency's needs?	General agreement that the Water TAC was a good, staff-level forum for discussing water resource issues. Support for monthly or quarterly Water TAC meetings with SWP subcommittee.
As a Water TAC member, would your agency be willing to financially contribute toward activities associated with identifying and securing grants and funding options for DCP task implementation?	General consensus: • The Water TAC should remain a staff-level forum for discussing projects, potential partnerships, and information exchange. • If an MOU or JPA was proposed, costs and benefits to participating agencies need to be developed and approved by Local Agency boards. • Additional regional studies, project analysis, grants, and/or financing proposals would need approval of individual Local Agency boards and could be administered under a potential MOU or JPA. • Agencies would consider partnering in a local, project-specific funding initiative.

7.2.1 Additional Considerations

As the NVDCP planning analysis was getting underway, two separate but related studies were initiated in the region. LAFCO undertook its MSR update, and the Napa County GSA was formed and began developing its GSP. Both initiatives were discussed with the DCP Task Force with the following outcomes:

- Local agency responses to the LAFCO MSR were in support of regional collaborations, but not in forming a county water agency at this time.
- The Napa County GSA was formed after the NVDCP was initiated, and the DCP Task Force agreed these two entities need to continue to engage in communications.
- The hydraulic model being developed under the Napa Valley Subbasin GSP will be completed later this year (2021 would be of great benefit to the Integrated Supply and Operations Study identified as a high priority under the NVDCP.
- Both the NVDCP and the Napa Valley Subbasin GSP need to be updated periodically and should include actions on how these two initiatives contribute toward building resiliency into the Napa Valley water supply.

As the DCP Task Force is completing its work, a few organizational issues need to be given consideration and future action by Local Agencies in support of implementation. These include:

- There is no established regional entity responsible for implementing the NVDCP.
- Reclamation requires the DCP identify an agency or regional entity responsible for implementing the DCP and updating document.
- It is anticipated that new California grant funding will prioritize collaboration between GSAs and IRWM groups. There are many on-line forums discussing how these plans could be integrated. Examples can be found on the IRWM website: https://roundtableofregions.org.

7.3 Supporting DCP Implementation

It is important to assign the roles and responsibilities for undertaking the actions necessary to implement each element of the NVDCP, which should include the procedures necessary to conduct drought monitoring, initiate response actions (including emergency response actions), initiate mitigation actions, and make updates to the document. Information flow and coordination among the Local Agencies and others as well as the approach for undertaking the actions necessary to implement each element of the NVDCP will leverage efforts and stakeholder activities already in place as well as the considerations and preferences discussed with the DCP Task Force.

7.3.1 Potential Implementation Strategies

Advancing the mitigation and response actions identified in this document from planning and design to construction and operation requires thoughtful planning and ongoing coordination. Based on discussions and feedback, the DCP Task Force was presented with the following two implementation strategy options for supporting its future work in building organizational capacity and in undertaking future studies and projects:

Implementation Strategy Option 1: The DCP Task Force would leverage its existing Water TAC meetings as the forum for addressing various NVDCP elements. The Water TAC meets monthly and would remain a staff-level forum for discussing projects and potential partnerships and for exchanging information. The City of Napa would be on point to lead NVDCP related topics at the Water TAC meetings and help coordinate efforts related to performing the requirements of the framework. Implementation of any additional regional studies, project analysis, grants, and/or financing proposals would need approval of individual Local Agency boards and could be administered under project specific MOUs.

- **Implementation Strategy Option 2:** This approach would be a more facilitated process involving the development of a Regional MOU. A consultant, such as CONCUR. Inc., who is currently facilitating the Napa Valley Subbasin GSP stakeholder engagement process, would help the Local Agencies craft this Regional MOU. The Regional MOU would serve as an ongoing, long-term agreement among the Local Agencies that would provide a clear understanding among the parties as to their common expectations and objectives of the evolving NVDCP, thus, establishing a common intention or framework for future engagements.

The theoretical flow down for both implementation strategy options is shown on Figure 7-1.

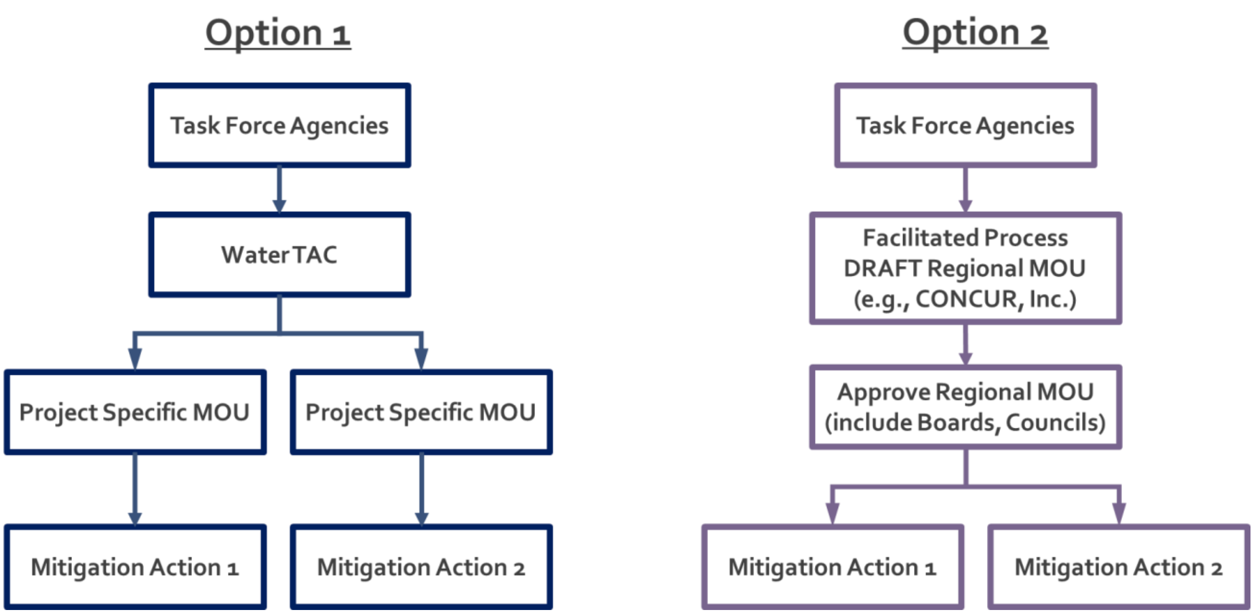

Figure 7-1. Potential implementation strategies

7.3.2 DCP Implementation Approach

In the near term, the DCP Task Force or some subset thereof expects to use Implementation Strategy Option 1 to further advance plans, explore funding options, and study feasibility for the projects and programs described in this NVDCP. Early efforts are already underway to advance some of the drought mitigation actions identified in Table 6-3, such as the Dwyer Road Pump Station Project and the Dunaweal Pump Station Replacement Project, for which a subset of the Local Agencies is currently looking to procure implementation funding. Other projects are still conceptual, and the feasibility and timing of implementation will depend on future needs, Local Agency approvals, and funding opportunities.

Over the next 5 years, the DCP Task Force will continue to use the Water TAC meetings as a forum to address:

- Continued coordination with the Napa County GSA
- Discuss funding and next steps to keep the NVDCP elements updated
- Incorporate on-going studies into drought mitigation and response activities, including the Napa Valley Subbasin GSP
- Use the modeling and analysis results of Napa Valley Subbasin GSP to check assumptions and update the drought planning for the next version of the NVDCP
- Continue support and tracking to further advance the planning-level projects
- Look for opportunities to implement projects categorized as Implementation Ready or further advance the Planning-level projects by:
  - Seeking grant funding
  - Providing a regional voice in support of project implementation funding
  - Coordinating with key project entities outside the purview of the DCP Task Force authority

Beyond the measures considered in this DCP, the Local Agencies are pursuing other projects individually or with agencies outside of the NVDCP partnership to further improve Napa Valley supply reliability. Taken together, joint NVDCP and individual Local Agency efforts are solidifying systems and resources to provide drought reliability through a sustainable, reliable, high-quality water supply, for a healthy community and vibrant Napa Valley economy.

7.3.3 DCP Update Process

The NVDCP will be updated in 2026 and then on an as-needed basis thereafter. This will allow updated information from the Local Agencies' UWMPs, which will also be filed with the State in 2026 and every five years thereafter, to be incorporated. The process for updating the NVDCP is summarized by quarter (Q) and year as follows:

- **Q3 2024:** Using the Water TAC meetings as its forum, the DCP Task Force identifies findings of the Napa Valley Subbasin GSP, which may impact NVDCP updates.
- **Q4 2024:** DCP Task Force identifies which mitigation and response actions from Table 6-3 have been completed and added to the region's water supply portfolio. Additional projects identified through the Napa Valley Subbasin GSP, or other local pertinent studies will be added.
- **Q1 2025:** DCP Task Force updates and reviews changes to Table 6-3. The evaluation and prioritization approach discussed in Section 6.3 and detailed in Appendix B is reviewed and updated (if necessary).
- **Q2 2026:** UWMPs submitted to the State.

- **Q3 2026:** Existing water facilities sections (Section 2.1) updated based on then-known facilities. Current and future demand conditions (Section 2.2 and 2.3) updated based on UWMPs or other pertinent planning studies. The vulnerability assessment (Section 4) is performed based on future conditions from best available data. The evaluation and prioritization approach is applied to the new set of mitigation and response actions (approach is detailed in Appendix B) based on the updated vulnerability assessment and the goals and objectives set by the DCP Task Force.
- **Q4 2026:** Other sections of the NVDCP updated and report finalized.

7.4 Funding

A lack of funding can often be the primary constraint in implementing any project. To help advance some of the regional drought mitigation and response actions, viable funding sources must be identified. There are several state, federal, and local funding sources that are potentially available (i.e., current grants and loan opportunities). Funding eligibility and other requirements, such as local cost-share for grants and repayment terms for loans, are important considerations. In addition, grant funding is competitive (thus, less certain to materialize). Alternative funding mechanisms, such as public-private partnerships (P3), are additional pathways to consider.

Like any other water project, costs associated with drought mitigation measures identified in the NVDCP have three components—capital costs for initial construction, O&M costs, and repair and replacement costs for ongoing implementation once initial construction is complete. Some funding sources can be used only for capital expenditures, while others are more broadly applicable.

7.4.1 Grants and Loans

Capital projects can be financed using grant and loan programs. Table 7-2 provides a summary of currently available federal and state funding sources. The referenced programs tend to evolve with time, and current information is typically most efficiently found on websites (refer to the embedded hyperlinks in Table 7-2).

When pursuing grant funding, the following general guidelines typically apply:

- Grant applications must demonstrate the ability to construct, operate, and maintain the project without grant funding.
- Grant award or funding authorization is not a promise of grant reimbursement.
  - Most grants are reimbursements and not up-front cash, which means a funding source must be available for project construction.
  - Grant reimbursements are subject to annual budget and appropriations processes. As such, disbursement of grant funds is not guaranteed to follow an established schedule.
  - It may take several years after project completion to receive reimbursements, especially in difficult economic times.
  - Most grants require a minimum cost share by the project sponsor.
  - Federal grants typically require investment of additional resources.

Despite the competitive nature of grants, securing external funding can help to minimize ratepayer impacts and the rising cost of water services, which is particularly important to the Local Agencies concerning affordability issues in low-income disadvantaged communities (DAC).

7.4.2 Public-Private Partnerships

In recent years, public agencies have explored P3s and other forms of private sector financial involvement as possible ways to improve service, quality, and efficiency. When designed well and implemented in a balanced regulatory environment, P3s can bring greater efficiency and sustainability to the provision of public services. P3s involve private financing and the sharing of a project's risks and rewards beyond the construction phase between public and private partners. In P3 projects, the private partner is typically responsible for a facility's financing, design, construction, and O&M. In return, the private partner will typically receive a fee for the water from the public partner(s).

California's Infrastructure Finance Act (IFA) (IFA; published in California Government Code Section 5956) authorizes local governments to use private-sector investment capital for developing "fee-producing infrastructure facilities." It must be paid for by those benefiting from the facility. Among others, the IFA applies to cities (general law and charter), counties (general law and charter), special districts, JPAs, and any other public or municipal corporations. The government agency may grant ownership or leasing rights to the facility for up to 35-year terms.

Projects built under a P3 approach can offer some unique benefits. P3s provide a new source of funding for projects with costly infrastructure and/or operational costs. This approach can make otherwise unaffordable capital projects economically feasible. Private partners are often incentivized to complete the project as soon as possible because the private partner is usually not paid until after the project has been successfully constructed and is operating to predetermined performance requirements.

While P3s can offer many direct and indirect benefits, they also present challenges. Some P3 arrangements can be complex. Each agreement is unique and requires significant legal and technical input by both the public and private partners. Also, by forming a P3, an agency may concede some control of its water system to a private entity. Further, the public may perceive issues with respect to privatizing public infrastructure assets and the loss of public control over such assets. While these concerns can be mitigated by the terms of most agreements, they can pose challenges for a public agency pursuing projects on a P3 basis.

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Table 7-2. Federal and State Grant and Loan Funding Opportunities

Program	Agency	Type	Description	Funding Ceiling	Minimum Cost-Share Requirement
Federal					
American Rescue Plan Act (ARPA) of 2021 (Coronavirus State and Local Fiscal Recovery Fund)	U.S. Department of the Treasury	Grants: Recovery and Implementation	Provides $350B in emergency funding associated with the COVID-19 crisis for state, local, territorial, and Tribal governments to enable them to continue to support the public health response and lay the foundation for a strong and equitable economic recovery. It will help these entities cover the costs incurred responding to the public health emergency and provide support for a recovery through assistance to households, small businesses, and nonprofits; aid to impacted industries; and support for essential workers. It will also provide resources for state, local, territorial, and Tribal governments to invest in infrastructure, including water, sewer, and broadband services. The allocation includes $195B for states (a minimum of $500M for each state), $130B for local governments ($10B for a Coronavirus Capital Projects Fund, $60B for counties), $20Bfor tribal governments, and $4.5Bfor territories. (https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/state-and-local-fiscal-recovery-funds)	No maximum funding limit. Allocation amounts per metropolitan city are reported on the Treasury website.	None required
Drought Response Program	Reclamation	Grants	Provides assistance to water managers to develop and update comprehensive drought plans and implement projects that will build long-term drought resiliency. Program areas include contingency planning, resiliency projects, and emergency response actions. (https://www.usbr.gov/drought/).	Contingency planning: $200,000 Resiliency projects: $300,000 Emergency response actions: No maximum funding limit	50% (non-federal)
Non-Point Source Grants Program (Section 319 of the Clean Water Act)	EPA	Grants	Provides grants for activities that prevent water pollution from non-point sources. Activities include education, training, technical and financial assistance, technology transfer, demonstration projects, and monitoring non-point source implementation projects. Eligible projects include decentralized wastewater systems. (https://www.epa.gov/nps/319-grant-program-states-and-territories).	No maximum funding limit	40% (non-federal)
Public Water System Supervision (PWSS) Grants Program	EPA	Grants	Assists states, territories, and tribes developing and implementing PWSS programs to enforce the requirements of the Safe Drinking Water Act. Eligible activities include developing and maintaining drinking water regulations, recording compliance information, conducting sanitary surveys, identifying analytical laboratories, and creating enforcement programs. (https://www.epa.gov/dwreginfo/public-water-system-supervision-pwss-grant-program).	No maximum funding limit	None required
Rural Economic Development Lona and Grant Program	USDA	Grants/Loans	Provides funding for rural projects through local utility organizations. The United States Department of Agriculture (USDA) provides zero-interest loans to local utilities which they, in turn, pass through to local businesses (ultimate recipients) for projects that will create and retain employment in rural areas. The ultimate recipients repay the lending utility directly. The utility then is responsible for repayment to USDA. USDA provides grants to local utility organizations, which use the funding to establish revolving loan funds. Loans are made from the revolving loan funds to projects that will create or retain rural jobs. When the revolving loan fund is terminated, the grant is repaid to USDA. (https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program).	Grants: Up to $300,000 Loans: Up to $1M	Grants: 20% (non-federal) Loans: Not applicable to loans
Sewer Overflow and Stormwater Reuse Municipal Grants Program	EPA	Grants	Provides grants to states, the District of Columbia, and U.S. territories to assist in sewer overflow and stormwater needs. State recipients may use funding for municipal projects that plan, design, or construct combined sewer overflows, sanitary sewer overflows, or stormwater projects. (https://www.epa.gov/cwsrf/sewer-overflow-and-stormwater-reuse-municipal-grants-program).	No maximum funding limit	20% (non-federal)
Title XVI	Reclamation	Grants: Construction	Administers funds for recycled water feasibility, demonstration, and construction projects through the Water Reclamation and Reuse Program authorized by the Reclamation Wastewater and Groundwater Study and Facilities Act of 1992 (Title XVI) and its amendments. To meet eligibility requirements, a project must have a feasibility study, comply with environmental regulations, and demonstrate the ability to pay the remainder of the construction costs. Programs/projects that provide regional benefits are more likely to be funded under this program. Successful projects are authorized by Congress and included in Reclamation's annual budget request to the president. Congress then appropriates funds, and Reclamation ranks and prioritizes projects and disburses the money on a competitive grant basis each year. Prioritized projects are those that postpone the development of new water supplies, reduce diversions from natural watercourses, and reduce demand on federal water supply facilities, or that have a regional or watershed perspective. (https://www.usbr.gov/watersmart/title/index.html)	Up to 25% of construction costs, with a maximum of $20M	75% of construction costs (non-federal)
WaterSMART Basin Study Program	Reclamation	Grants	Basin studies evaluate water supply and demand and help ensure reliable water supplies by identifying strategies to address imbalances in water supply and demand. Each study includes four key elements: state-of-the-art projections of future supply and demand by river basin, an analysis of how the basin's existing water and power operations and infrastructure will perform in the face of changing water realities, the development of strategies to meet current and future water demands, and a trade-off analysis of strategies identified. (https://www.usbr.gov/watersmart/bsp/).	$200,000, given project can be completed within two years	50% (non-federal)
WaterSMART Cooperative Watershed Management Program	Reclamation	Grants: Planning and Implementation	Provides funding to watershed groups to encourage diverse stakeholders to form local solutions to address water management needs. Funding is provided for watershed group development, restoration planning, and management project design (Phase I), and provides cost-shared financial assistance to watershed groups to implement watershed management projects (Phase II). (https://www.usbr.gov/watersmart/cwmp/).	Planning: $50,000 Implementation: $100,000	Planning: None required Implementation: 50% (non-federal)
WaterSMART Water and Energy Efficiency Grants	Reclamation	Grants: Implementation	Provides cost-shared funding for projects that save water, increase energy efficiency and the use of renewable energy in water management, support environmental benefits (i.e., make conserved water available instream or otherwise address endangered species issues), and mitigate conflict risk in areas at a high risk of future water conflict, and accomplish other benefits that contribute to water supply sustainability in the western United States. Projects are selected through a competitive process, with the focus on projects that can be completed within 24 months that will help sustainable water supplies in the western United States. (https://www.usbr.gov/watersmart/weeg/index.html).	Up to $500,000 for smaller, on-the-ground projects and up to $2M for larger, phased on-the-ground projects that may take up to 3 years to complete	50% (non-federal)

Table 7-2. Federal and State Grant and Loan Funding Opportunities

Program	Agency	Type	Description	Funding Ceiling	Minimum Cost-Share Requirement
Water Infrastructure Finance and Innovation Act (WIFIA)	EPA	Loans	The WIFIA program accelerates investment in the nation's water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects. EPA estimates that current budget authority may provide more than $1B in credit assistance and may finance more than $2B in water infrastructure investment. (https://www.epa.gov/wifia).	Up to 49% of eligible project costs Minimum project size: $20 million for large communities (population greater than 25,000) $5 million for small communities (population of 25,000 or less)	Not applicable to loans
Water Pollution Control Grants Program (Section 106 of Clean Water Act)	EPA	Grants	Section 106 grant guidance covers the core water pollution control activities: water quality standards, water quality monitoring, impaired waters listing and total maximum daily loads development, NPDES permitting, enforcement and compliance, and assumed programs for dredge and fill permitting and enforcement. Total allotment for the 2021 fiscal year was $28 M. (https://www.epa.gov/water-pollution-control-section-106-grants/learn-about-water-pollution-control-section-106-grant).		States, territories, and agencies must contribute at least their maintenance of effort spent on pollution control programs in 1971
Water and Environmental Programs (WEP)	USDA	Through Rural Utilities Service Water and Environmental Programs (WEP), rural communities obtain the technical assistance and financing necessary to develop drinking water and waste disposal systems. WEP provides funding for the construction of water and waste facilities in rural communities with populations of 10,000 or less. WEP also provides funding to organizations that provide technical assistance and training to rural communities in relation to their water and waste activities. (https://www.rd.usda.gov/programs-services/all-programs/water-environmental-programs).			
		Grants	Emergency community water assistance grants	Water transmission line grants: Up to $150,000 Water source grants: Up to $1M	Partnerships encouraged
		Grants/Loans	Water and waste disposal loan and grant program	No maximum funding limit	Partnerships encouraged
		Grants	Solid waste management grants	No maximum funding limit	Partnerships encouraged
		Grants: Planning	Water and waste disposal predevelopment planning grants	$30,000 or 75% of predevelopment costs	25% (non-federal)
Water Infrastructure Improvements for the Nation Act (WINN Act) Grant Programs	EPA	The 2016 WIIN Act addresses, supports, and improves America's drinking water infrastructure. The three drinking water grants that promote public health and the protection of the environment are described below. (https://www.epa.gov/dwcapacity/water-infrastructure-improvements-nation-act-wiin-act-grant-programs).			
		Grants	Assistance for Small and Disadvantaged Communities ($42.8M total in 2019).	No maximum funding limit	45% (non-federal)
		Grants	Reduction in Lead Exposure Via Drinking Water. National Priority Area 1 addresses the reduction of lead exposure in the nation's drinking water systems through infrastructure and treatment improvements. National Priority Area 2 addresses reducing children's exposure to lead in drinking water in schools and childcare facilities.	National Priority Area 1: $17M National Priority Area 2: $7.6M	20% (non-federal), unless DWSRF affordability criteria is met, then 10%
		Grants	Lead Testing in School and Child Care Program Drinking Water ($26M total in 2020).	No maximum funding limit	Not required
State					
Proposition 1	SWRCB	The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) authorizes $7.545B in general obligation bonds to fund ecosystems and watershed protection and restoration, water supply infrastructure projects (including surface water and groundwater storage), and drinking water protection. The SWRCB is administering funds for five programs, described below. (https://www.waterboards.ca.gov/water_issues/programs/grants_loans/proposition1/)			
		Grants: Planning and Construction	Drinking Water (total funding: $260M)	Planning: $500,000 Construction: $5M	Variable, depending on inclusion of DACs and/or economically distressed areas (EDA)
		Grants: Planning and Implementation	Groundwater Sustainability (total funding: $800M)	Planning: $100,000 to $2M Implementation: $500,000 to $50M	Variable, depending on inclusion of DACs and/or EDAs. Non-DAC/EDA projects require a 50% match.
		Grants: Planning and Construction	Small Community Wastewater (total funding: $260M)	Planning: $500,000 Construction: $6M	Variable, depending on inclusion of DACs and/or EDAs
		Grants: Planning and Implementation	Prop 1 authorized $7.545Bin general obligation bonds for water projects, including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection. The State Water Board will administer Prop 1 funds for five programs. Of the $7.545B, Prop 1 provides $200M in grant funds for multi-benefit storm water management projects, which may include but not be limited to green infrastructure, rainwater and storm water capture projects, and storm water treatment facilities. Storm water resource plans or functionally equivalent plan(s) are required to obtain grant funds for storm water and dry weather capture projects. (https://www.waterboards.ca.gov/water_issues/programs/grants_loans/swgp/prop1/)	Planning: $50,000 to $500,000 Implementation: $250,000 to $10 million	50% (local)
		Loans	Water Recycling (total funding: $625M): Round 2 awards already committed.	TBD	Not applicable to loans

Table 7-2. Federal and State Grant and Loan Funding Opportunities

Program	Agency	Type	Description	Funding Ceiling	Minimum Cost-Share Requirement
	CWC	Grants: Implementation	Water Storage Investment Program: Funding for storage projects. State funds can only be spent on the public benefits.	$2.7B ~$64M remaining in April 2021	50% (local)
	CNRA	Grants: Planning and Implementation	CVP Improvement Act Grant Program (total funding: $475M; 2016/17 budget: $89.15M)	No maximum funding limit	
Integrated Regional Water Management (IRWM) Grant Program	DWR	Grants: Planning and Implementation	Provides funding for projects that help meet the long-term water needs of the state, including assisting water infrastructure systems adapt to climate change; providing incentives throughout each watershed to collaborate in managing the region's water resources and setting regional priorities for water infrastructure; and improving regional water self-reliance, while reducing reliance on Sacramento-San Joaquin Delta. (https://water.ca.gov/Work-With-Us/Grants-And-Loans/IRWM-Grant-Programs/Proposition-1).	No maximum funding limit Planning: $4.2M total Implementation: $403M total DAC involvement: $51M total	50% (local)
CalConserve Water Use Efficiency Loan Program	DWR	Loans	Sustainable funding source for water use efficiency projects that establishes a loan program to local agencies for specific types of water conservation and water use efficiency projects and programs to achieve urban water use targets, specifically water use efficiency upgrades and fixing expensive and difficult-to-repair customer leaks. Projects include but are not limited to dish/clothes washer upgrades; water-saving plumbing fixtures; hot-water recirculating pumps; leak detection and repair; landscape irrigation upgrades; and commercial, institutional, and industrial water efficiency. Estimated $7M remaining in July 2020. (https://www.grants.ca.gov/grants/calconserve-water-use-efficiency-loan-program/).	No maximum funding limit	Variable, depending on inclusion of DACs and/or EDAs. Non-DAC/EDA projects require a 50% match.
Proposition 68 – SB 5	SWRCB/DWR	Grants	California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018 (June 2018). Relevant categories: safe drinking water, wastewater recycling, water conservation, water measurement, stormwater, watershed improvements, and groundwater.		
Self-Generated Incentive Program (SGIP)	California PUC	Rebates	Offers rebates for installing energy storage technology at both residential and non-residential facilities. These technologies include battery storage systems that can function in the event of a power outage. Funding includes prioritization of communities living in high-fire-threat areas, communities that have experienced two or more utility Public Safety Power Shut-off (PSPS) events, as well as low-income and medically vulnerable customers. The funds are also available for "critical facilities" that support community resilience in the event of a PSPS or wildfire. Any non-residential customer of Pacific Gas and Electric Company, Southern California Edison, Southern California Gas Company, or San Diego Gas & Electric is eligible for a General Market SGIP rebate of approximately $350/kilowatt-hour, which means the rebate covers approximately 35% of the cost of an average energy storage system. There are two additional categories of higher SGIP rebates for non-residential customers: Equity and Equity Resiliency. (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/self-generation-incentive-program/participating-in-self-generation-incentive-program-sgip - see brochure for non-residential customers).	$350/kWh rebate	None required
Sustainable Groundwater Planning (SGWP) Grant Program	DWR	Grants: Planning and Implementation	Provides a minimum of $103M in Prop 68 funds for competitive grants, in two rounds of grant solicitations, to fund implementation projects that address drought and groundwater challenges to achieve regional sustainability for investments in groundwater recharge projects with surface water, stormwater, recycled water, and other conjunctive use projects; prevent or clean up contamination of groundwater that serves as a source of drinking water; support water supply reliability, water conservation, and water use efficiency; and support water banking, exchange, and reclamation. (https://water.ca.gov/Work-With-Us/Grants-And-Loans/Sustainable-Groundwater)	$5Mper basin	Variable, depending on inclusion of DACs and/or EDAs. Non-DAC/EDA projects require a 25% match.
Water Desalination Grant Program	DWR	DWR provides grants to local agencies for planning, design, and construction of desalination facilities (including pilot, demonstration, and research projects) for both brackish and ocean water. DWR has conducted three funding rounds since 2005 using Prop 50 funds. The rules and procedures for funding vary depending on funding source/availability and DWR priorities at the time of funding. A fourth funding round is planned and will use primarily Prop 1 funds (total funding of $100M for desalination projects). The five relevant project categories follow below. (https://water.ca.gov/Work-With-Us/Grants-And-Loans/desalination-Grant-Program)			
		Grants: Construction	Construction projects	$10M	50%
		Grants: Construction	Pilot and demonstration projects	$1.5M	50%
		Grants: Planning	Feasibility studies	$750,000	50%
		Grants: Planning	Environmental documentation	$500,000	50%
		Grants: Research	Research projects	$1M	50%
Clean Water State Revolving Fund (SRF)	SWRCB	Loans	Offers low-interest (below-market) financing for a wide variety of water quality projects, such as construction of wastewater treatment and water recycling facilities, implementation of non-point source and storm drainage pollution control solutions, and development and implementation of estuary plans to protect and promote the health, safety, and welfare of all Californians. Repayment periods are usually the lesser of 30 years or the expected useful life of the financed asset. (http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/)	No maximum funding limit	Not applicable to loans
Drinking Water SRF	SWRCB	Loans	Provides low-interest loans, additional subsidy (principal forgiveness), and technical assistance to public water systems for infrastructure improvements to correct system deficiencies and improve drinking water quality for the health, safety, and welfare of all Californians. (http://www.waterboards.ca.gov/drinking_water/services/funding/SRF.shtml)	No maximum funding limit	Not applicable to loans

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Section 8

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Appendix A: NVDCP Task Force and Stakeholder Meeting Documentation

Appendix includes:

- DCP Task Force Meeting Documentation
- Napa Valley Watershed Information and Conservation Council Meeting Documentation
- Documentation from meeting given to the Napa Valley Groundwater Sustainability Plan Advisory Committee

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DCP Task Force Meeting Documentation

Brown AND Caldwell

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Project Kickoff Meeting Agenda

Wednesday, September 11, 2019 • 1:00 pm - 3:00 pm

Location: Napa City Hall, Committee Room, 955 School Street, Napa, CA 94559.

Agenda

Part 1 – Napa Drought Contingency Plan (DCP) Overview

- Welcome & Introductions
- Overview of DCP insights and benefits
- Review Napa Valley Drought Contingency Plan Tasks and Proposed Approach
- Identify Desired Outcomes (Discussion)

Part 2 – Activities Completed to Date and Next Steps

- Water resources schematics (Discussion)
- Date request approach
- Other Potential funding opportunities
- Next steps

Task Force Meeting #1 Attendee List

Wednesday, September 11, 2019 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- Patrick Costello
- Phil Brun

Napa County

- Steven Lederer
- Leigh Sharp

City of Calistoga

- Derek Rayner
- Hamid Heidary

City of St. Helena

- Clayton Church

City of American Canyon

- Felix Hernandez

Town of Yountville

- Debbie Hight
- Joe Tagliaboschi

Napa Sanitation District

- Tim Healy
- Andrew Damron

USBR

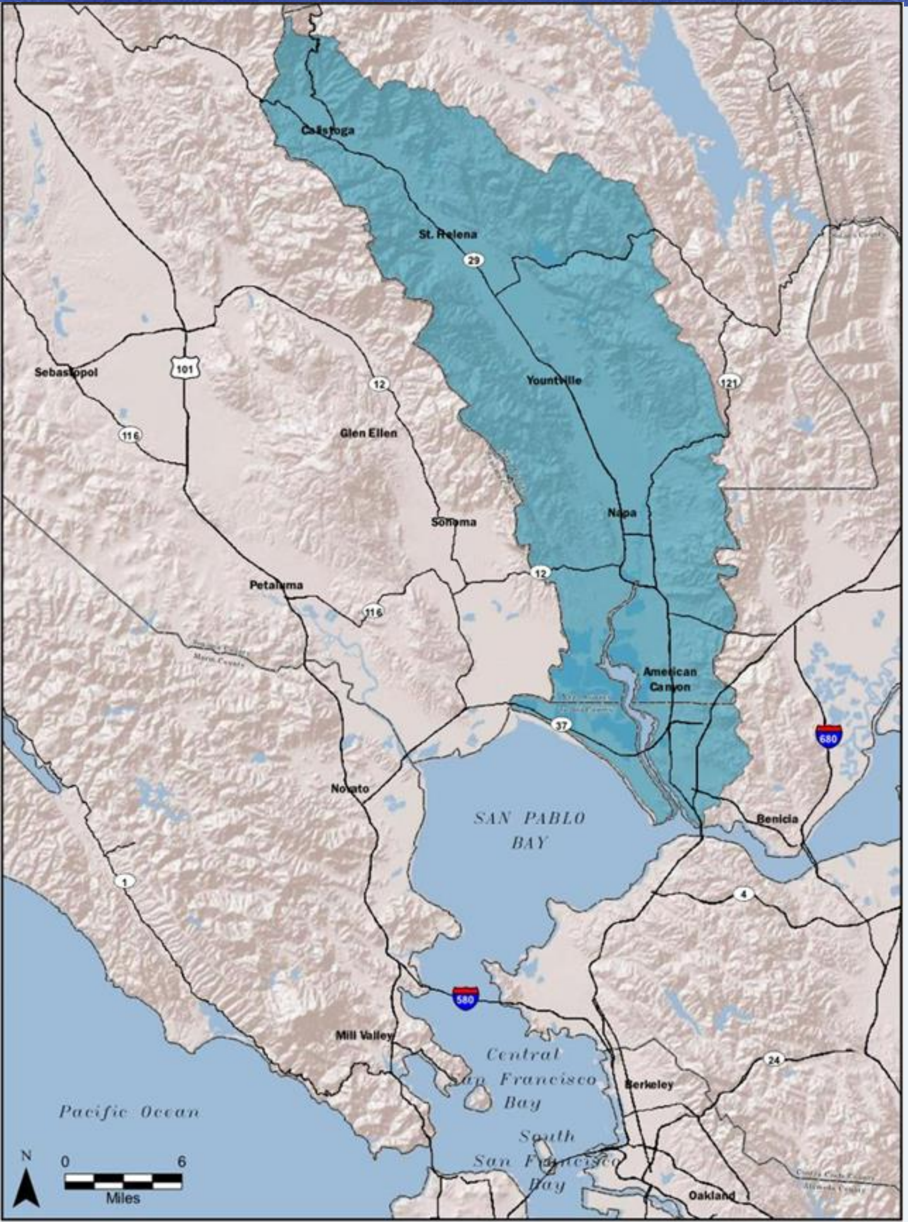
- Vanessa Emerzian

DCP Team

- Rene Guillen
- Ginger Bryant
- Mike Savage
- Mark Millan

Napa Valley Water
Management Agencies

U.S. Bureau of Reclamation



Napa Valley Drought Contingency Plan

Kickoff Meeting

September 11, 2019

Meeting Topics

Part 1 – Napa Drought Contingency Plan (DCP) Overview

- Welcome & Introductions
- Overview of DCP insights and benefits
- Review Napa Valley Drought Contingency Plan Tasks and Proposed Approach
- Identify Desired Outcomes (Discussion)

Part 2 – Activities Completed to Date and Next Steps

- Water resources schematics (Discussion)
- Data request approach
- Other Potential funding opportunities
- Next Steps

Napa Valley Water
Management Agencies

U.S. Bureau of Reclamation

What is a Drought Contingency Plan?

Drought Response Program

- Proactive approach for non-Federal partners to prepare for and respond to drought.
- Funding for Drought Planning and for Drought Resiliency Projects
- Drought Contingency Planning
  - Addresses:
    - How will we recognize the next drought in the early stages?
    - How will drought affect us?
    - How can we protect ourselves from the next drought?
- Drought Resiliency Projects
  - Drought Resiliency is defined as the capacity of a community to cope with and respond to drought.
  - Reclamation provides grant assistance for drought resiliency projects to prepare for and respond to drought.
  - These projects are referred to as "mitigation actions" in a DCP.

What is a Drought Contingency Plan?

- Collaborative planning approach to building long-term resiliency to drought
- Requires stakeholders process to plan development
- Stakeholder issues include agricultural, municipal, and environmental to and develop broad support for mitigation and response actions
- Must include consideration of climate change impacts to water supplies to support long term resiliency
- Mitigation and Response actions are projects that could compete for implementation funding under WaterSMART

The Six Required Elements of a DCP

Element	Purpose
Drought Monitoring	• Establish a **process for monitoring** water availability, and a **framework** for predicting the probability of future droughts or confirming an existing drought. • The collection, analysis, and dissemination of data to **define stages of drought**, mitigation and response actions.
Vulnerability Assessment	• Evaluate and assess the **risks and impacts of drought** and the contributing factors that could impact critical resources in the Plan area. • This supports development of potential mitigation and response actions.
Mitigation Actions	• Identify, evaluate and prioritize actions and activities that will build **long-term** water supply resiliency and mitigate risks
Response Actions	• Identify, evaluate and prioritize actions and activities that can be implemented in a drought and triggered during different stages of drought to provide **quick benefits**
Operational and Administrative Framework	• **Determine local responsibility** for undertaking the actions necessary to implement the DCP.
Plan Update Process	• Develop a process and schedule for monitoring, evaluating and updating the Plan.

Why do a Drought Contingency Plan?

- Provides informed coordinated local responses to drought for resiliency
- Under the 2018 State Water Conservation and Drought Planning Legislation new drought planning requirements are anticipated
- Cooperative regional/watershed programs – and projects identified as part of their planning activities – are more likely to be funded
- Potential funding for drought mitigation projects, including:
  - Stormwater capture and treatment
  - Recycled water
  - Groundwater banking and management
  - Facility re-operation programs
  - Surface storage and stream flow management and habitat restoration
- Provides a basis for other local water resource studies or actions

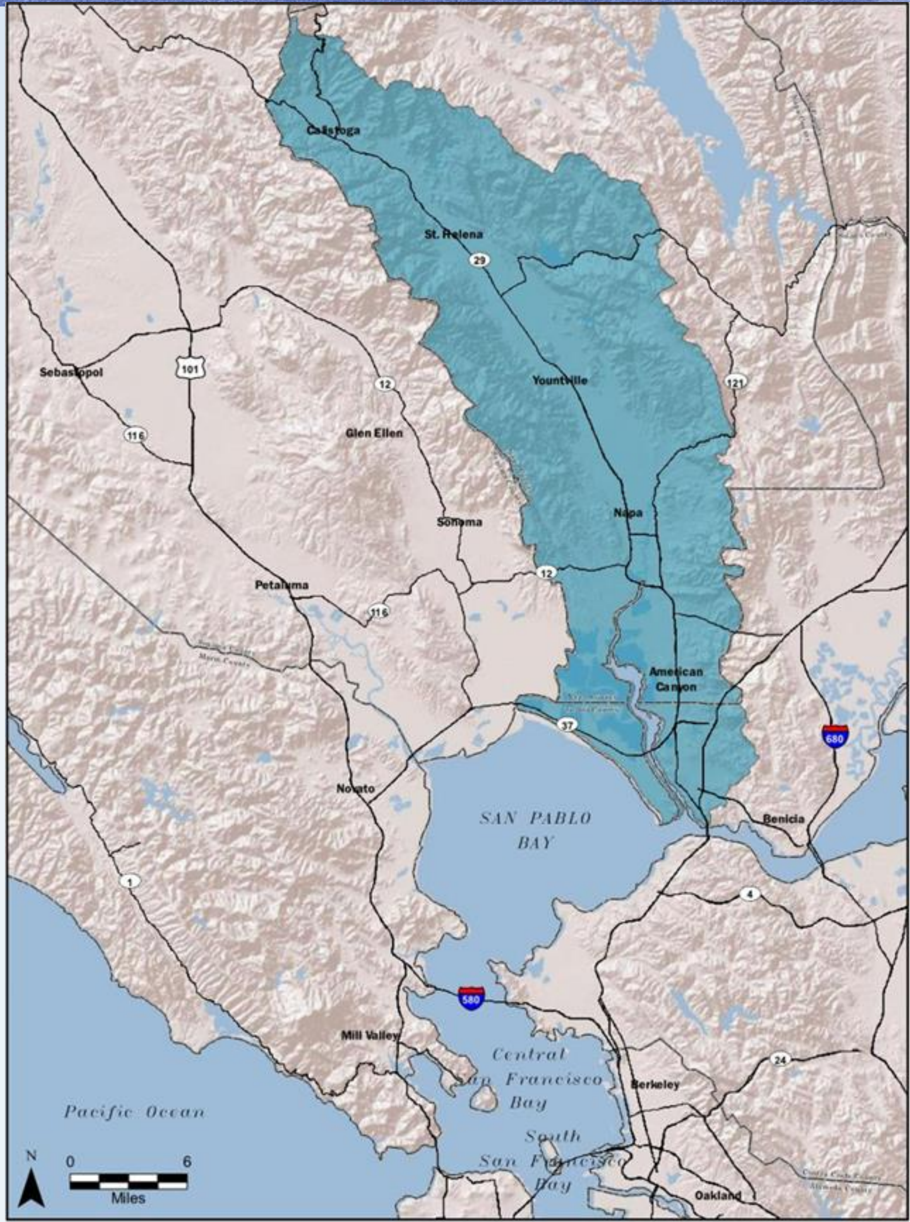
Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

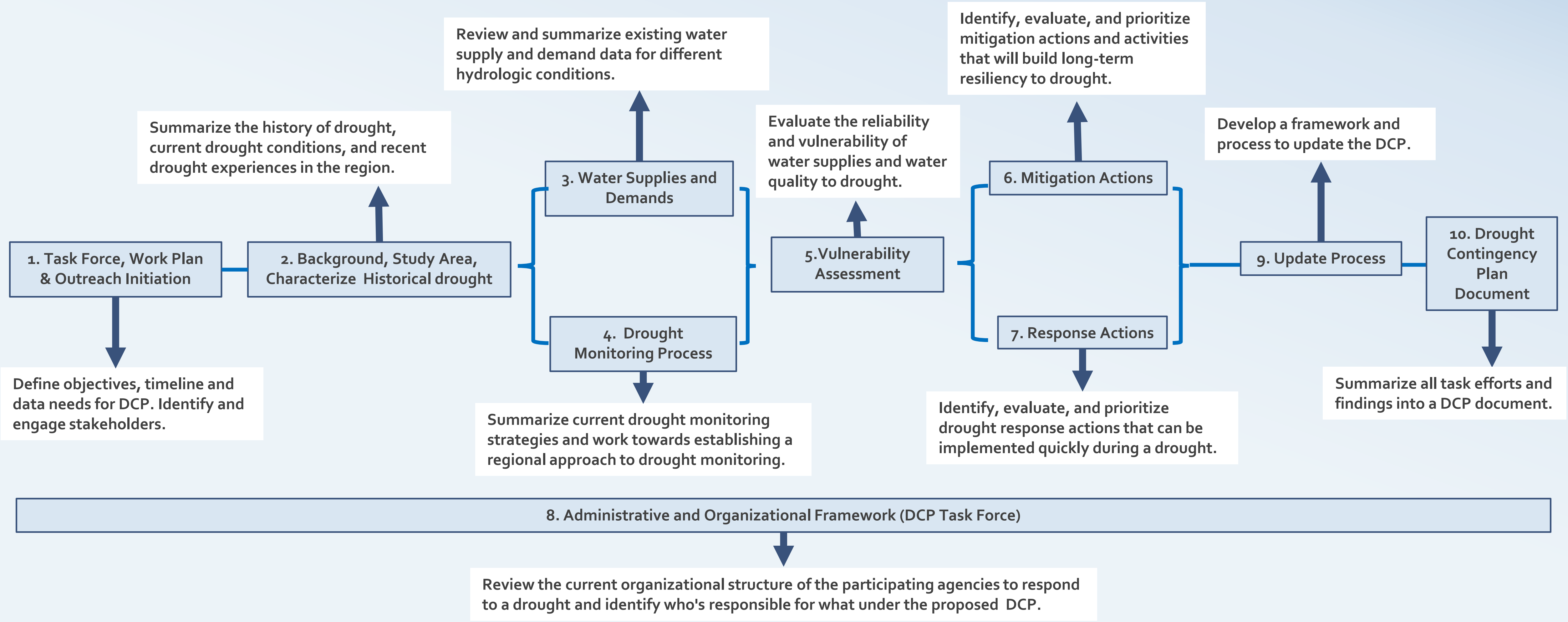
Napa Valley Drought Contingency Plan: Tasks and Proposed Approach

Study Area

- Napa River watershed that drains into the northern edge of San Pablo Bay and includes an area of 430 square miles.
- Study area is composed of urban and residential areas, extensive vineyards and agriculture, and diverse environmental habitat.
- Water users in the area rely on a mixture of water supplies that include local surface water, imported surface water, groundwater, and recycled water.



Napa Valley DCP Tasks



A Project Team comprised of Agency, Reclamation, and Consultant Staff Working Together

Partner Agencies

- City of Napa
- City of American Canyon
- Town of Yountville
- City of St. Helena
- City of Calistoga
- Napa County
- Napa Sanitation District

DCP Consultant Team

- Brown and Caldwell
  - Rene Guillen
  - Melanie Holton
- Bryant & Associates
  - Ginger Bryant
- Data Instincts
  - Mark Millan
  - Mike Savage

Bureau of Reclamation

- Vanessa Emerzian

Communication and Outreach Plan

- Identify interest groups (stakeholders) that have a stake in drought contingency planning, and to understand their interests (environmental, civic, agricultural, etc.)
  - Suggested list is included in the next slide
- Workshops for engagement and interaction
- Inform and gain input into the DCP process
  - Suggest interface with Watershed Information & Conservation Council

DCP Task Force and Potential Stakeholders

DCP Task Force

- City of Napa
- City of American Canyon
- Town of Yountville
- City of St. Helena
- City of Calistoga
- Napa County
- Napa Sanitation District

Potential Stakeholders

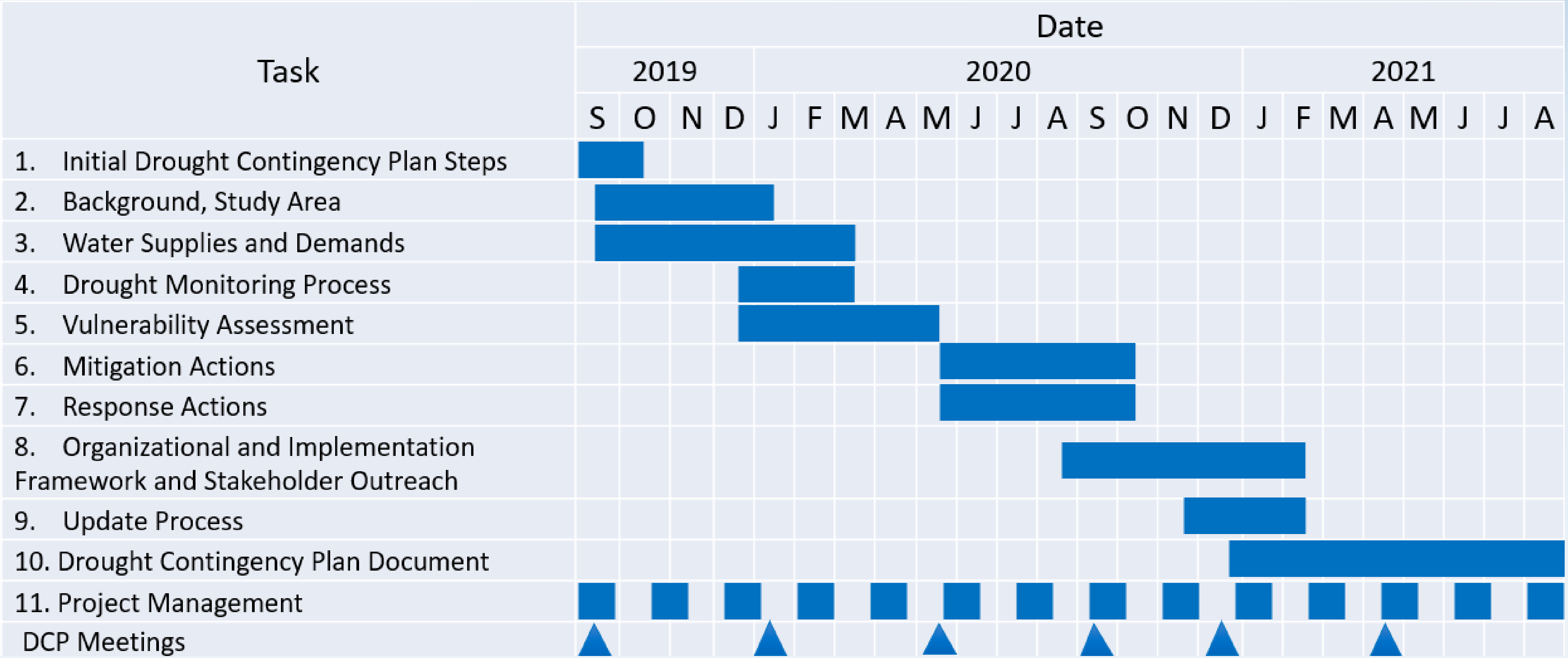
- Watershed Information & Conservation Council
- Visit Napa Valley
- Napa County Farm Bureau
- Carneros Wine Alliance
- Napa Valley Grape Growers Association
- Napa Valley Vintners
- Napa County Resource Conservation Districts
- Wine Growers of Napa County
- Environmental Education Coalition of Napa County
- Friends of the Napa River
- Napa County Parks and Open Space District

Communication & Outreach Plan

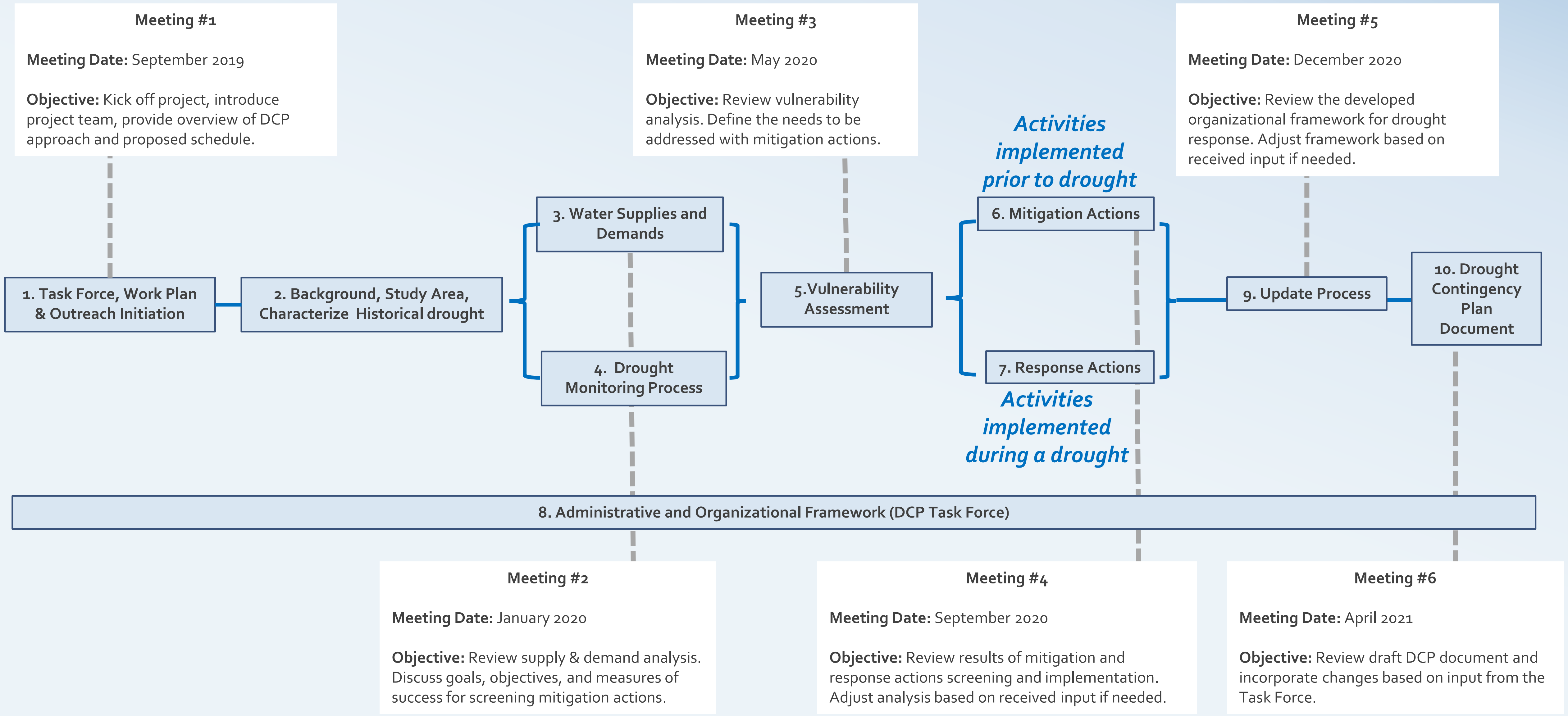
Outreach activities:

- Web pages dedicated to DCP on county or city website
  - Content would include: Project-related information, studies, reports, maps, and contact information
- Stakeholder Outreach Meetings

Proposed Project Schedule



Workflow



Meeting #1
Meeting Date: September 2019
Objective: Kick off project, introduce project team, provide overview of DCP approach and proposed schedule.
Meeting #3
Meeting Date: May 2020
Objective: Review vulnerability analysis. Define the needs to be addressed with mitigation actions.
Activities implemented prior to drought
Meeting #5
Meeting Date: December 2020
Objective: Review the developed organizational framework for drought response. Adjust framework based on received input if needed.
1. Task Force, Work Plan & Outreach Initiation
2. Background, Study Area, Characterize Historical drought
3. Water Supplies and Demands
4. Drought Monitoring Process
5.Vulnerability Assessment
6. Mitigation Actions
7. Response Actions
Activities implemented during a drought
9. Update Process
10. Drought Contingency Plan Document
8. Administrative and Organizational Framework (DCP Task Force)
Meeting #2
Meeting Date: January 2020
Objective: Review supply & demand analysis. Discuss goals, objectives, and measures of success for screening mitigation actions.
Meeting #4
Meeting Date: September 2020
Objective: Review results of mitigation and response actions screening and implementation. Adjust analysis based on received input if needed.
Meeting #6
Meeting Date: April 2021
Objective: Review draft DCP document and incorporate changes based on input from the Task Force.

Napa Valley DCP Responsibilities

- Each agency provides in-kind technical support
  - Provide technical reports and information
  - Provide staff member(s) to the team
  - Meet with DCP team to provide input and direction regarding their area
  - Attend DCP meetings
  - Review technical products and report
- City of Napa
  - Agreement with Reclamation
  - Administer the Consultant contract
  - Manage agency invoicing
- DCP Consulting Team
  - Conduct the technical analysis
  - Facilitate DCP meetings

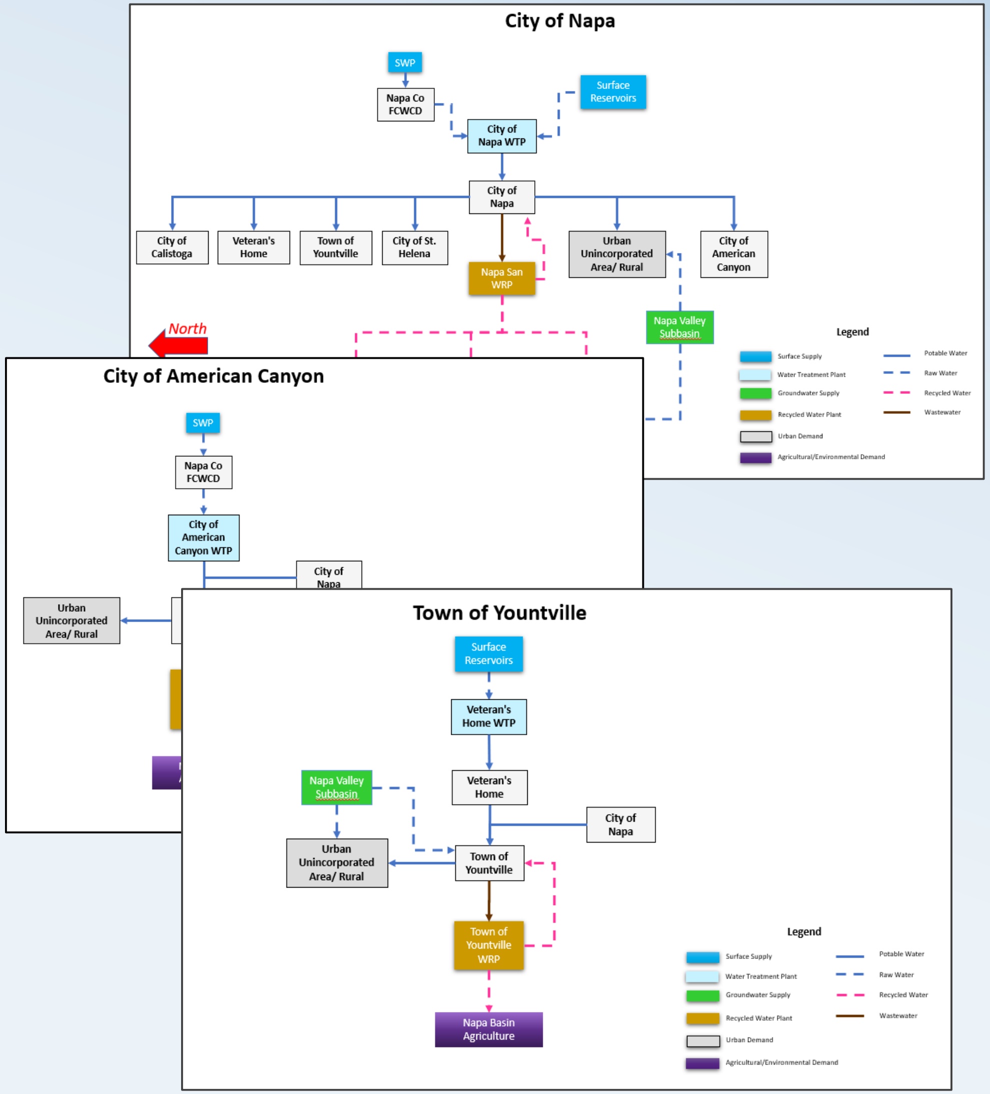
Desired Outcomes (Discussion)

- As mentioned previously, there are certain requirements each DCP must cover:
  - Must establish a **Drought Monitoring** Process
  - Complete a **Vulnerability Assessment** for critical water resources in the study area
  - Identify **Mitigation and Response Actions** for drought response and improved long term resiliency
  - Establish an **Operational and Administrative Framework** to implement the DCP
  - Create a process and schedule to periodically **update the DCP**
- **Discussion – Given these requirements, what would you like to see accomplished?**
  - What would you like to see accomplished with your DCP?
  - What are your critical success factors?
  - Regions objectives?

Activities Completed to Date and Next Steps

Understanding the Water Resource Systems

- Each of the water supply agencies has shared water supplies or linkages
- Understanding the linkages is critical to addressing drought responses
- Following Schematics:
  - Address individual purveyors first
  - Then address the linkages between the purveyors
- Follow-up is likely needed
  - Address issues identified by DCP Task Force
  - Add missing information



Supply and Demand Data Request Tables

- Each agency will receive an Excel Workbook requesting data that will form the basis of our analysis. The tabs are as follows:

  1) Instructions

  2) Demands and Population

  3) Water Shortage Contingency Plans
     - Conditions/Trigger & Actions to be taken for each Stage
     - Information for each agency where available

  4) Vulnerability Assessment
     - Data from 2015 UWMPs
     - One Sheet per agency
     - Projected Water Supplies for Normal, Single Dry, and Multiple Dry year conditions

Other Potential Funding Opportunities

- Drought Resiliency Grants
  - Grant funding available for drought resiliency projects in 2020 and 2021
  - Up to $300K and $750K available per agreement, depending on project timeline
  - For projects in 2020, applications are due on October 16, 2019. For projects in 2021, applications are due in October 14, 2020
- 2020 Basin Study Application
  - Would need to prepare a letter of interest
  - Could potentially lead to more funding for the region

Next Steps

- Designate point of contact/responsible staff for each agency
- Input from agencies:
  - On tables and schematics shared today
  - One set of aggregated/resolved comments per agency
  - Interest in other funding opportunities
  - Response requested by October 9th

Contact Information

- City of Napa
  - Patrick Costello
  - Phone: (707) 257 – 9309
  - Email: PCostello@CityofNapa.org
- Brown and Caldwell
  - Rene Guillen
  - Phone: (925) 210 – 2464
  - Email: RGuillen@BrwnCald.com

Task Force Meeting #2 Agenda

Wednesday, January 22, 2020 • 2:00 pm - 4:00 pm

Location: Napa City Hall, Committee Room, 955 School Street, Napa, CA 94559.

Agenda

- **Review the supply and demand analysis.**
- **Discuss goals, objectives, and measures for screening mitigation actions.**
- **Introduce the Administrative and Organizational Framework for the DCP.**
- **Proved an update on Stakeholder Engagement.**
- **Discuss Next Steps.**

Task Force Meeting #2 Attendee List

Wednesday, January 22, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- **Patrick Costello**
- **Phil Brun**
- **Joy Eldredge**

Napa County

- **Steven Lederer**
- **Phil Miller**

City of Calistoga

- **Derek Rayner**
- **Hamid Heidary**

City of St. Helena

- **Clayton Church**

City of American Canyon

- **Felix Hernandez**

Town of Yountville

- **John Ferons**
- **Joe Tagliaboschi**

Napa Sanitation District

- **Tim Healy**
- **Andrew Damron**

USBR

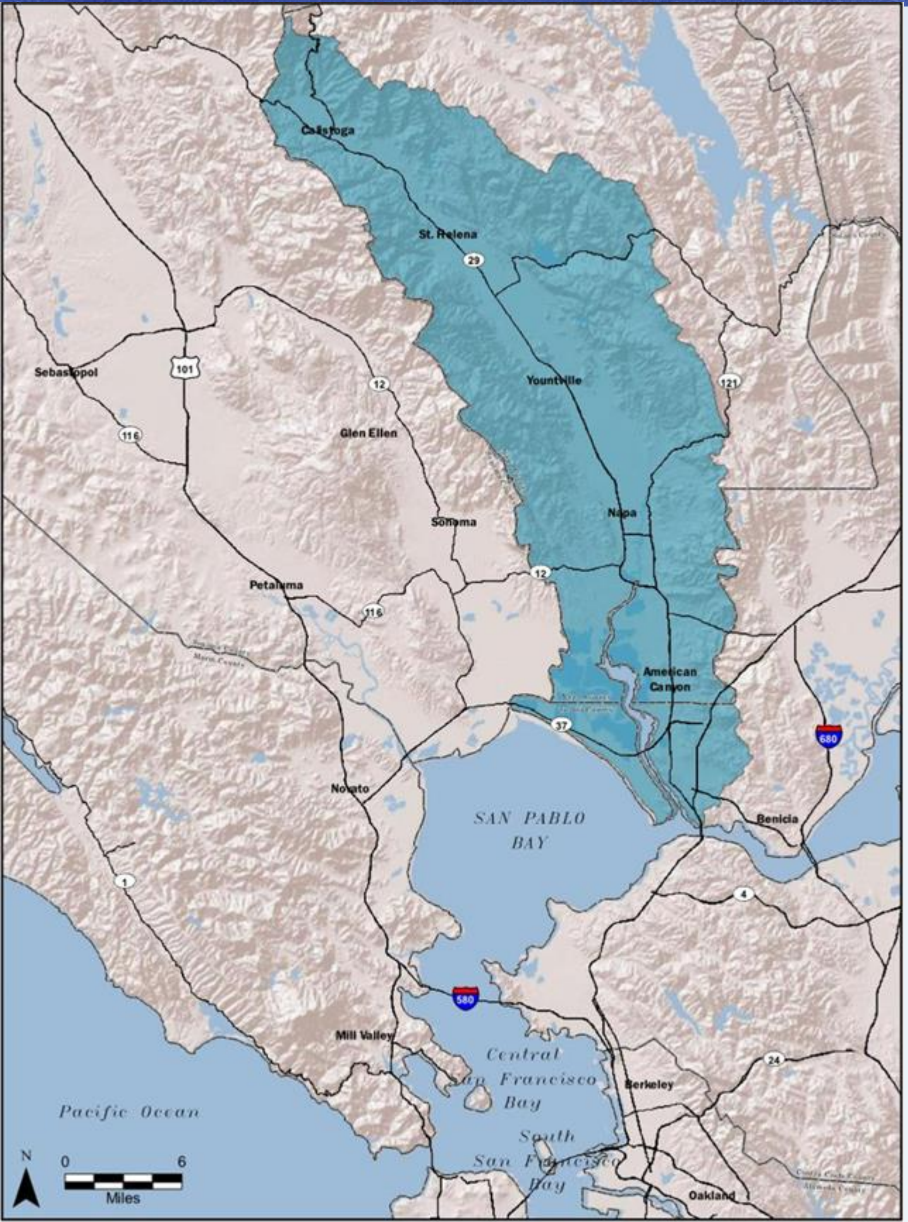
- **Vanessa Emerzian**

DCP Team

- **Rene Guillen**
- **Ginger Bryant**
- **Mike Savage**
- **Mark Millan**

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation



Napa Valley
Drought Contingency Plan

Task Force Meeting #2

January 22, 2020

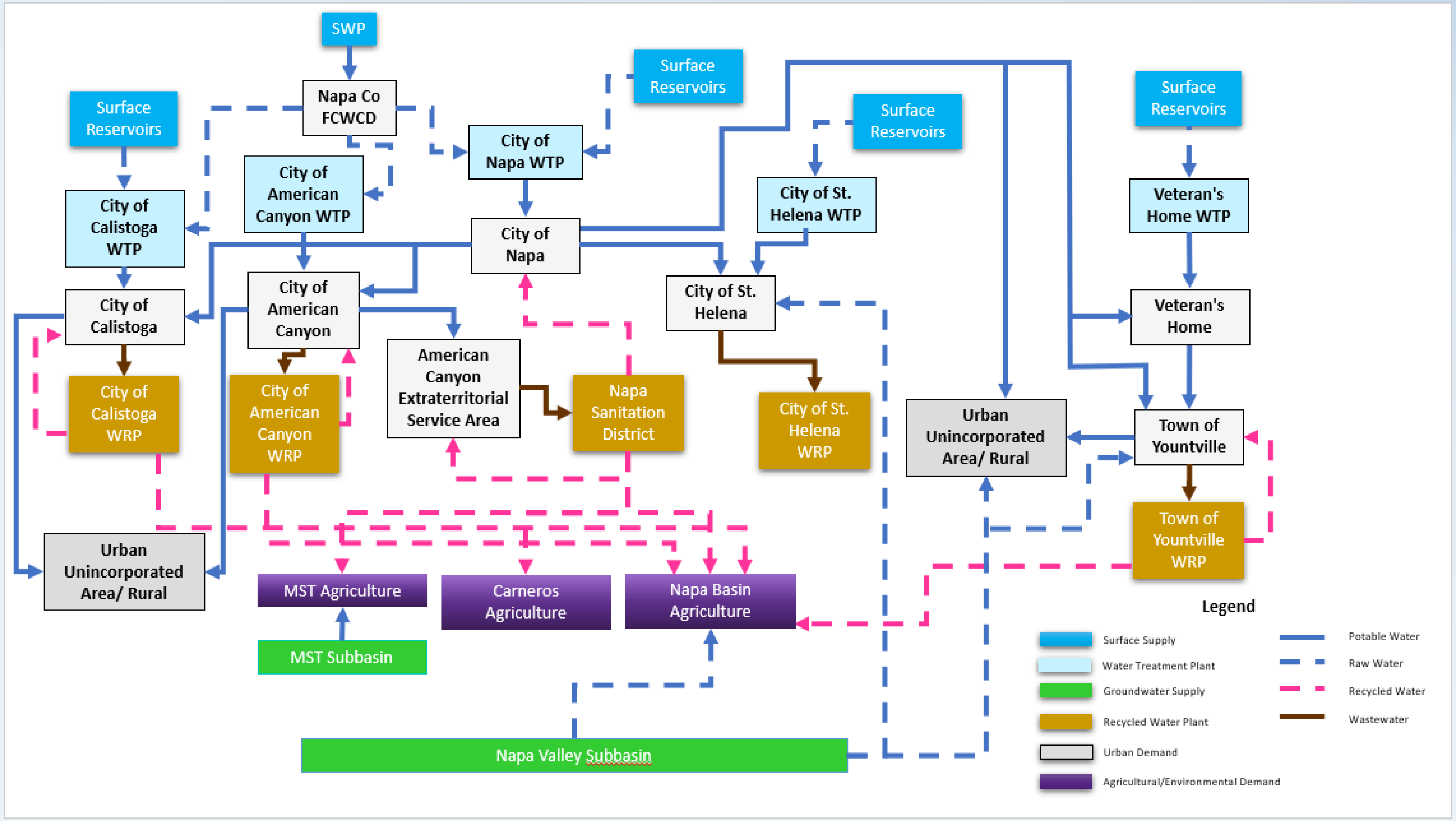
Meeting Topics

- Supply and Demand Analysis
- Goals, Objectives, and Measures for Screening Mitigation Actions
- Introduction to the Administrative and Organizational Framework
- Stakeholder Engagement
- Next Steps

Supply & Demand Analysis

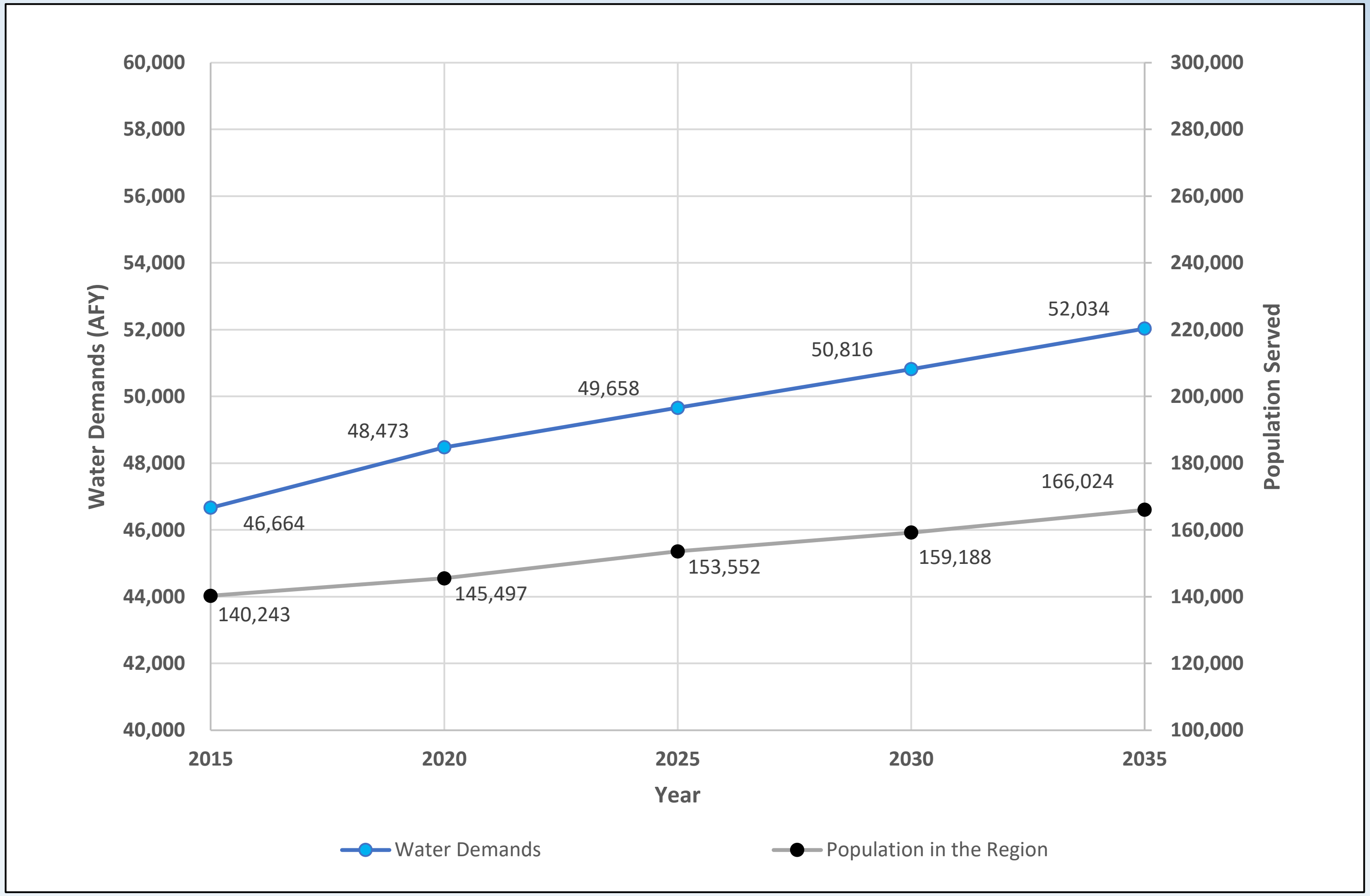
The Partner Agencies are Physically Linked

- Each of the water supply agencies has shared water supplies or linkages
- Understanding the linkages is critical to addressing drought responses



Water Demands

- Water demands are influenced by population trends and land uses
- The majority of the population in the Valley lives in the five incorporated municipalities (City of Napa, City of St. Helena, City of Calistoga, City of American Canyon, and Town of Yountville)
- **Most of the land area is used for agriculture**
  - Agriculture water demands rely largely on groundwater pumping
  - **Over the last 10 years groundwater pumping for agriculture has averaged about 15,000 AFY**
- Current projections indicate that **population will increase across all five incorporated municipalities and unincorporated areas** within the Valley



Source: 2015 UWMPs and input from Partner Agencies

Sources of Water Supply

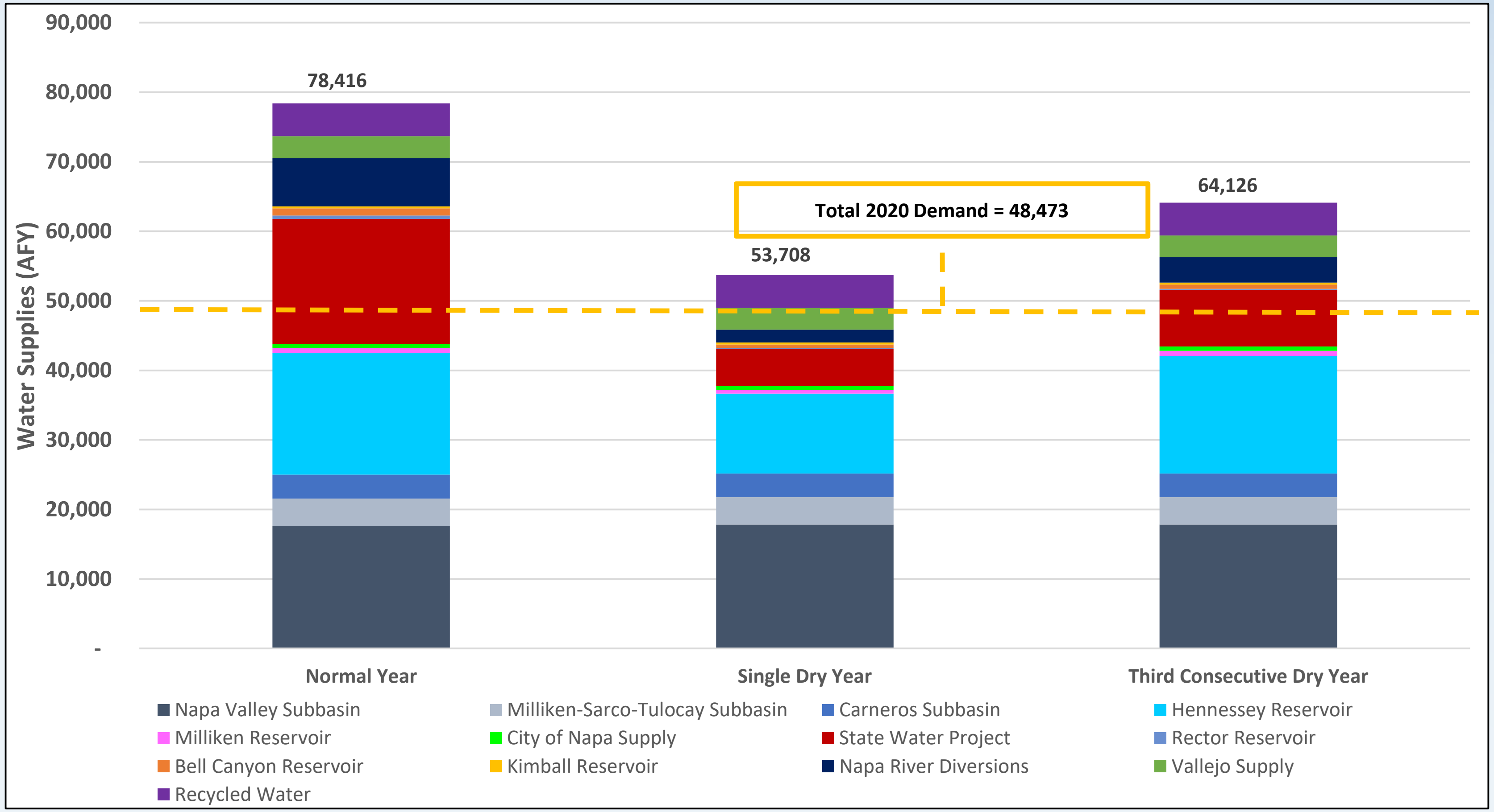
- **City of Napa –** Uses imported State Water Project water, local surface waters from Lake Hennessey and the Milliken Reservoir, as well as a growing contribution from recycled water
- **County of Napa –** Uses groundwater from the three subbasins in the Valley, diversions from the Napa River, and recycled water
- **City of St. Helena –** Uses imported surface water from the City of Napa, as well as local surface water from Bell Canyon, and groundwater
- **City of Calistoga –** Uses imported surface water from the State Water Project, local surface water from the Kimball Reservoir, and a relatively constant amount of recycled water
- **City of American Canyon –** Uses imported surface water from the State Water Project, City of Vallejo, and recycled water
- **Town of Yountville –** Uses surface water from the State Water Project and locally from the Rector Reservoir. Have a groundwater well they can utilize during an emergency or drought conditions

	City of Napa	County of Napa	City of St. Helena	City of Calistoga	City of American Canyon	Town of Yountville
Napa Valley Subbasin	0%	50%	18%	0%	0%	26%
Milliken-Sarco-Tulocay Subbasin	0%	12%	0%	0%	0%	0%
Carneros Subbasin	0%	10%	0%	0%	0%	0%
Hennessey Reservoir	54%	0%	0%	0%	0%	0%
Milliken Reservoir	2%	0%	0%	0%	0%	0%
City of Napa Supply	0%	0%	31%	0%	0%	0%
State Water Project	42%	0%		65%	45%	0%
Rector Reservoir	0%	0%	0%	0%	0%	43%
Bell Canyon Reservoir	0%	0%	51%	0%	0%	0%
Kimball Reservoir	0%	0%	0%	19%	0%	0%
Napa River Diversions	0%	21%	0%	0%	0%	0%
Vallejo Supply	0%	0%	0%	0%	42%	0%
Recycled Water	2%	7%	0%	16%	13%	30%

Percentages are based on projected 2020 water supply totals
Source: 2015 UWMPs and input from Partner Agencies

Supply and Demand Comparison – 2020 Future Condition

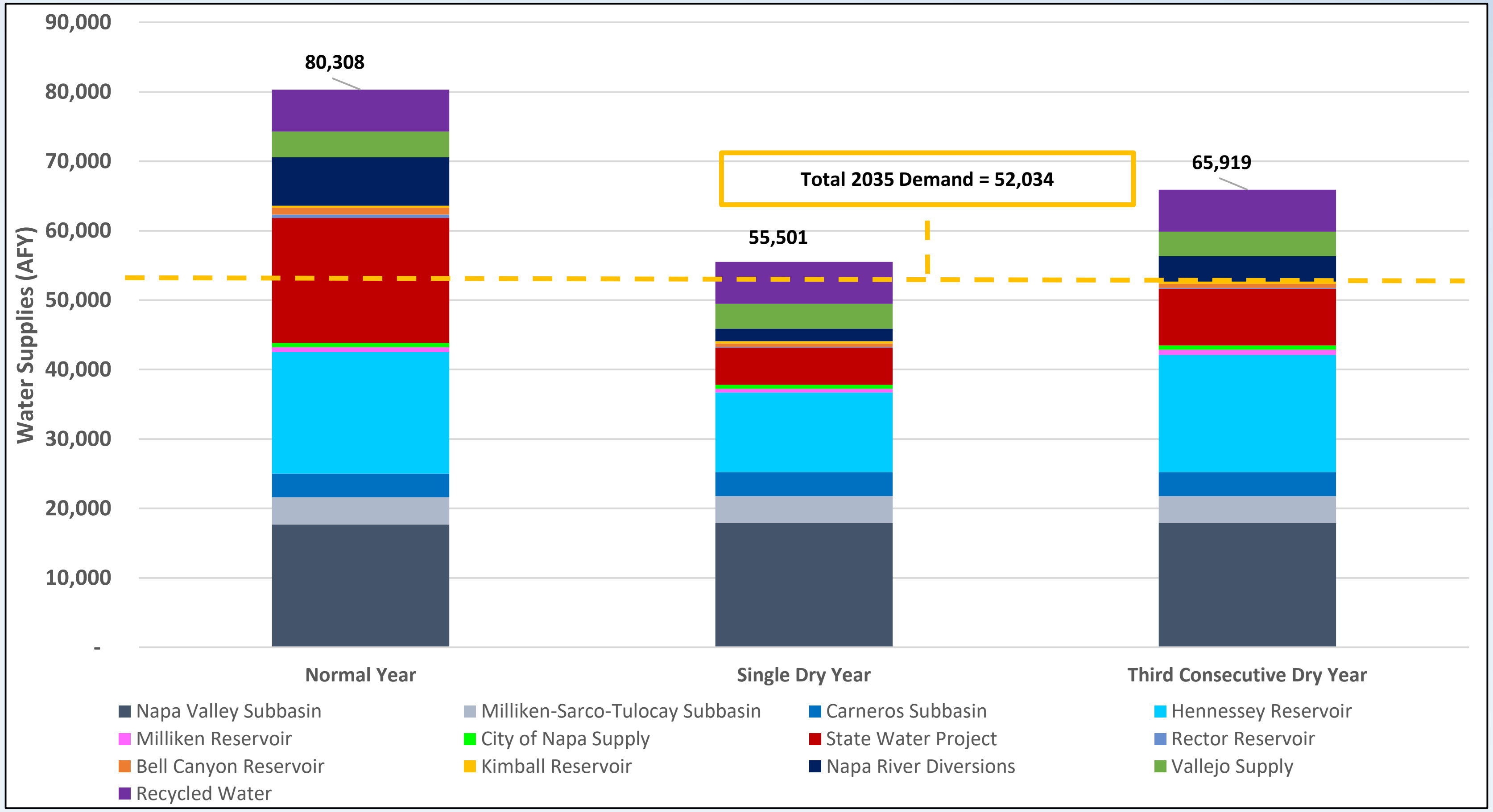
- **Total demand 48,473 AFY**, this includes municipal, agricultural, and unincorporated area water demands
- Groundwater pumping from the Napa Valley Subbasin, surface water from Hennessey Reservoir, and imported surface water from the State Water Project account for most of the water supply in the region
  - 65 to 68% of the total supply comes from these three sources
- **As a region, there is enough water supply** to meet the 2020 municipal, agricultural, and unincorporated area demands across all year types
- **However, as stand alone municipalities, the City of St. Helena, City of Calistoga, City of American Canyon, and Town of Yountville all face supply deficits during drought conditions**



Source: 2015 UWMPs and input from Partner Agencies

Supply and Demand Comparison – 2035 Future Condition

- **Total demand 52,034 AFY**, this includes municipal, agricultural, and unincorporated area water demands
- Groundwater pumping from the Napa Valley Subbasin, surface water from Hennessey Reservoir, and imported surface water from the State Water Project account for most of the water supply in the region
  - 63 to 67% of the total supply comes from these three sources
- **As a region, there is enough water supply** to meet the 2035 municipal, agricultural, and unincorporated area demands across all year types
- **However, as stand alone municipalities, the City of St. Helena, City of Calistoga, City of American Canyon, and Town of Yountville all face supply deficits during drought conditions**



Source: 2015 UWMPs and input from Partner Agencies

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

Goals, Objectives, & Measures for Screening Mitigation Actions

Develop Objectives for Evaluating Mitigation Actions

- Simply use "cost" as the evaluation criteria? (e.g.,2050 Plan)
  - We want to maximize net benefits, not just minimize costs
- Why look at other objectives?
  - Gain stakeholder acceptance and increase "implementability" of proposed projects
  - Need to recognize and address externalities and impacts on others
  - Often there are social goals (e.g., maintain agricultural culture)
  - Satisfy the objectives of funding programs from the State or Federal government
  - Incorporate separate goals and objectives of the study partners
- Why develop objectives early in the study?
  - Formulate projects that have a high degree of economic, social, and institutional benefits
  - Formulate projects that have a greater chance of funding support

Reclamation Guidance

- Reclamation programs such as Title XVI and Basin Studies have specific goals and objectives identified in the FOAs (Funding Opportunity Announcement)
- Guidance is limited for the DCP program
  - Projects that are eligible for funding should address at least one of the following goals:
    - Increasing the reliability of water supplies
    - Improving water management
    - Providing benefits for fish and wildlife and the environment
  - Give water managers flexibility in times of low water supply.
  - Improvements to increase flexibility in times of drought
- Be cognizant of funding agency evaluation criteria for project funding

BUREAU OF
RECLAMATION

DCP Evaluation Criterion B – Need for the Project (30 points)

"This criterion will evaluate the extent to which the proposal demonstrates a compelling need to implement the project during an existing drought, based on the following:

- The current drought situation (e.g., using the Drought Monitor or similar sources)
- The period of time that the area has been experiencing drought conditions
- The magnitude of the impacts if the proposed project is not funded (e.g., economic, social, public health, etc…)
- How many people are being impacted by the risk(s)
- How the project will address the existing drought risks

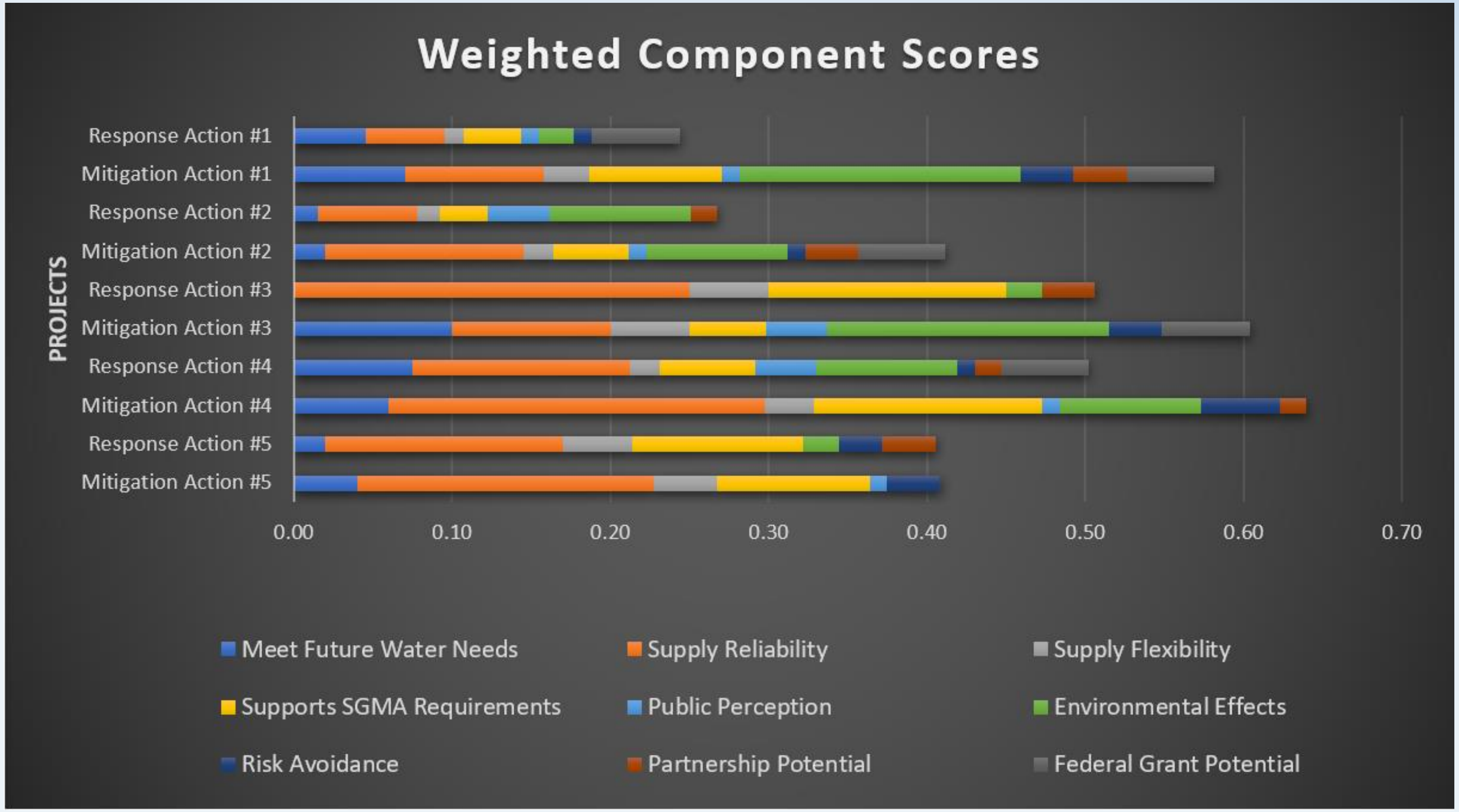
• Identify mitigation goals and priorities; i.e., decreasing consumptive use, developing supply augmentation, prevention of economic loss"

Agencies Expressed Desired Outcomes at the Kickoff Meeting

- Projects and actions that deliver real results
- Recommendations that are implementation driven
- Review and make recommendations on how to better utilize/manage existing facilities and supply
- Look at expanding applications for Napa San winter water and potential for potable reuse
- Develop a common platform for understanding surface supply water and groundwater interface, how this relates to state water project, and use this information for both DCP and regional educational purposes
- Keep in mind the DCP's ability to support Napa and American Canyon's WSCP updates

Example – How Objectives will be Used

- Example objectives (across the bottom) are used to prioritize potential mitigation and response actions

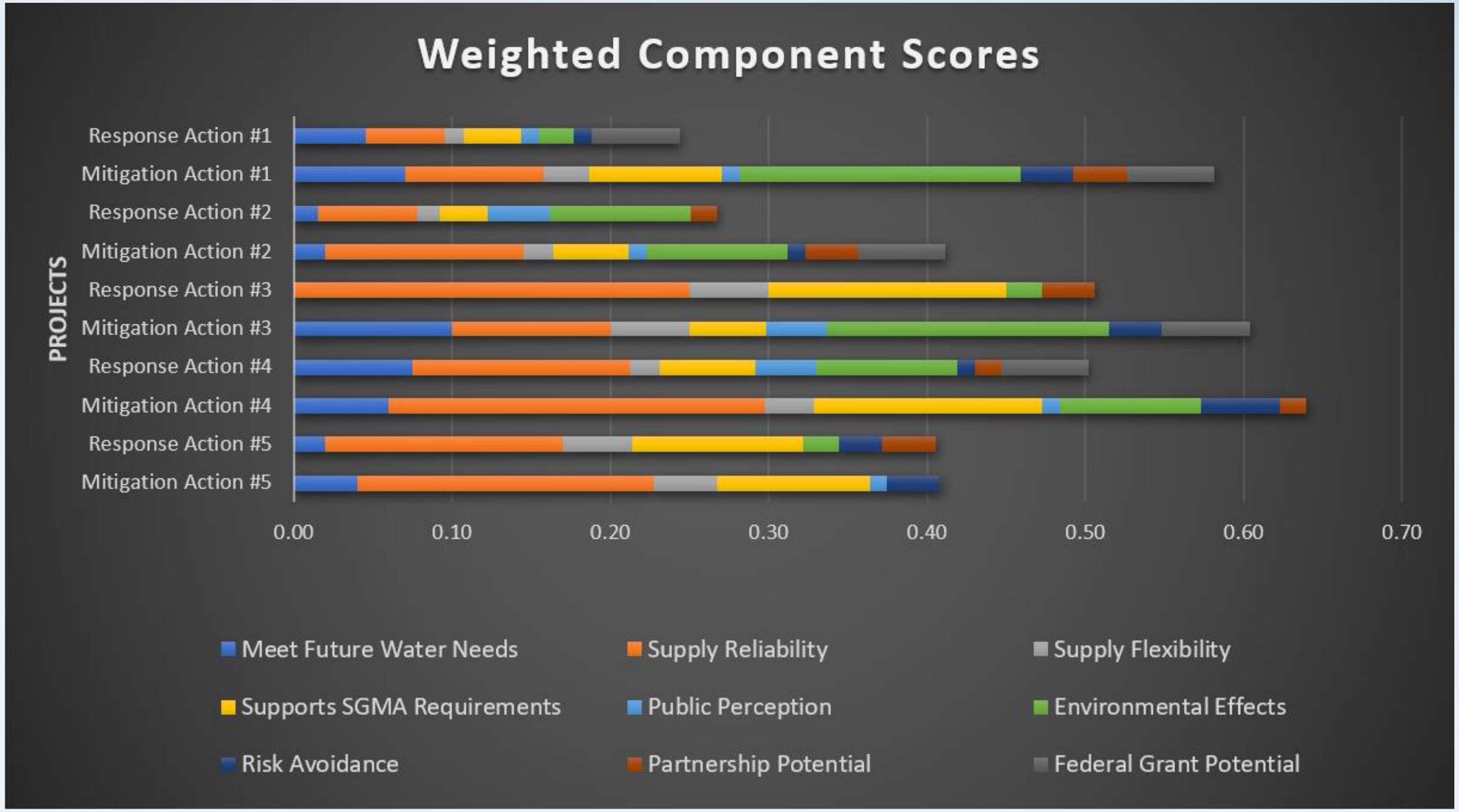


Objectives for Discussion

- Potential Objectives:
  - Cost (present worth analysis over X years and Y interest rate)
  - Meet future water needs (could be additional supply or conservation)
  - Increased supply reliability during drought
  - Increased flexibility
  - Support SGMA requirements in the basin
  - Better utilize/manage existing facilities and supply
- **Discussion**
  - **What is important to your agency?**
  - **What is important to the region?**

How Objectives will be Used

- Objectives will be used to score/evaluate potential mitigation/response actions
- Process shows how a project performs against objectives



Administrative and Organizational Framework

Administrative and Organizational Framework

Purpose

Identify who is responsible for implementing elements of the DCP

Approaches include

- Tables with roles and responsibilities for DCP partner agencies
- Flowcharts establishing information and decision protocols
- For entire Plan or broken down for each section of the DCP

Local Agency Considerations

Who owns the Administrative Framework?

- Tasked with implementing Mitigation Measures, Response Actions, updating the DCP and communicating with the public
- Do you want efficiencies of a single management entity?
- Do you want to partner on drought mitigation projects, actions and manage water beyond established service areas?
- Financial assistance, ability to secure and manage project grants and or/financing

LAFCO Water and Waste Water Municipal Services Review: DRAFT REPORT Due January 2020

Give consideration to findings from LAFCO Municipal Services Review

- Infrastructure needs or deficiencies;
- Growth and population projections for the affected area;
- Financing constraints and opportunities;
- Cost avoidance opportunities;
- Opportunities for rate restructuring;
- Opportunities for shared facilities;
- Governance options, including consolidation or reorganization of service providers;
- Evaluation of management efficiencies; and
- Local accountability and governance.

Source: Policy Consulting Associates Update Oct 7, 2019

LAFCO Water and Waste Water Municipal Services Review DRAFT REPORT Due January 2020

Possible Governance Structure Options

- Transition of the Resort Improvement Districts to CSD or WD
- Reorganization of Napa Sanitation District and Los Carneros Water District
- Consolidation of Spanish Flat and Circle Oaks Water Districts
- Countywide Water Agency or County Water District
- Regional Sanitation District or Joint Powers Agreement
- Dissolution of Congress Valley Water District/continued service by Napa
- Reorganization of Napa Sanitation District with City of Napa
- Clarification of American Canyon service area
- Clarification of LAFCO Sphere of Influence (SOI) Policy re: City-owned property
- Napa River Reclamation District reorganization
- Annexations of outside service areas: Spanish Flat and others

Source: Policy Consulting Associates Update Oct 7, 2019

State of California Policy Considerations

Water Resilience Portfolio Principles

- Prioritize multi-benefit approaches that meet multiple needs at once
- Utilize natural infrastructure such as forests and floodplains
- Embrace innovation and new technologies
- Encourage regional approaches among water users sharing watersheds
- Incorporate successful approaches from other parts of the world
- Integrate investments, policies and programs across state government
- Strengthen partnerships with local, federal and tribal governments, water agencies and irrigation districts, and other stakeholders

Source: Governor's Executive Order April 2019

State of California Policy Considerations

Water Resilience Portfolio – Initial Inventory and Assessment

Inventory and assess current water supplies and the health of waterways. Also assess projected future water needs, anticipated climate-driven impacts on water systems, including more severe droughts and floods, and other challenges.

State of California Policy Considerations

Initial Inventory and Assessment (continued)

Specifically, the following will be inventoried and assessed:

- Existing demand for water on a statewide and regional basis and available water supply to address this demand
- Existing water quality of our aquifers, rivers, lakes and beaches
- Projected water needs in coming decades for communities, economy and environment
- Anticipated impacts of climate change to our water systems, including growing drought and flood risks, and other challenges to water supply reliability
- Work underway to complete voluntary agreements for the Sacramento and San Joaquin river systems regarding flows and habitat
- Current planning to modernize conveyance through the Bay-Delta with a new single tunnel project
- Expansion of the state's drinking water program to ensure all communities have access to clean, safe and affordable drinking water
- Existing water policies, programs, and investments within state government

Source: Water Resilience Portfolio Initiative – http://waterresilience.ca.gov/

Administrative and Organization Framework

What’s next:

- Build a ‘crosswalk’ that will facilitate review of
  - LAFCO Report Recommendations
  - DCP Mitigation and Response Actions
- Assist in identification of Framework that best supports
  - Local agency priorities
  - Ability to implement and manage individual aspects and/or entire DCP
- Potential opportunities for partnering to secure State and Federal funding to implement projects identified under the DCP

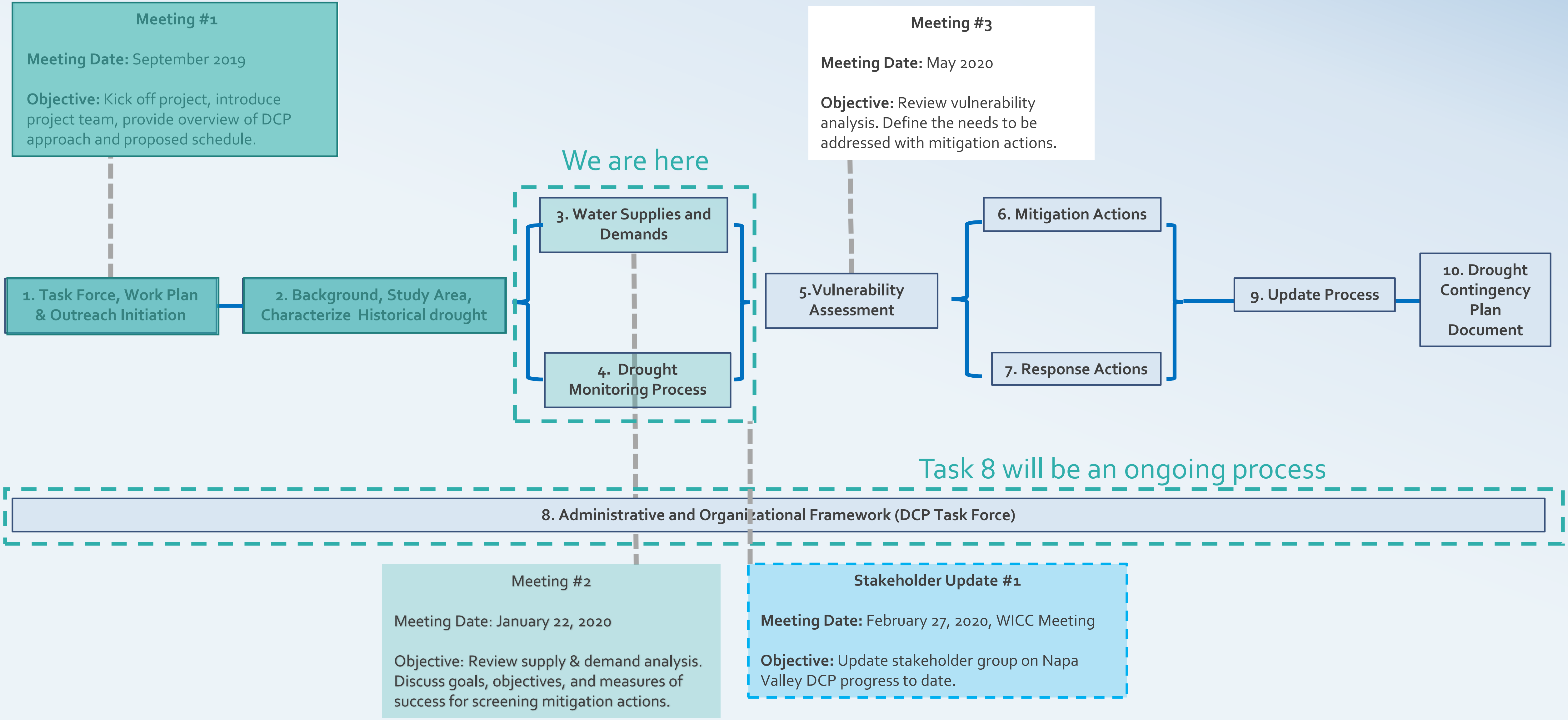
Stakeholder Engagement

Stakeholder Engagement Update

- Napa Valley DCP website
- Task Force will provide update on status of Napa Valley DCP at the February 27th WICC Meeting
- Process for receiving Stakeholder input is under development

Wrap up and Next Steps

Where are we?



Meeting #1
Meeting Date: September 2019
Objective: Kick off project, introduce project team, provide overview of DCP approach and proposed schedule.
We are here
Meeting #3
Meeting Date: May 2020
Objective: Review vulnerability analysis. Define the needs to be addressed with mitigation actions.
1. Task Force, Work Plan & Outreach Initiation
2. Background, Study Area, Characterize Historical drought
3. Water Supplies and Demands
4. Drought Monitoring Process
5.Vulnerability Assessment
6. Mitigation Actions
7. Response Actions
9. Update Process
10. Drought Contingency Plan Document
Task 8 will be an ongoing process
8. Administrative and Organizational Framework (DCP Task Force)
Meeting #2
Meeting Date: January 22, 2020
Objective: Review supply & demand analysis. Discuss goals, objectives, and measures of success for screening mitigation actions.
Stakeholder Update #1
Meeting Date: February 27, 2020, WICC Meeting
Objective: Update stakeholder group on Napa Valley DCP progress to date.

Next Steps

- Provide feedback on Water Supply and Demand analysis by February 7, 2020
- Confirm objectives for evaluating mitigation actions by February 7, 2020
- Conduct Vulnerability Analysis for water supplies in the region
- Provide stakeholder update at the February 27th WICC meeting
- Next Task Force meeting is tentatively scheduled for May 2020

Task Force Meeting #3a Agenda

Wednesday, June 10, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Review vulnerability assessment analysis.**
- **Discuss interface between the DCP and the Napa Valley Groundwater Sustainability Plan.**
- **Discuss DCP Project Implementation Grant Opportunity.**
- **Discuss Next Steps – Task Force Meeting 3b, on June 17, 2020 from 1:30 pm to 3:30 pm.**

Task Force Meeting #3a Attendee List

Wednesday, June 10, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- **Patrick Costello**
- **Phil Brun**
- **Joy Eldredge**

Napa County

- **Phil Miller**
- **Steven Lederer**

City of Calistoga

- **Derek Rayner**

City of St. Helena

- **N/A**

City of American Canyon

- **Felix Hernandez (briefly)**

Town of Yountville

- **John Ferons**
- **Joe Tagliboschi**

Napa Sanitation District

- **Andrew Damron**
- **Tim Healy**

USBR

- **Vanessa Emerzian**

DCP Team

- **Rene Guillen**
- **Ginger Bryant**
- **Mike Savage**
- **Mark Millan**

Napa Valley Water Management Agencies

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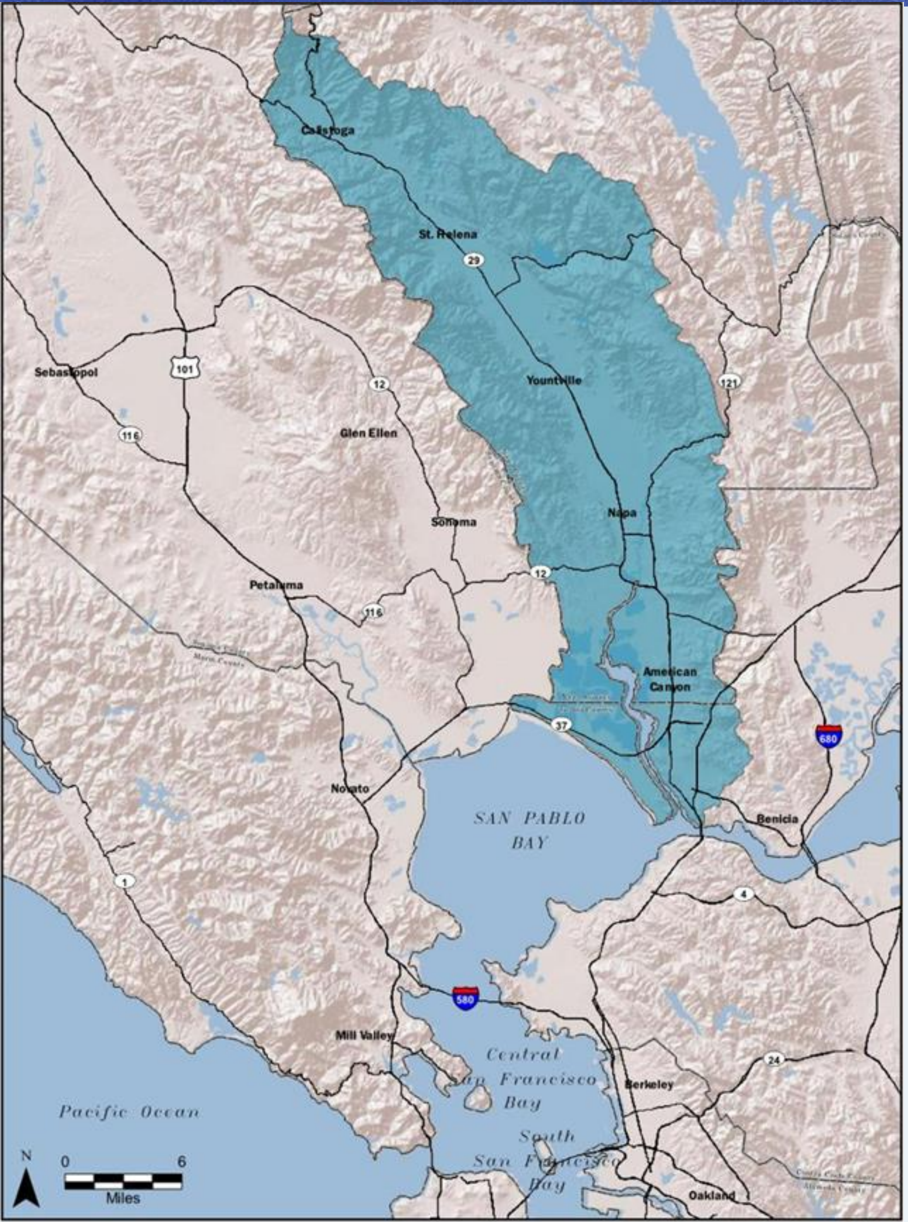


Napa Valley Drought Contingency Plan

Task Force Meeting #3a

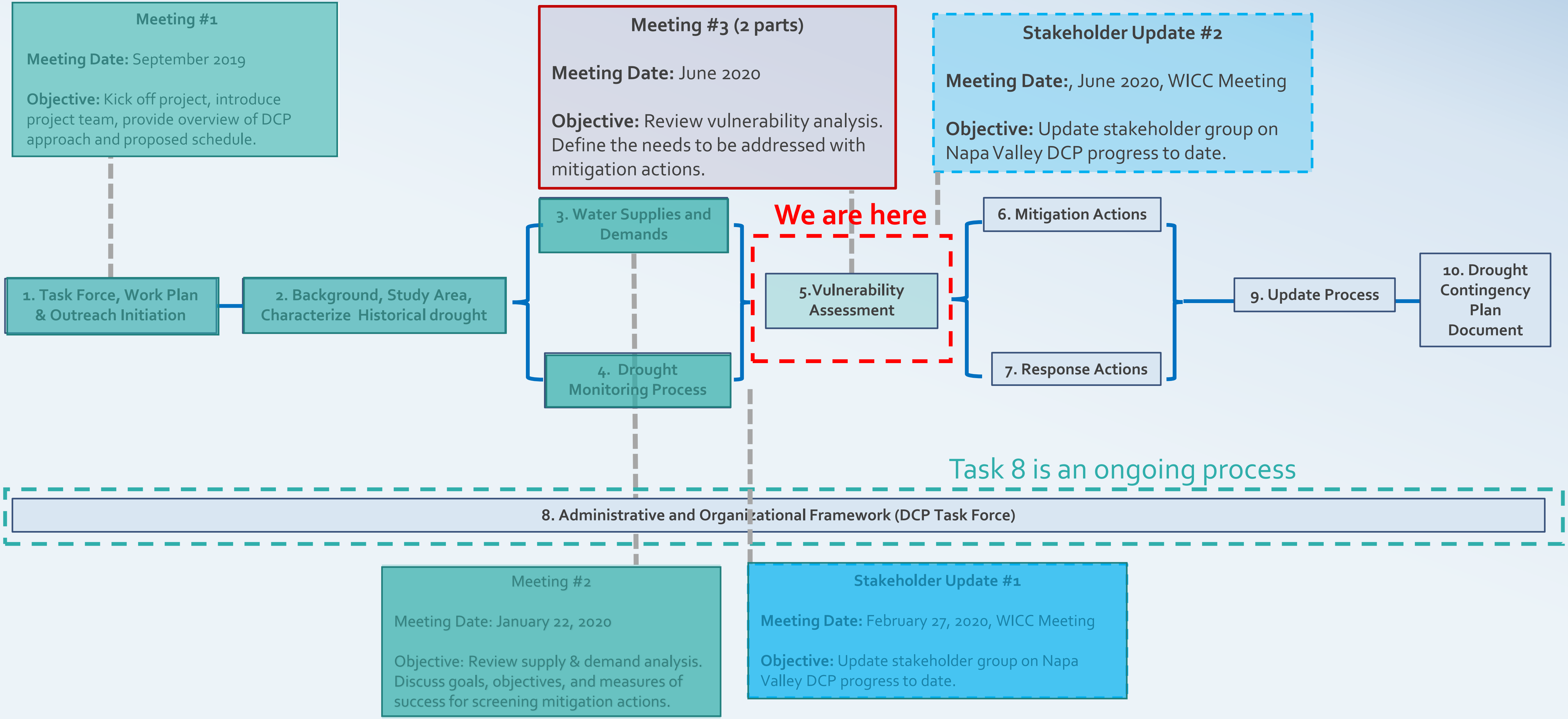
June 10, 2020 1:30-3:00

Meeting Agenda

Task Force Meeting 3a

- Vulnerability Assessment Analysis
  - Part 1: Introduction
  - Part 2: Climate Change Assessment
  - Part 3: Analysis Results
- Interface between the DCP and the Napa Valley Groundwater Sustainability Plan
- DCP Project Implementation Grant Opportunity
- Next Steps – Task Force Meeting 3b

Where Are We?


Meeting #1
Meeting Date: September 2019
Objective: Kick off project, introduce project team, provide overview of DCP approach and proposed schedule.
Meeting #3 (2 parts)
Meeting Date: June 2020
Objective: Review vulnerability analysis. Define the needs to be addressed with mitigation actions.
Stakeholder Update #2
Meeting Date:, June 2020, WICC Meeting
Objective: Update stakeholder group on Napa Valley DCP progress to date.
We are here
1. Task Force, Work Plan & Outreach Initiation
2. Background, Study Area, Characterize Historical drought
3. Water Supplies and Demands
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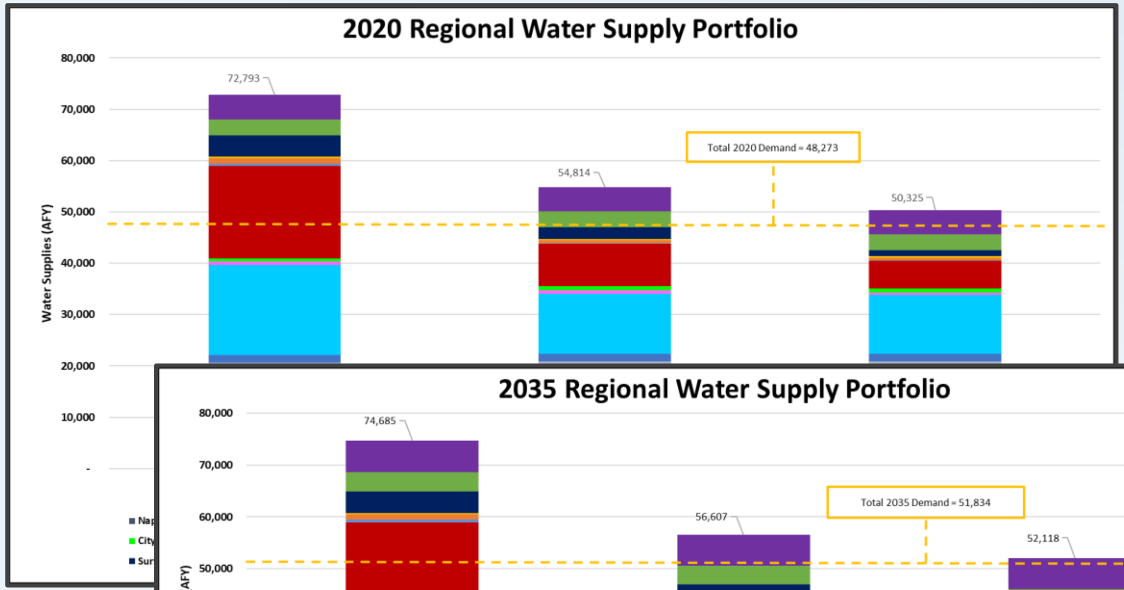
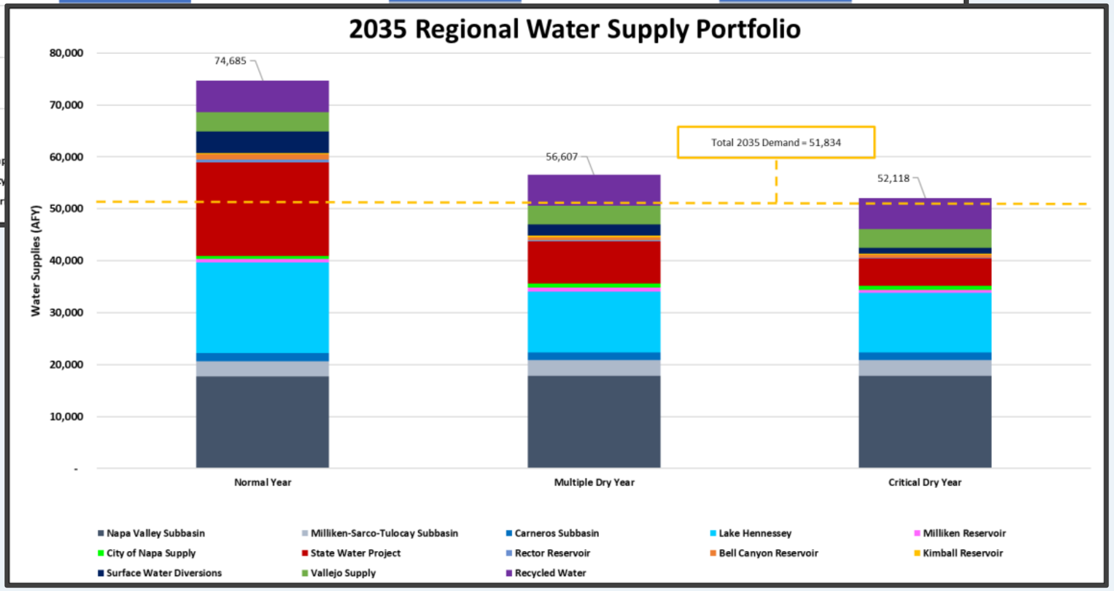
Vulnerability Assessment

Part 1: Introduction

Updated Water Supply and Demand Analysis





- Water supply and demand numbers have been finalized with your feedback
  - Identified a heavy reliance on limited number of supply sources
- **As a region, there is enough water supply across all year types**
  - ***However, some municipalities face supply deficits during drought conditions***

Vulnerability Assessment

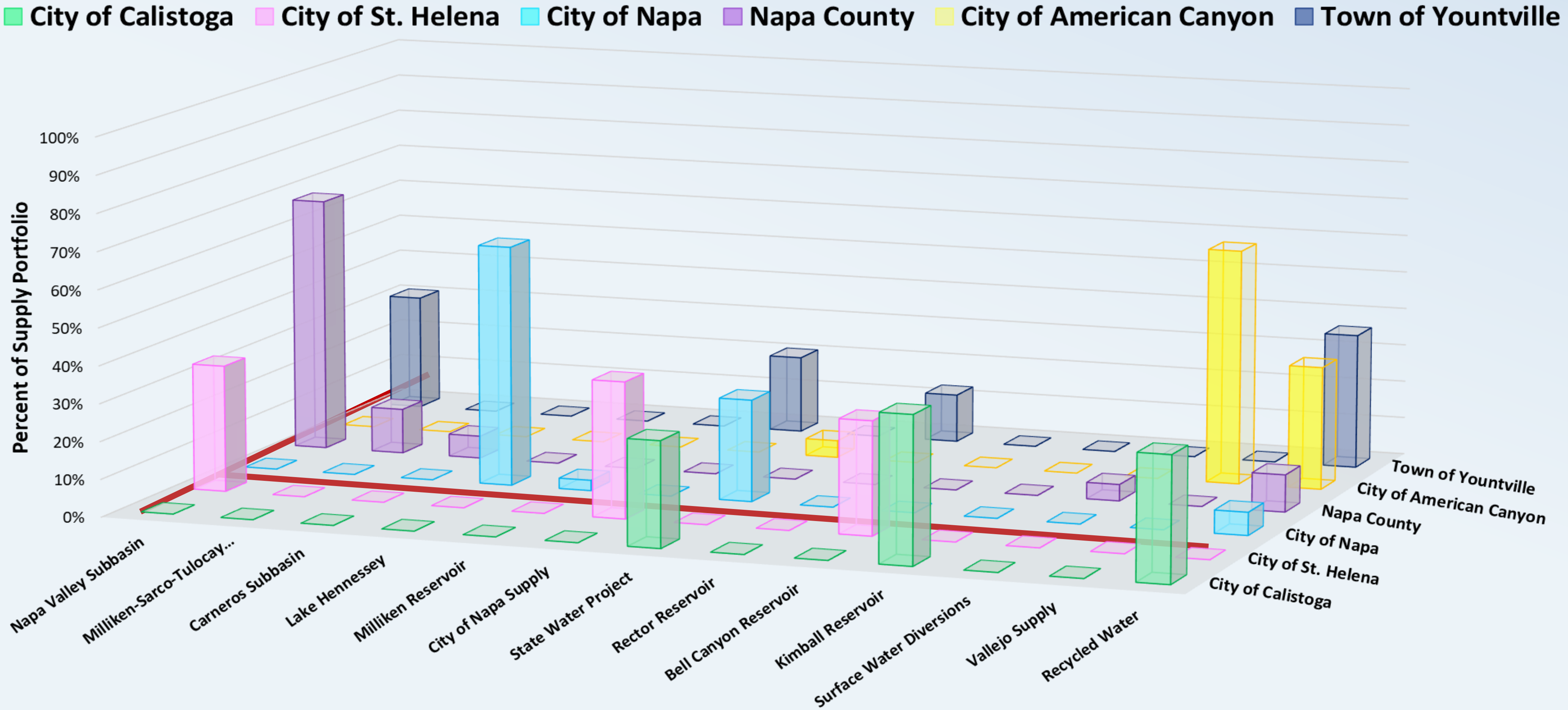
- The Vulnerability Assessment helps evaluate specific threats to critical water resources
  - Forms the basis for development of drought response and mitigation actions (i.e., projects)
- **In the context of this DCP:**
  - ***Drought Vulnerability is the extent to which the Partner Agencies, and the region, are exposed or susceptible to risk***

How Can We Assess Vulnerability?

- Risk is a combination of:
  - Likelihood of occurrence
  - Magnitude and severity
  - Consequences
- **Risk = Consequence x Likelihood**
  - Consequence = quantitative score based on significance of the supply source
  - Likelihood = qualitative score based on uncertainty factors that contribute to loss of supply

Consequence – Significance of Supply Sources by Agency

Level of exposure is dependent on level of reliance on any given supply source



Note: Data in figure is for critical dry year in 2035.

Likelihood - Uncertainty Factors

- Critical water supplies in the Valley face a number of threats and uncertainties, these include:
  - **Climate Change**
  - **Infrastructure Susceptibility and Supply Limitations**
  - **Regulatory, Environmental, and Water Rights Constraints**
  - **Cost Constraints and Affordability**
  - **Source Water Quality Degradation**

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Vulnerability Assessment

Part 2: Climate Change Assessment

Climate Change Assessment

- **Climate Change is projected to make planning for water supply and demand imbalances even more challenging**
- While existing water supply data does account for climate variability, climate change has the potential to adversely impact the availability and reliability of certain supplies
- Future climate impacts, including changes to temperature and precipitation, must be considered when assessing supply

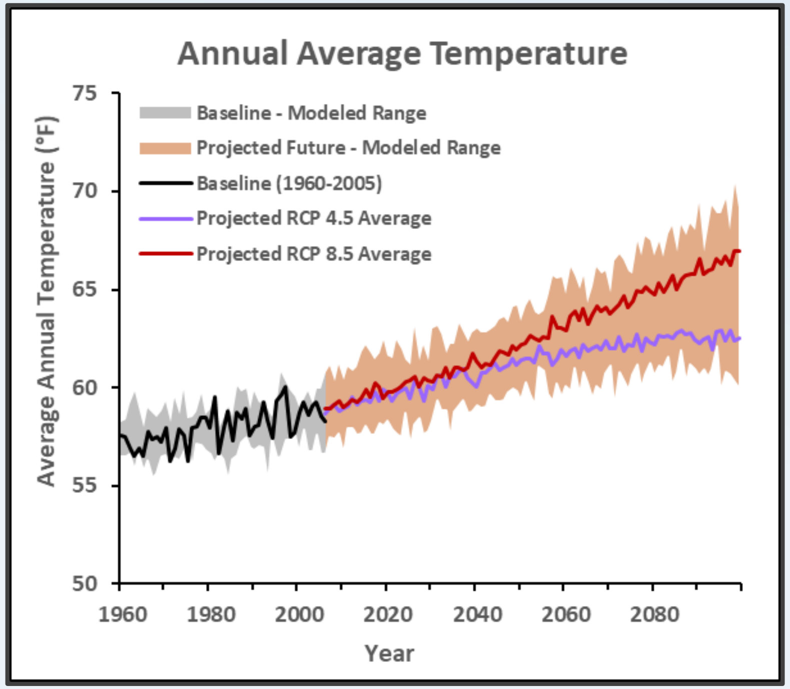
Climate Change Assessment

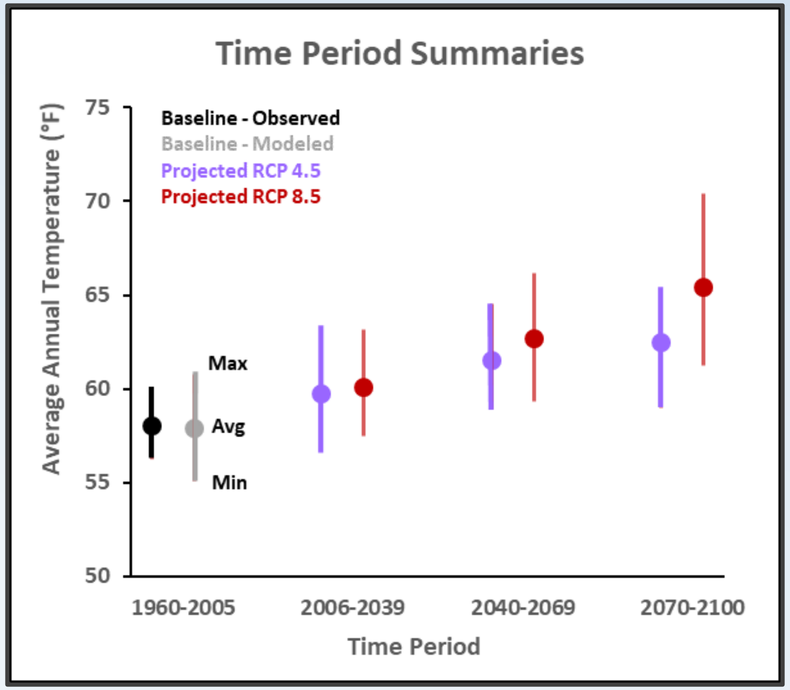
- Study team obtained new Napa Valley specific climate data
  - Currently working with Reclamation on other water supply and climate investigations e.g. Salinas and Carmel River Basins Study
  - New Napa Valley specific data adds critical information and exceeds the scope that this DCP would have otherwise been able to address
  - Special thanks to Ian Ferguson at DOI's Technical Service Center in Denver

Climate Change Data

- Using California's Fourth Climate Change Assessment, temperature and precipitation data were used to develop Napa data set
- Data included projections from 32 Global Climate Models (GCM)
  - Special focus on 10 GCMs that were found to perform best for California
- Data included two emissions scenarios
  - Where emissions peak in 2040, then decline (representative concentration pathway [RCP] 4.5)
  - Where emissions continue to rise strongly through 2050 and plateau in 2100 (RCP 8.5)

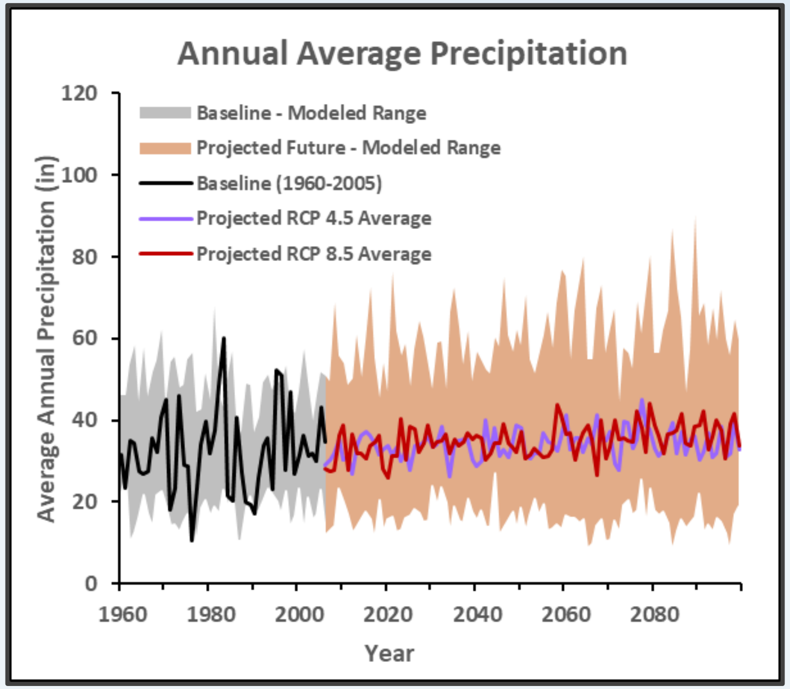
Climate Change Assessment – Temperature

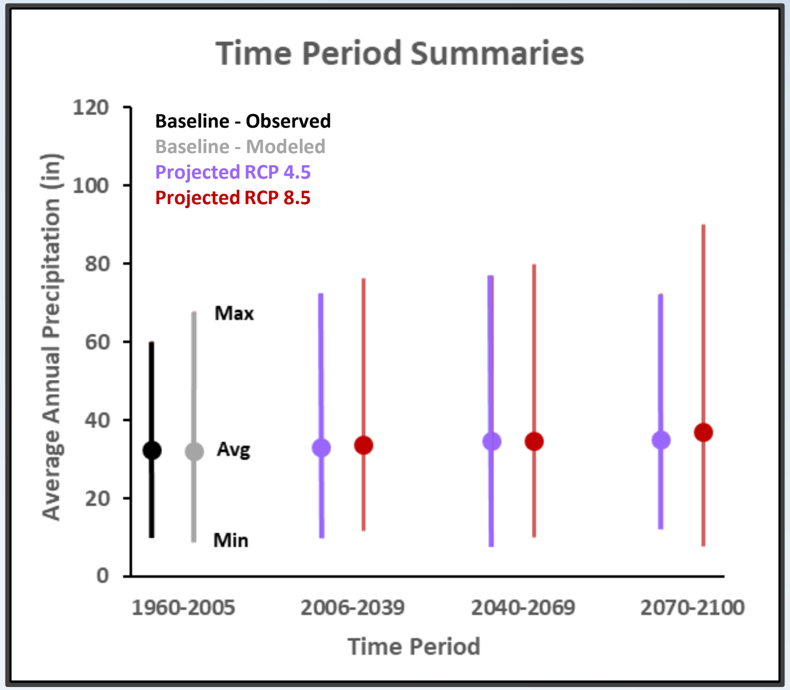




- **By the end of the century, average annual temperatures are expected to increase between 4° (RCP 4.5) and 7° (RCP 8.5) Fahrenheit as compared to the baseline**
- Rising temperatures in the Valley will continue to make the region more arid
- Warming temperatures are expected to cause more precipitation to fall as rain and cause snow melts earlier in the year impacting State Water Project reservoirs

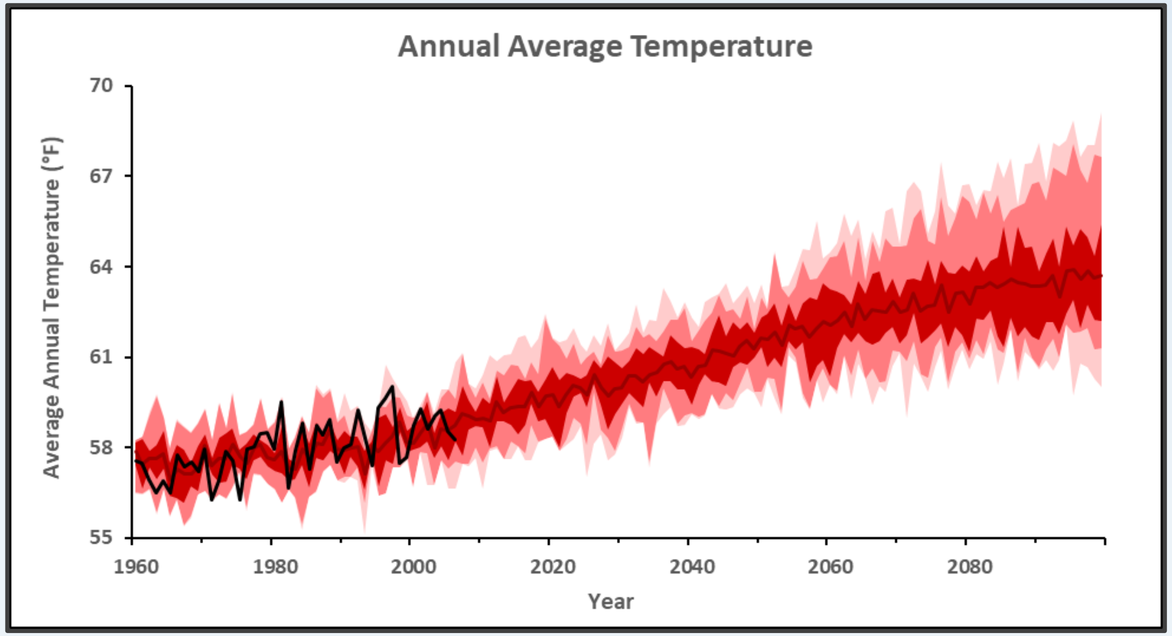
Climate Change Assessment – Precipitation

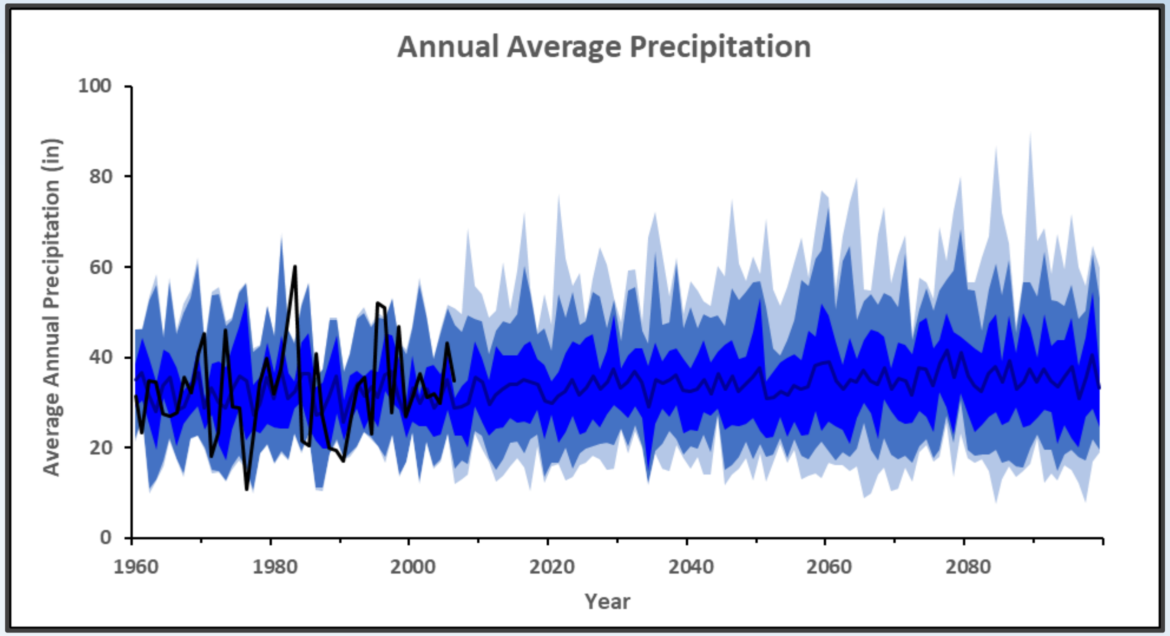




- **Average annual precipitation and year-to-year variability are both expected to increase along with an increased incidence of dry years**
- More frequent and severe droughts can potentially impact the reliable yield of both surface water supply and sustainable management of groundwater basins
- Winter runoff is likely to become increasingly “flashy” increasing the risk of flooding in the region

Climate Change Assessment – Summary



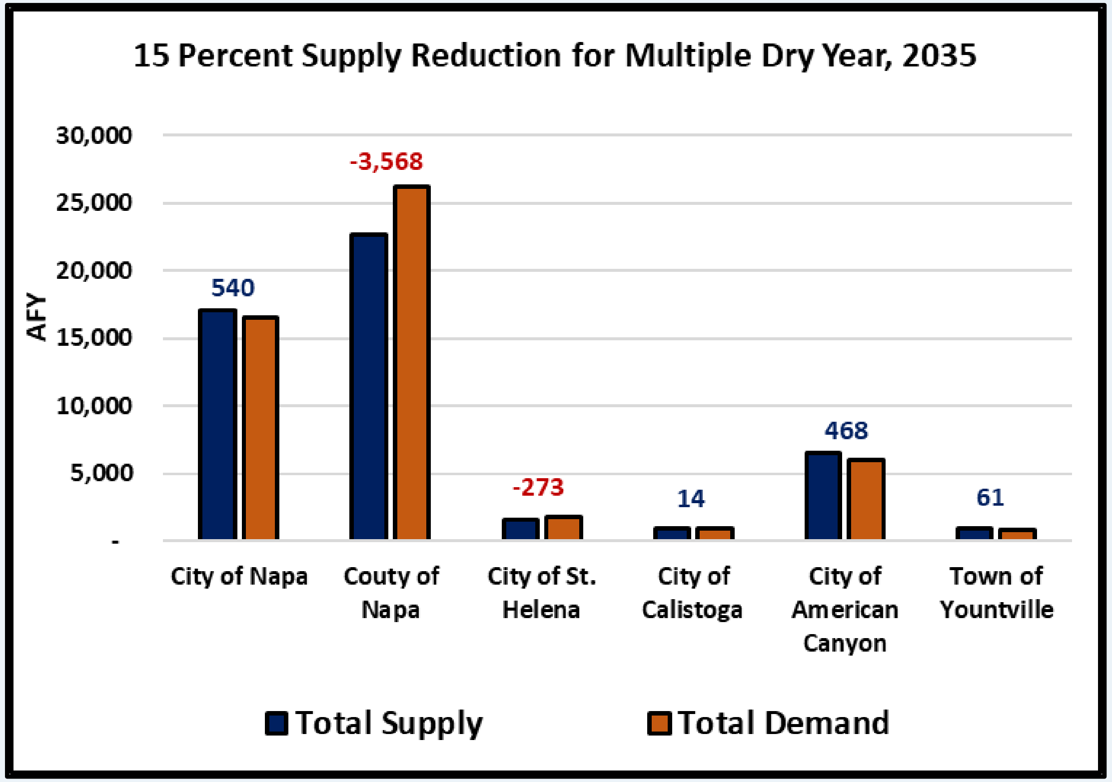


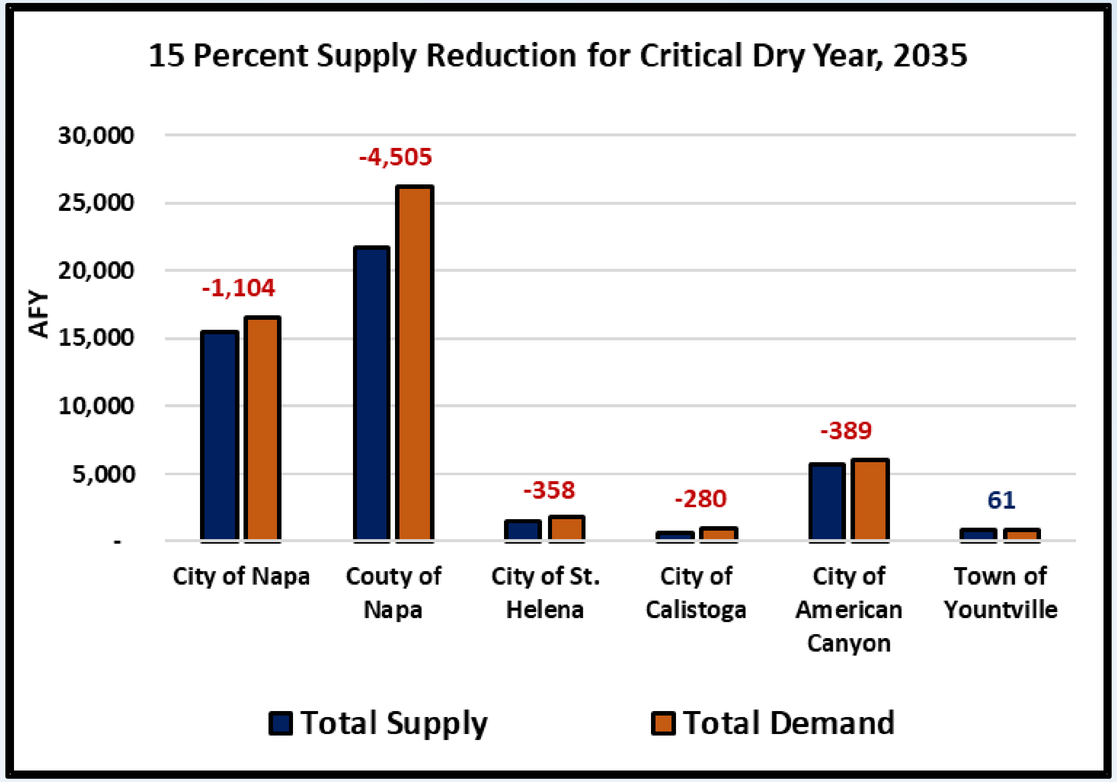
- **Temperature increases in all projections – strong consensus**
  - Many projections show an increase in variability and extremes
  - Potential impacts on water supply and demand – increased water demand

- **Precipitation increases in some projections, decreases in others – modest increase overall but no clear consensus**
  - Many projections also show an increase in variability and extremes
  - Potential impacts on water supply and demand – floods and droughts

Climate Change Assessment – Supply Reduction Analysis

- Using the identified climatic uncertainties, a range of supply reduction scenarios were developed to assess impacts on the region's ability to meet projected future demands
- Reductions ranged from 10-20 percent and were applied to all groundwater, local surface water, and State Water Project water supplies





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Vulnerability Assessment

Part 3: Analysis Results

Development of Risk Matrix – Likelihood

Please refer to Table 2 in the handout

Likelihood – Uncertainty Factors Table

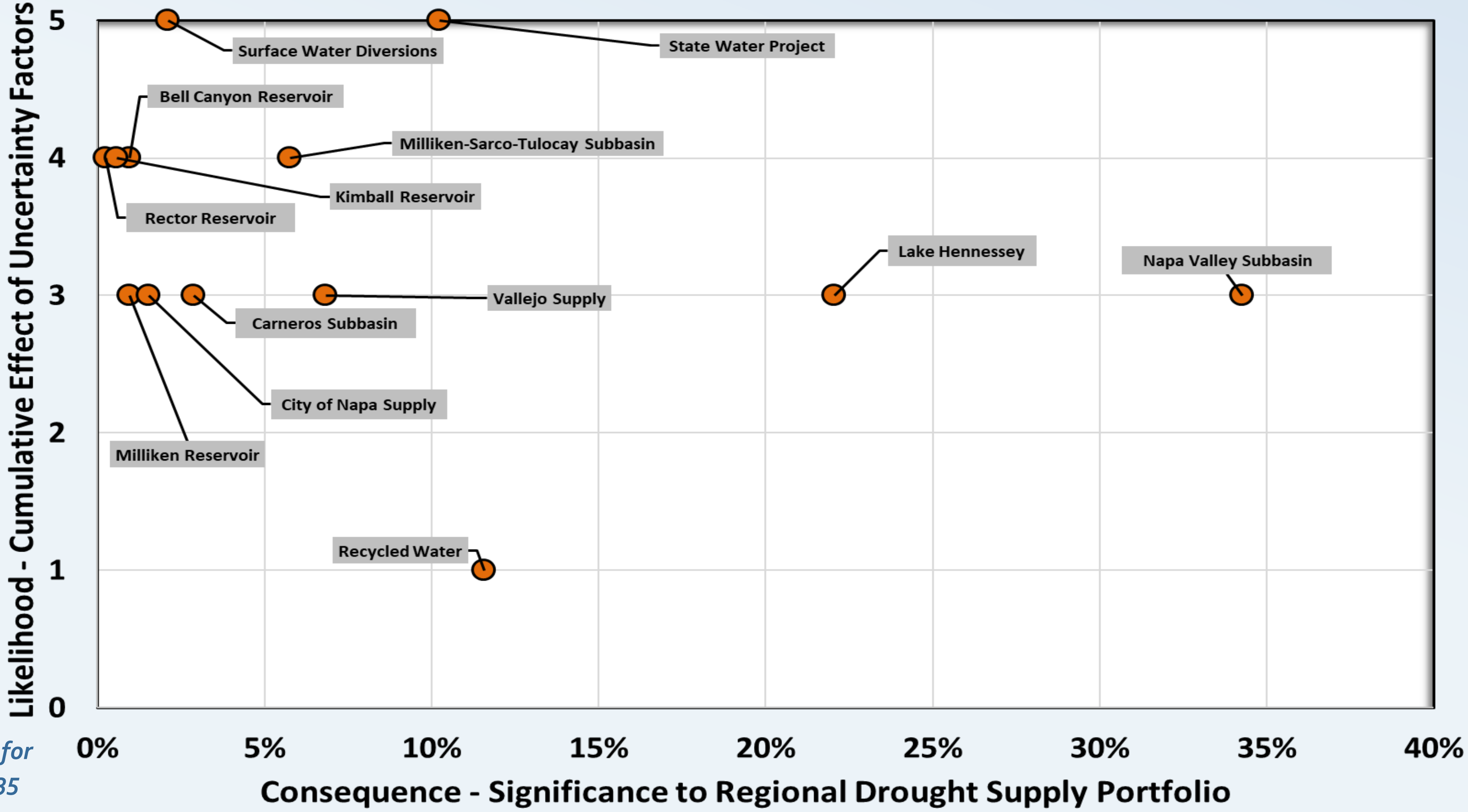
Summary of Uncertainty Factors Contributing to Potential Reduction or Loss of Critical Resources

Supply Source	Climate Change	Infrastructure Susceptibility and Dry Year Supply Limitations	Regulatory, Environmental, and Water Rights Constraints	Cost Constraints and Affordability	Source Water Quality Degradation	Likelihood	Regional Consequence
Napa Valley Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply Uncertain impacts of the SGMA	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	3	34%
Milliken-Sarco-Tulocay Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	4	6%
Carneros Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	3	3%
Lake Hennessey	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality Wildfire impacts on watersheds and water quality	Susceptible to supply reductions and changes in timing Regulatory uncertainty related to in-stream/ downstream flow requirements Facilities and infrastructure susceptible to seismic events	Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	Pumping costs Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	Agriculture runoff Algal blooms (also potentially affect treatability and decrease production capacity) Turbidity due to extreme weather and/or forest fires	3	22%
Milliken Reservoir	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality Wildfire impacts on watersheds and water quality	Susceptible to supply reductions and changes in timing Regulatory uncertainty related to in-stream/ downstream flow requirements Facilities and infrastructure susceptible to seismic events	Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	Pumping costs Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	Agriculture runoff Algal blooms (also potentially affect treatability and decrease production capacity) Turbidity due to extreme weather and/or forest fires	3	1%
City of Napa Supply	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality	Potential dry year curtailments Reliant on aging infrastructure (susceptible to failure) Susceptible to Delta water quality disruptions due to earthquake, level failure, sea level rise, etc. Aging Delta levees and SWP infrastructure vulnerable to seismic events	Regulatory uncertainties that can change timing of exports, reduce deliveries, and impact transfer capacities	Infrastructure requirements and operational requirements (e.g., monitoring)	Saltwater intrusion due to droughts Levee failure Sea level rise Algal by-products/ blooms during drought Increased levels of TOC/DOC and	3	2%

- Table includes a list of considerations for each of the uncertainty factors
- **Each water supply was assigned a score between 1 and 5 (low to high likelihood) meant to represent the potential for supply reduction or loss**
- Table also includes regional consequence (i.e., what percentage of the total regional drought supply portfolio each source of supply accounts for)

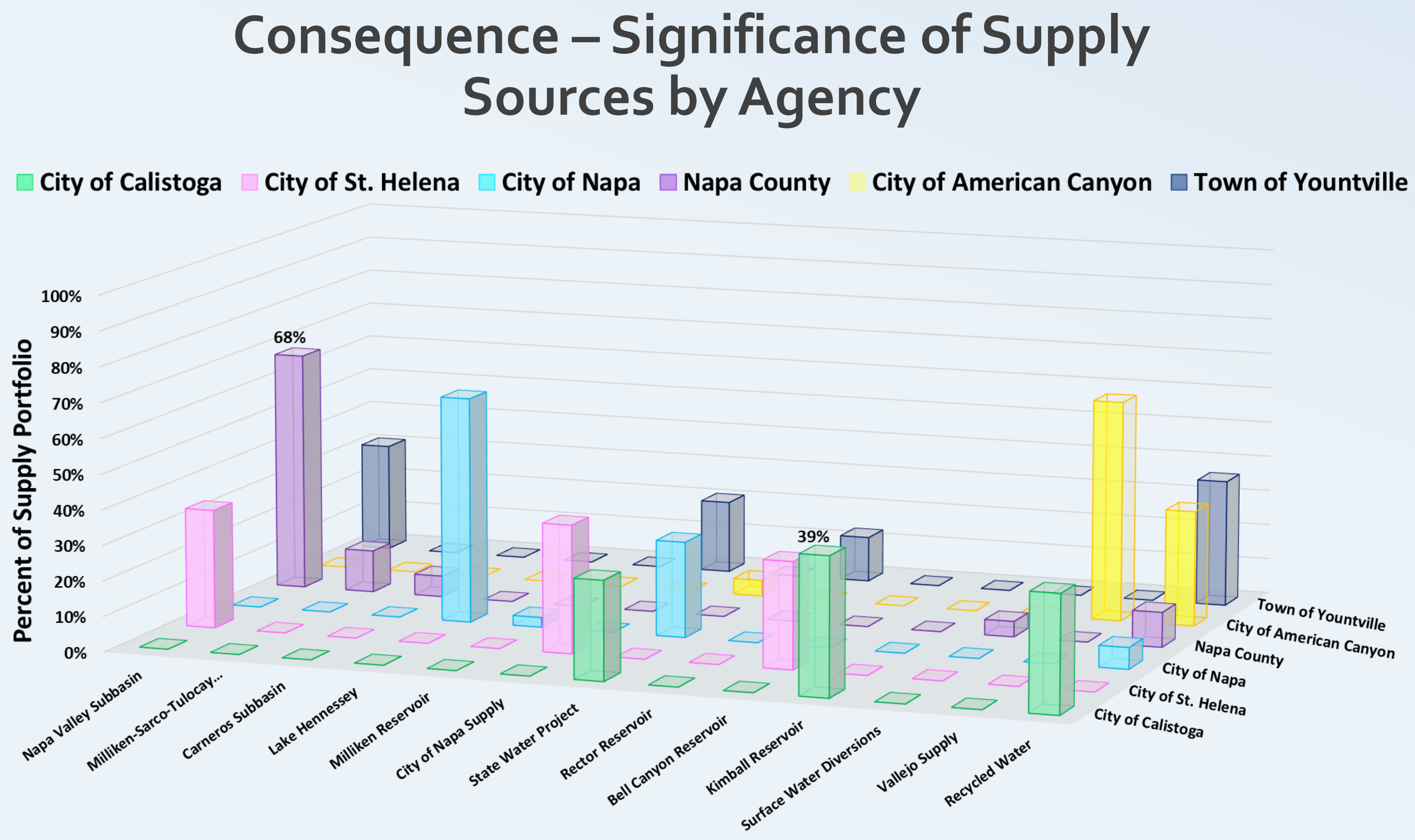
Development of Risk Matrix

The likelihood of supply reduction is based on uncertainty factors and regional significance of each supply. **However, this alone does not determine vulnerability in the region**



Note: Data in figure is for critical dry year in 2035

Development of Risk Matrix – Consequence

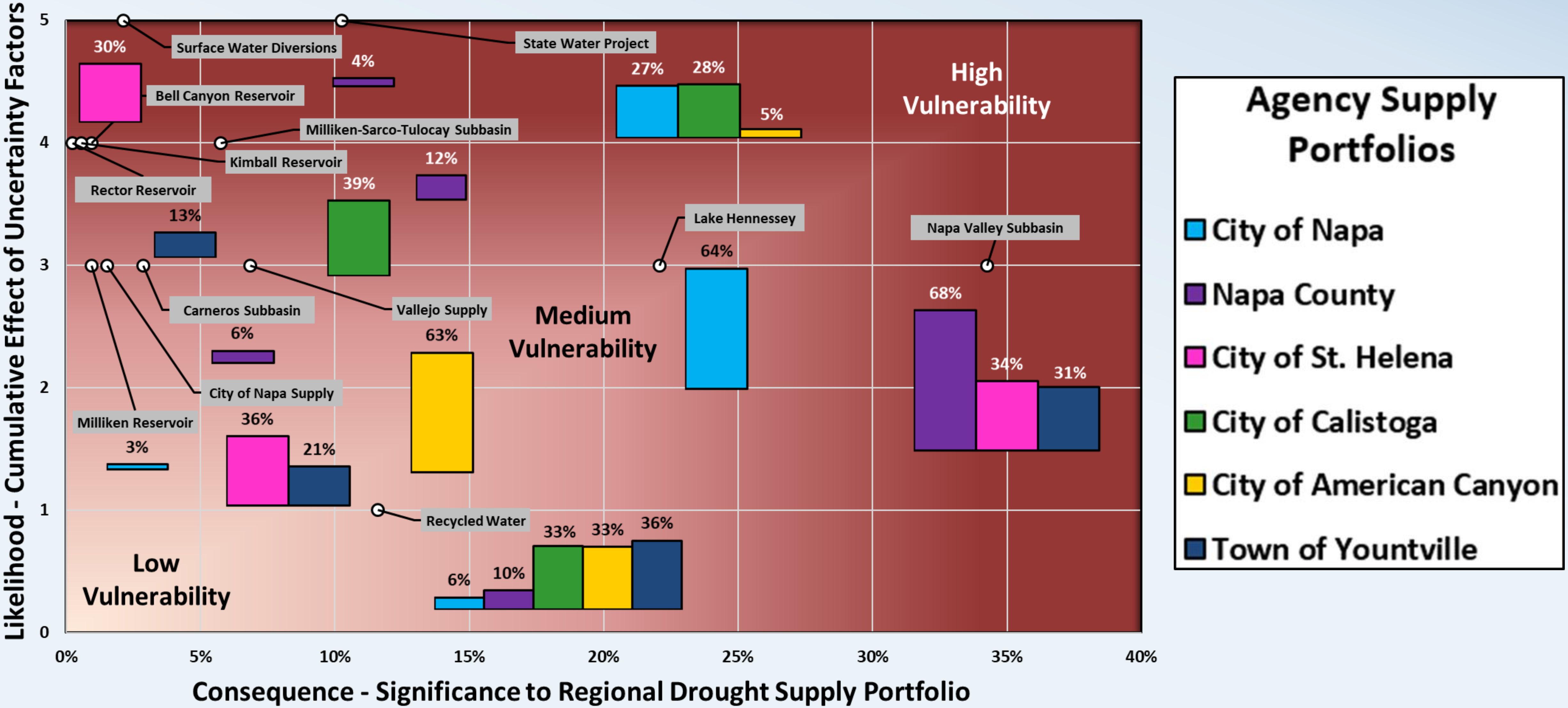


Note: Data in figure is for critical dry year in 2035.

- To fully assess vulnerability each agencies respective "Consequence" needs to be accounted for
- Relying solely on "Regional Consequence" can be misleading
  - **While some local reservoirs account for a small portion of the regional supply, they are critical to *each agencies* respective portfolio**

Risk Matrix varies between Agencies

Risks can vary by Agency within the Valley depending on the Source of Supply



Impacts of Drought Across Sectors

- Potential drought impacts extend beyond the supply sources themselves
- A lack of water can trigger impacts to various sectors across the region
- Although not every agency is affected equally, all are susceptible to many of these impacts

Drought Impacts Across Sectors

Potential Drought Impact	Agriculture	Energy	Environmental (Fish/Wildlife)	Local Business	Public Health	Recreation	Residential	Tourism
Increased Water Temperatures	X		X					
Increased Nutrient Levels, Harmful Algal Blooms			X	X	X	X		X
Increased Salinity in Water and Soil	X	X	X	X				
Reduced Reservoir Levels	X	X	X	X	X	X	X	X
Reduced Stream Flow	X	X	X	X	X	X	X	X
Reduced Groundwater Supply	X	X	X	X	X		X	
New Development Limitations/Moratorium				X			X	
Loss of Vegetation, Wetlands, Crops	X		X	X	X		X	X
Air Quality Degradation			X	X	X	X		X
Land Subsidence	X		X	X			X	
Increased Soil Erosion	X		X	X	X	X	X	X
Increased Evapotranspiration (ET)	X		X	X		X	X	
More Frequent and Intense Wildfires		X	X	X	X	X	X	X

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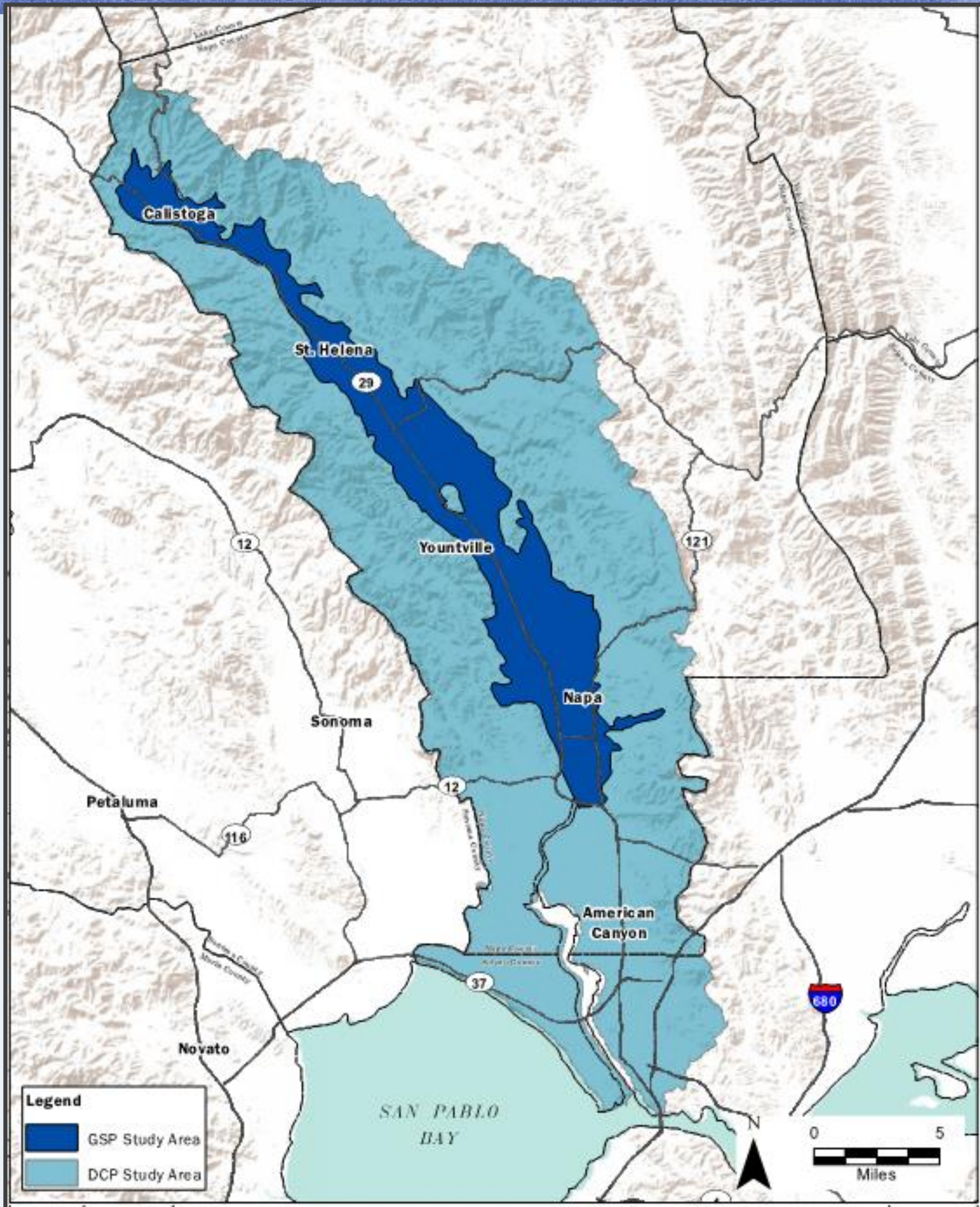
Interface between the DCP and the Napa Valley Groundwater Sustainability Plan

Interface between Napa Valley DCP and Napa Valley GSP

May 27, 2020



Introduction

- When the Napa Valley DCP scope was developed in Spring 2019, in addition to the required tasks, the City of Napa emphasized:
  - Strong, project-oriented outcomes
  - Where possible, identify opportunities to collaborate in order to maximize support for, and secure, project implementation funding
- Subsequent formation of the Napa Valley GSA, and future development of the GSP, present an opportunity for additional regional collaboration
- In reviewing the DRAFT outline of the proposed GSP, we found several commonalities with DCP tasks
- A conference call was scheduled to discuss these commonalities on Friday May 29, 2020

Who Participated on the Call?

County of Napa

- David Morrison
- Jeff Sharp

Luhdorff & Scalmanini Consulting Engineers

- Vicki Kretsinger
- Reid Bryson

City of Napa

- Patrick Costello
- Joy Eldredge
- Phil Brun

Drought Contingency Plan Team

- Rene Guillen, DCP Project Manager
- Ginger Bryant
- Mark Millan
- Mike Savage

Opportunities for Collaboration between Studies

- The GSP requires a proactive approach to sustainably managing the groundwater basin through monitoring and implementation of projects
- The DCP requires locally developed water resources management actions that build resiliency into the water supply by emphasizing planning and projects including:
  - Stormwater capture and treatment
  - Recycled water
  - Groundwater banking and management
  - Facility re-operation programs
  - Surface storage and stream flow management
  - Environmental benefits and habitat restoration

Opportunities for Collaboration between Studies

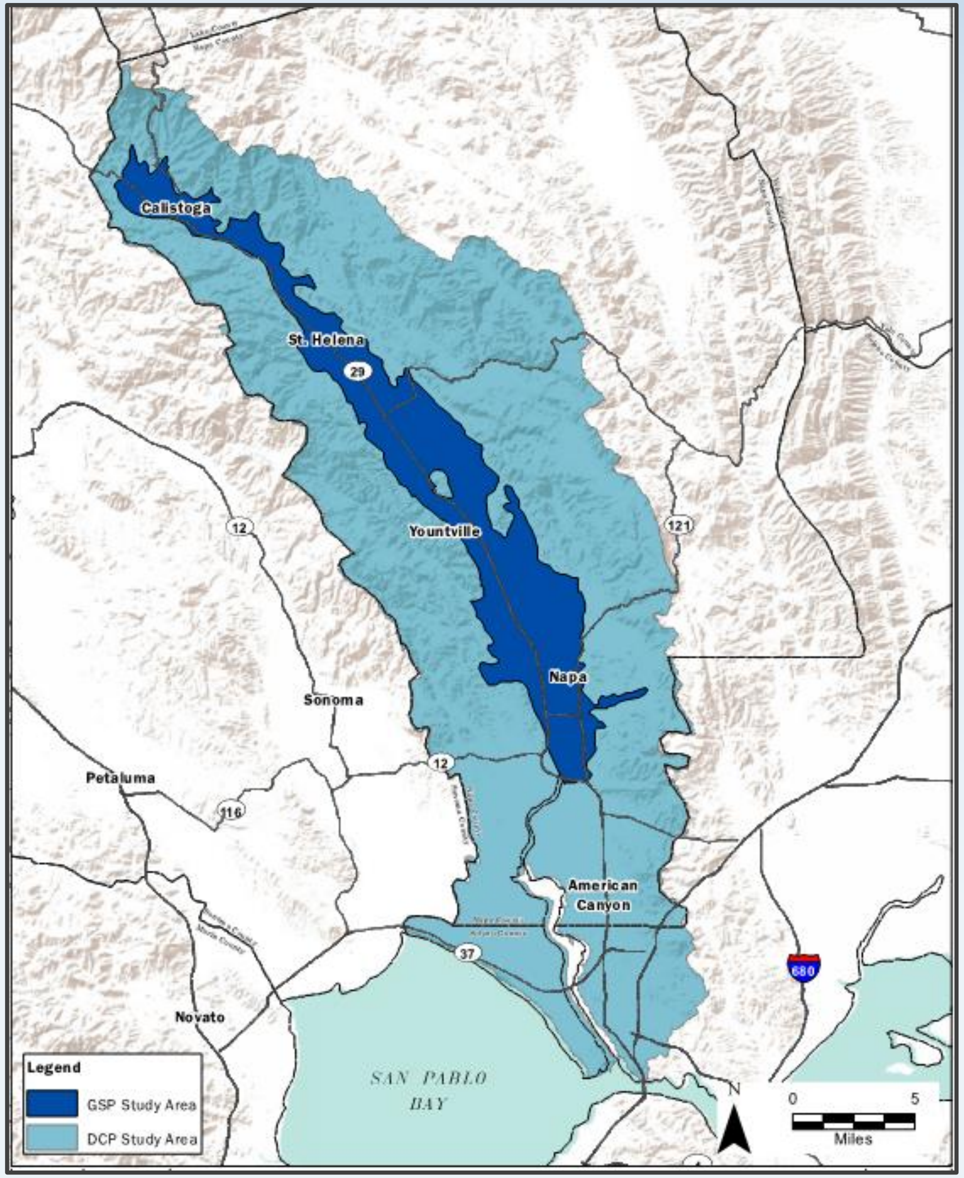
- The interface between these two investigations is described in greater detail as follows:
  - Common Agency Participants
  - Similar Study Areas
  - Common Study Schedules
  - Comparison of DCP and GSP tasks
  - Communication and Outreach
  - Implementation Strategies for Projects and Actions
  - Potential Future Actions

The DCP and GSP Share Common Agency Participants

Drought Contingency Plan *DCP Task Force Members*	**Napa Valley Subbasin Groundwater Sustainability Plan** *Sustainability Plan Advisory Committee (GSPAC)*	
Lead Agency: City of Napa	***Lead Agency: Napa County Groundwater Sustainability Agency***	
City of Napa (1-member)	City of Napa (1-member)	Napa River Surface Water Rights Holders (2-members)
Napa San (1-member)	Napa San (1-member)	Groundwater Dependent Public Water Systems (2-members)
American Canyon (1-member)		Overlying Groundwater Rights Holders (2-members)
Yountville (1-member)	Yountville (1-member)	Agricultural Interests (5-members)
St. Helena (1-member)	St. Helena (1-member)	Environmental Users (5-members)
Calistoga (1-member)	Calistoga (1-member)	Disadvantaged Communities (2-members)
Napa Co FCWCD (1-member)		Public At Large (2-members)

DCP and GSP Study Areas

The DCP and GSP study areas also interface

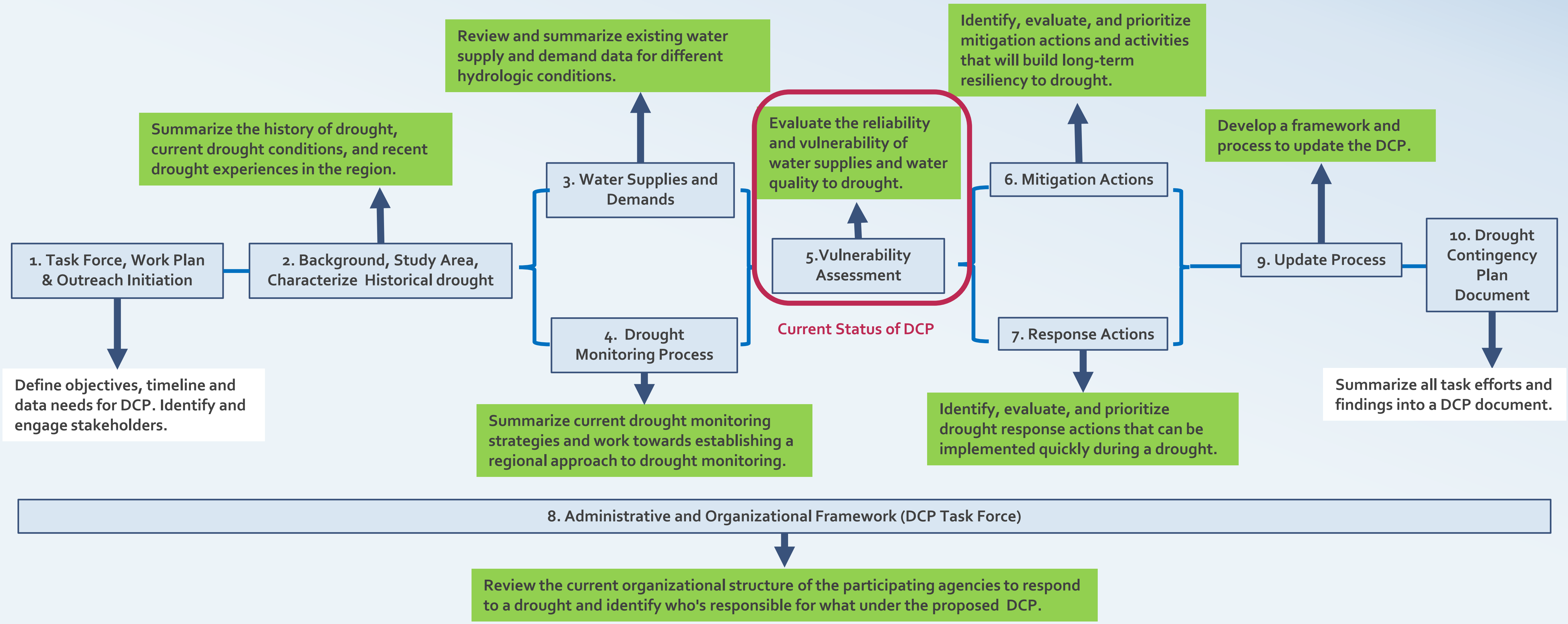


The DCP and GSP Schedules

Although not exactly concurrent, the schedules are similar

Study	Date			
	2019	2020	2021	2022
Napa Valley Drought Contingency Plan	Sept 19 – Apr 21			
Napa Valley Subbasin Groundwater Sustainability Plan		Mar 20 – Jan 22		

Napa Valley DCP Tasks in Common with GSP



Comparison of DCP and GSP Tasks

Overview of DCP and GSP Task Linkages	
DCP	**GSP**
Task 1. Initial Drought Contingency Plan Steps	Task 9. Napa Valley Subbasin Sustainability Goal
Task 2. Background, Study Area, and Participating Agencies	Task 2. Plan Area
Task 3. Water Supplies and Demands	Task 6 Groundwater and Surface Water Conditions Task 7 Historical, Current and Projected Water Supplies
Task 4. Drought Monitoring Process	
Task 5. Vulnerability Assessment	Task 8 Water Budget
Task 6. Mitigation Actions	Task 11. Sustainable Groundwater Management: Projects and Management Actions Task 12 Plan Implementation
Task 7. Response Actions	
Task 8. Organizational and Implementation Framework and Stakeholder Outreach	11.2 Education and Collaboration Communication and Outreach
Task 9. Update Process	12.5 Periodic Evaluation by GSA
Task 10. Drought Contingency Plan Document	Task 12. Plan Implementation • 12.1 Summary • 12.2 Summary of Recommendations
Task 11. Project Management	.

Communication and Outreach

- The region has a robust stakeholder community, developing a unified message demonstrating a collaborative process between these studies could help:
  - Eliminate potential confusion on the recommendations, outcomes and costs of these studies
  - Create broad stakeholder support for public investment in studies and future project implementation
  - Demonstrate a united effort on leveraging local, state, and federal funds to benefit regional water resources planning, projects and management

Implementation Strategies for Projects and Actions

- Napa Valley has limited new water supply options, both studies are likely to identify a similar set of projects
- The DCP requires creation of a regional plan/entity for implementing actions and projects that mitigate drought impacts, build supply resiliency, and could:
  - Help reduce costs with future studies and CEQA/NEPA documents
  - Help secure, leverage and manage project funding
  - Seek to eliminate potential competition between agencies for state and federal study and implementation grants
  - Provide equitable benefit and cost distribution throughout the Valley

Potential Future Actions

- The DCP team would like to discuss collaborating with the GSP team to mutually benefit water resources planning in the Napa Valley
- Items for Discussion:
  - Is there willingness between the Lead Agencies and Study Partners to do this?
  - If so, how would scopes, schedules and budgets be integrated?
  - Merging the two investigations could provide additional local cost-share contribution by applying the federal DCP grant/local agency match thereby reducing the required GSA local cost-share match

Next Steps

- The DCP and GSP consulting teams will discuss common tasks and report recommendations on potential collaboration
- A call is being scheduled with LSCE and we are targeting the end of June

Napa Valley Water Management Agencies

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DCP Project Implementation Grant Opportunity

DCP Project Implementation Grant Opportunity

- Once a project is identified in a DCP, it is able to compete for an Implementation Grant
  - In May, Reclamation released the 2021 Drought Resiliency Implementation Grant Funding Opportunity Announce (FOA)
  - Applications are due Wednesday July 8, 2020
- Although the Napa DCP isn't completed, the team identified the Putah South Intertie Project for consideration
  - This is a clearly defined drought mitigation project and could meet the intent/criteria of the grant
- The initial project proposal is 5-years old, needs to be jointly submitted with Solano WA
- A call was held on June 3, 2020 to determine if the proposal should be pursued
  - Phil Miller agreed to discuss the potential FOA submittal with Solano Co WA

Wrap up and Next Steps

Next Meeting Agenda

Task Force Meeting 3b – June 17, 2020 1:30-3:00

- Mid-point Summary and Review
  - Goals, Objectives, and Measures for Screening Mitigation Actions
  - Administrative and Organizational Framework & LAFCO Water and Wastewater MSR
- Discussion/Consider Action: Interface between the DCP and GSP
- Discussion/Consider Action: Direction re DCP Project Implementation Grant
- Stakeholder Engagement: Next WICC Meeting/Briefing scheduled for June 25, 2020

Task Force Meeting #3b Agenda

Wednesday, June 17, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Vulnerability assessment recap.**
- **Discuss Goals, Objectives, and Measures for Screening Mitigation and Response Actions.**
- **Preview to Drought Mitigation and Response Actions.**
- **Administrative and Organizational Framework Discussion (LAFCO MSR discussion).**
- **Discuss Next Steps.**

Task Force Meeting #3b Attendee List

Wednesday, June 17, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- Patrick Costello
- Phil Brun

Napa County

- Phil Miller
- Steven Lederer

City of Calistoga

- Derek Rayner

City of St. Helena

- Clayton Church
- Erica Ahmann Smithies

City of American Canyon

- Felix Hernandez

Town of Yountville

- John Ferons

Napa Sanitation District

- Andrew Damron
- Tim Healy

USBR

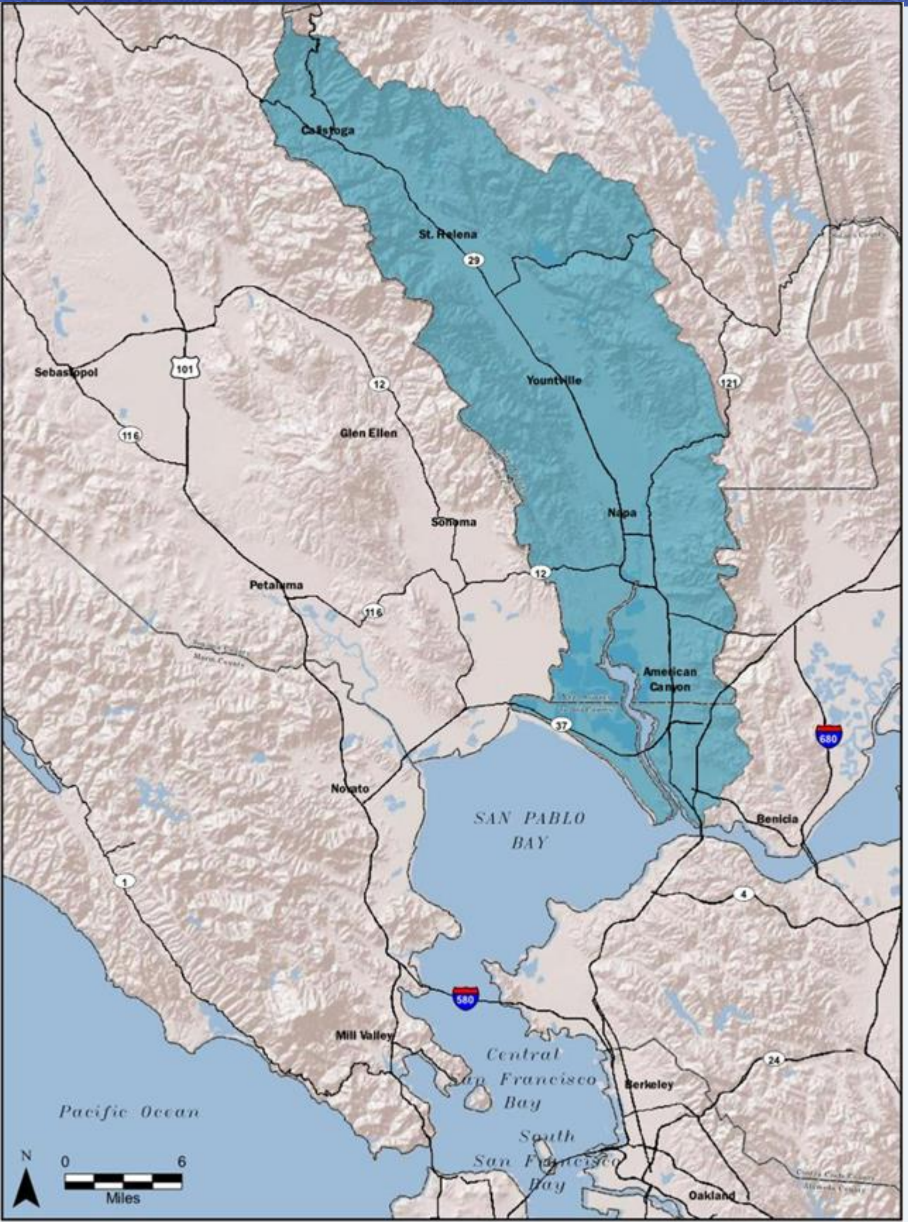
- Vanessa Emerzian

DCP Team

- Rene Guillen
- Ginger Bryant
- Mike Savage
- Mark Millan

Napa Valley Water
Management Agencies

U.S. Bureau of Reclamation



Napa Valley Drought Contingency Plan

Task Force Meeting #3b

June 17, 2020 1:30-3:00

Rene Guillen

Meeting Agenda

Task Force Meeting 3b

- Vulnerability Assessment Recap
- Goals, Objectives, and Measures for Screening Mitigation Actions
- Preview to Drought Mitigation & Response Actions
- Administrative and Organizational Framework Discussion
- Next Steps

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

Vulnerability Assessment Recap

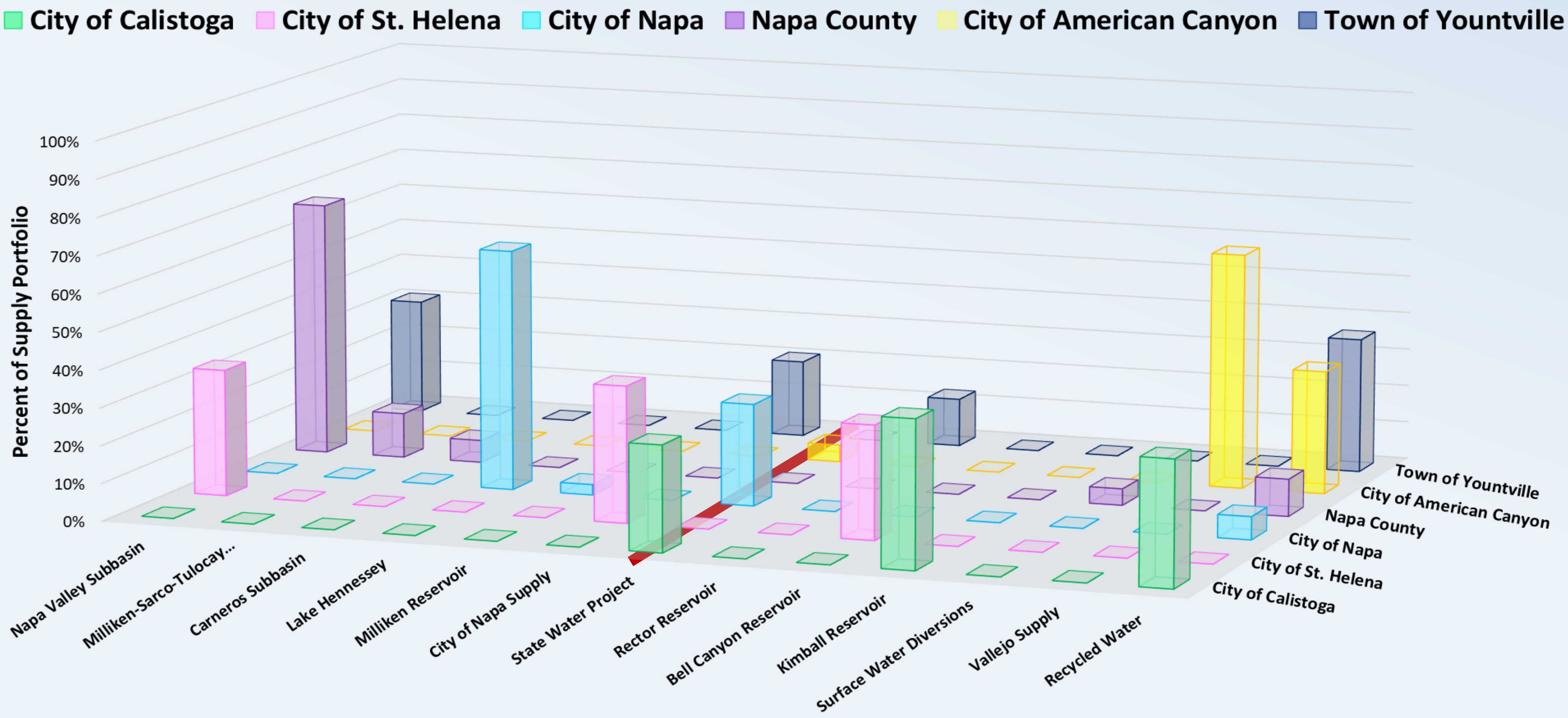
Scenario Summary

- The water supply data we are working with is based on *three different year types*:
  - **Normal Year:** The amount of water that most closely represents the average water supply available to your agency
  - **Multiple Dry Year:** This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean third dry year
  - **Critical Dry Year:** This is meant to represent the lowest water supply available to your agency
- **The Critical Dry Year Scenario is used for the Vulnerability Assessment**

Rene Guillen

Water Supply in a Future Critical Dry Year (2035)

2035 level of reliance per supply source in a Critical Dry Year

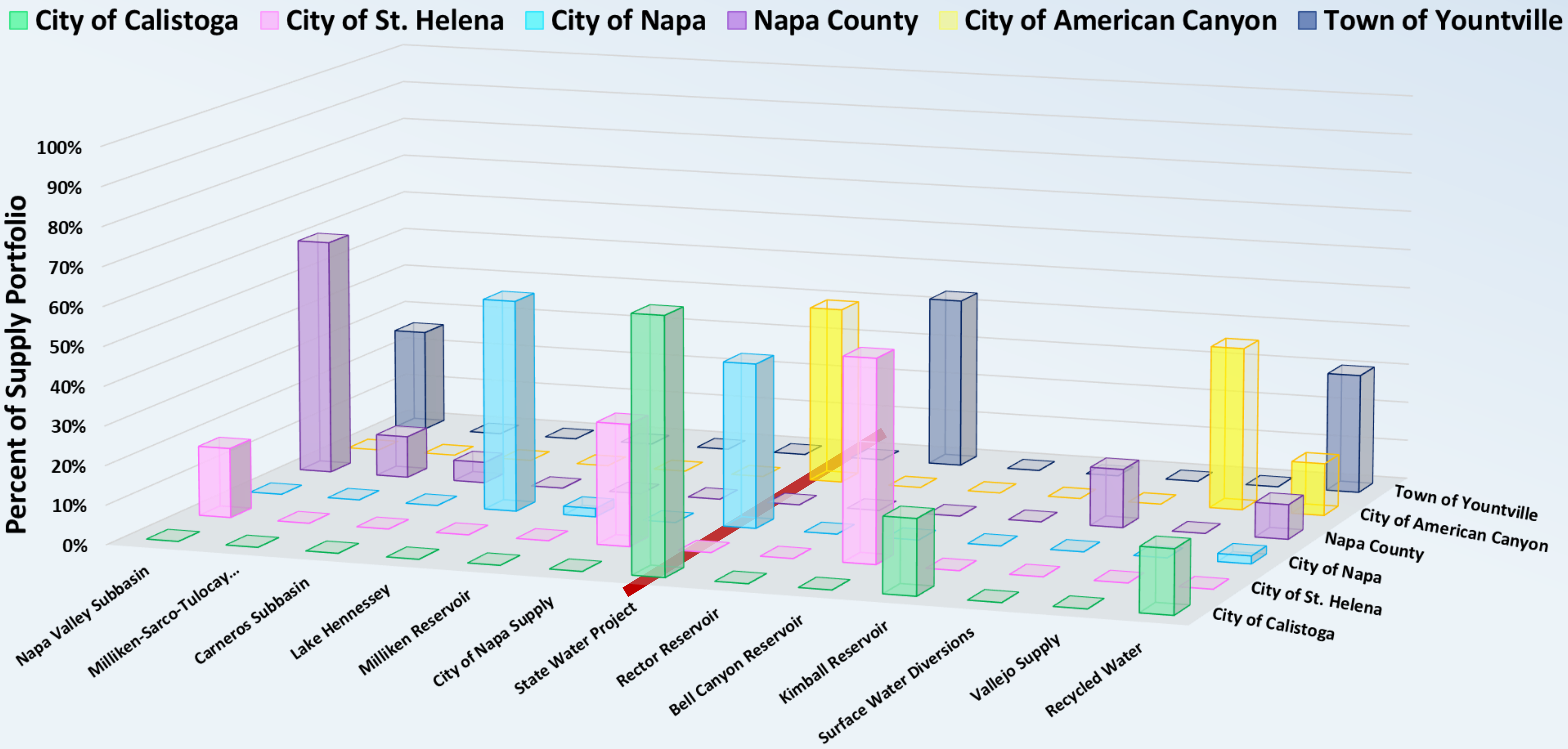


Note: Data in figure is for critical dry year in 2035.

Rene Guillen

Water Supply in a Normal Year (2020)

2020 level of reliance per supply source in a Normal Year



Note: Data in figure is for normal year in 2020.

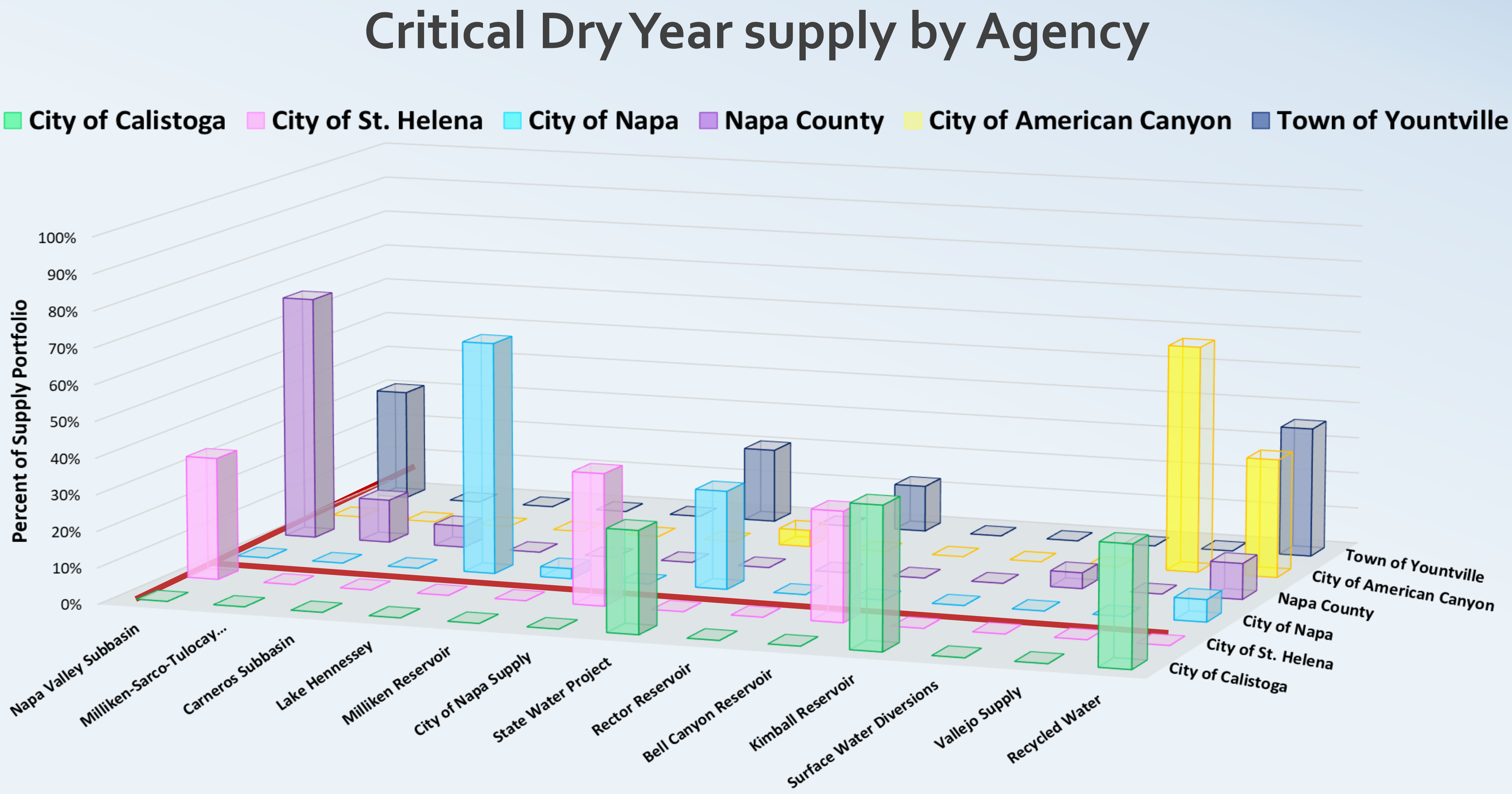
Rene Guillen

How Can We Assess Vulnerability?

- Risk is a combination of:
  - Likelihood of occurrence
  - Magnitude and severity
  - Consequences
- **Risk = Consequence x Likelihood**
  - Consequence = quantitative score based on significance of the supply source
  - Likelihood = qualitative score based on uncertainty factors that contribute to loss of supply

Rene Guillen

Consequence – Significance of Supply Sources by Agency



Note: Data in figure is for critical dry year in 2035.

Rene Guillen

Likelihood - Uncertainty Factors

- Critical water supplies in the Valley face a number of threats and uncertainties, these include:
  - **Climate Change**
  - **Infrastructure Susceptibility and Supply Limitations**
  - **Regulatory, Environmental, and Water Rights Constraints**
  - **Cost Constraints and Affordability**
  - **Source Water Quality Degradation**

Rene Guillen

Development of Risk Matrix – Likelihood

Please review Table 2 in the handout sent out on June 5, 2020

Likelihood – Uncertainty Factors Table

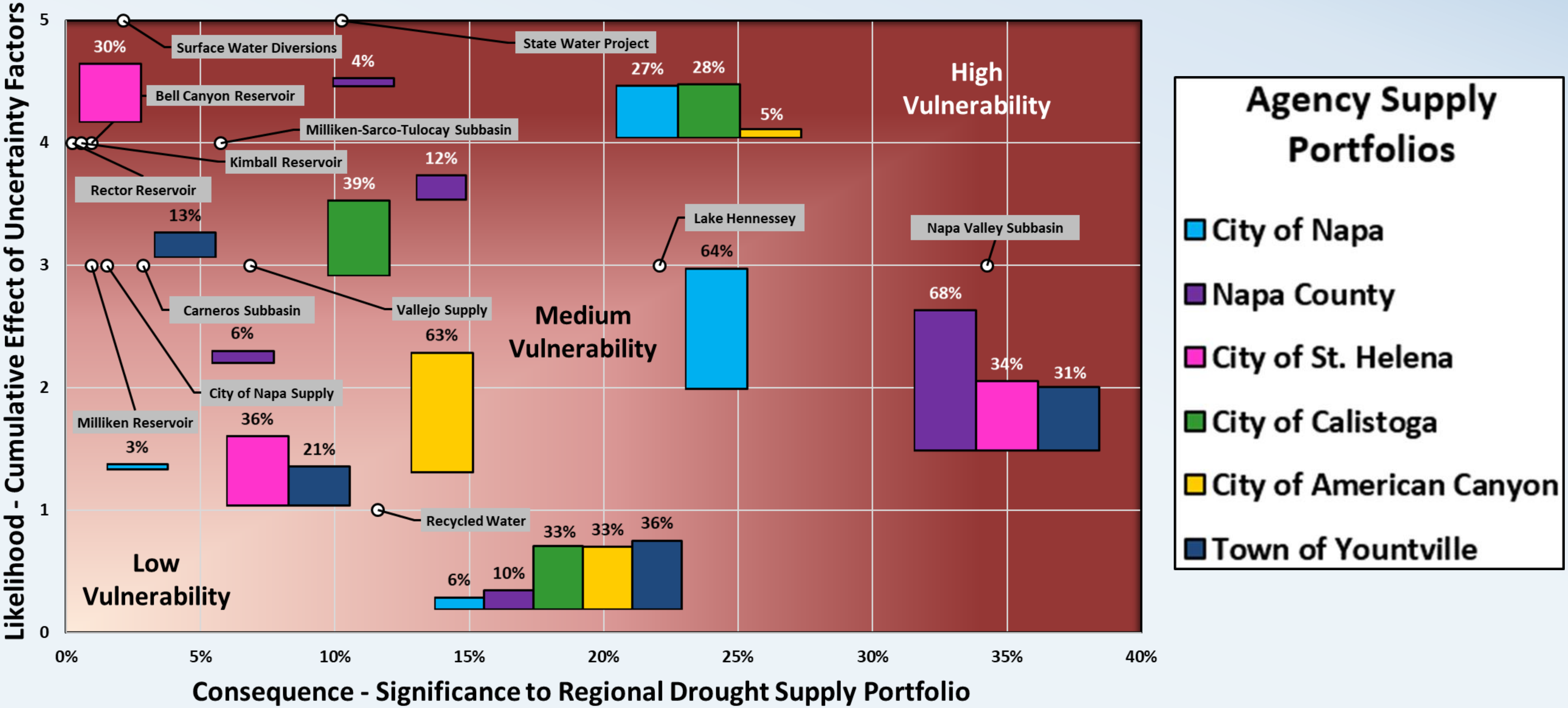
Summary of Uncertainty Factors Contributing to Potential Reduction or Loss of Critical Resources							
Supply Source	Climate Change	Infrastructure Susceptibility and Dry Year Supply Limitations	Regulatory, Environmental, and Water Rights Constraints	Cost Constraints and Affordability	Source Water Quality Degradation	Likelihood	Regional Consequence
Napa Valley Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply Uncertain impacts of the SGMA	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	3	34%
Milliken-Sarco-Tulocay Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	4	6%
Carneros Subbasin	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts (adverse impacts to reliable yield and reduced groundwater recharge/deliveries) Sea-level rise (seawater intrusion/water quality impacts and threats to facilities near coast lines)	Special care must be taken to avoid overdrafting, which can lead to subsidence Facilities and infrastructure susceptible to seismic events	More stringent water quality regulations that could impact the way agencies operate and manage this supply	Treatment costs with increasingly stringent water quality regulations Customer affordability issues with rising cost of water	Varies by end user and area within basin Saltwater intrusion due to droughts Some constituents of concern include: arsenic, iron, manganese, and boron	3	3%
Lake Hennessey	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality Wildfire impacts on watersheds and water quality	Susceptible to supply reductions and changes in timing Regulatory uncertainty related to in-stream/ downstream flow requirements Facilities and infrastructure susceptible to seismic events	Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	Pumping costs Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	Agriculture runoff Algal blooms (also potentially affec treatability and decrease production capacity) Turbidity due to extreme weather and/or forest fires	3	22%
Milliken Reservoir	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality Wildfire impacts on watersheds and water quality	Susceptible to supply reductions and changes in timing Regulatory uncertainty related to in-stream/ downstream flow requirements Facilities and infrastructure susceptible to seismic events	Potential curtailments and obligation to meet multiple operating objectives (e.g., in-stream flow requirements, flood control, etc.)	Pumping costs Infrastructure (e.g., storage) costs, including rehabilitation and replacement of aging infrastructure	Agriculture runoff Algal blooms (also potentially affec treatability and decrease production capacity) Turbidity due to extreme weather and/or forest fires	3	1%
City of Napa Supply	Altered/extreme precipitation patterns (less in spring, higher-intensity storms in winter) More frequent and severe droughts Higher water temperatures/degraded surface water quality	Potential dry year curtailments Reliant on aging infrastructure (susceptible to failure) Susceptible to Delta water quality disruptions due to earthquake, level failure, sea level rise, etc. Aging Delta levees and SWP infrastructure vulnerable to seismic events	Regulatory uncertainties that can change timing of exports, reduce deliveries, and impact transfer capacities	Infrastructure requirements and operational requirements (e.g., monitoring)	Saltwater intrusion due to droughts Levee failure Sea level rise Algal by-products/ blooms during drought Increased levels of TOC/DOC and	3	2%

- **Table includes a list of considerations for each of the uncertainty factors**
- **Each water supply was assigned a score between 1 and 5 (low to high likelihood) meant to represent the potential for supply reduction or loss**
- Table also includes regional consequence (i.e., what percentage of the total regional drought supply portfolio each source of supply accounts for)

Rene Guillen

Risk Matrix varies between Agencies

Risks can vary by Agency within the Valley depending on the Source of Supply



Rene Guillen

Vulnerability Assessment Review

- Please review the information included in Uncertainty Factors table (Table 2 of your handout)
- Review water supply data
- Please provide input and comments by July 1

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

Goals, Objectives, and Measures for Screening Mitigation Actions

Mike Savage

Initial Feedback from Task Force

- Projects and actions that deliver real results
- Recommendations that are implementation driven
- Review and make recommendations on how to better utilize/manage existing facilities and supply
- Look at expanding applications for Napa San winter water and potential for potable reuse
- Develop a common platform for understanding surface supply water and groundwater interface, how this relates to State Water Project, and use this information for both DCP and regional educational purposes

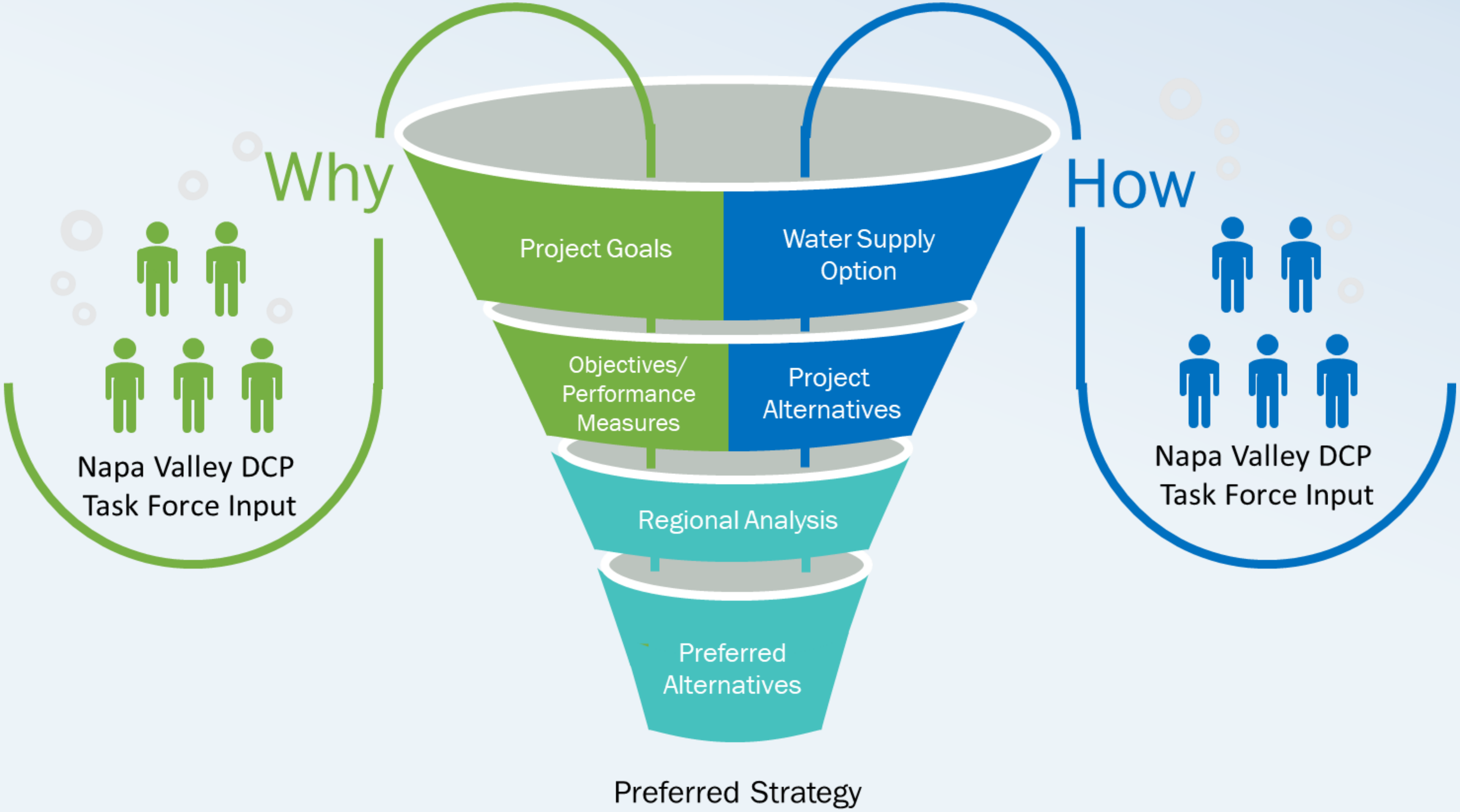
Reclamation Guidance

- DCP Program Guidance
  - Projects eligible for funding should address at least one of the following goals:
    - Increasing the reliability of water supplies
    - Improving water management
    - Providing benefits for fish and wildlife and the environment
  - Give water managers flexibility in times of low water supply
  - Improvements to increase flexibility in times of drought

Mike Savage

Separate the "Why" from the "How"

Equally inform development of strategies addressing needs of the region



Mike Savage

Preliminary DCP Goals and Objectives

Project Goals and Objectives to satisfy local priorities and federal guidelines

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives
Supply Reliability & Flexibility	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project
Watershed Approach	• Interface with Groundwater Sustainability Agencies to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation
Environmental Enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems
Economic Feasibility & Financial Viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed

Weighting of Goals and Objectives

- In most decision-making processes, Goals and Objectives are generally not equally important to participants
- By weighting the Goals and Objectives, values and preferences of Task Force members are better reflected

Mike Savage

Preliminary Weighting Factors Discussion

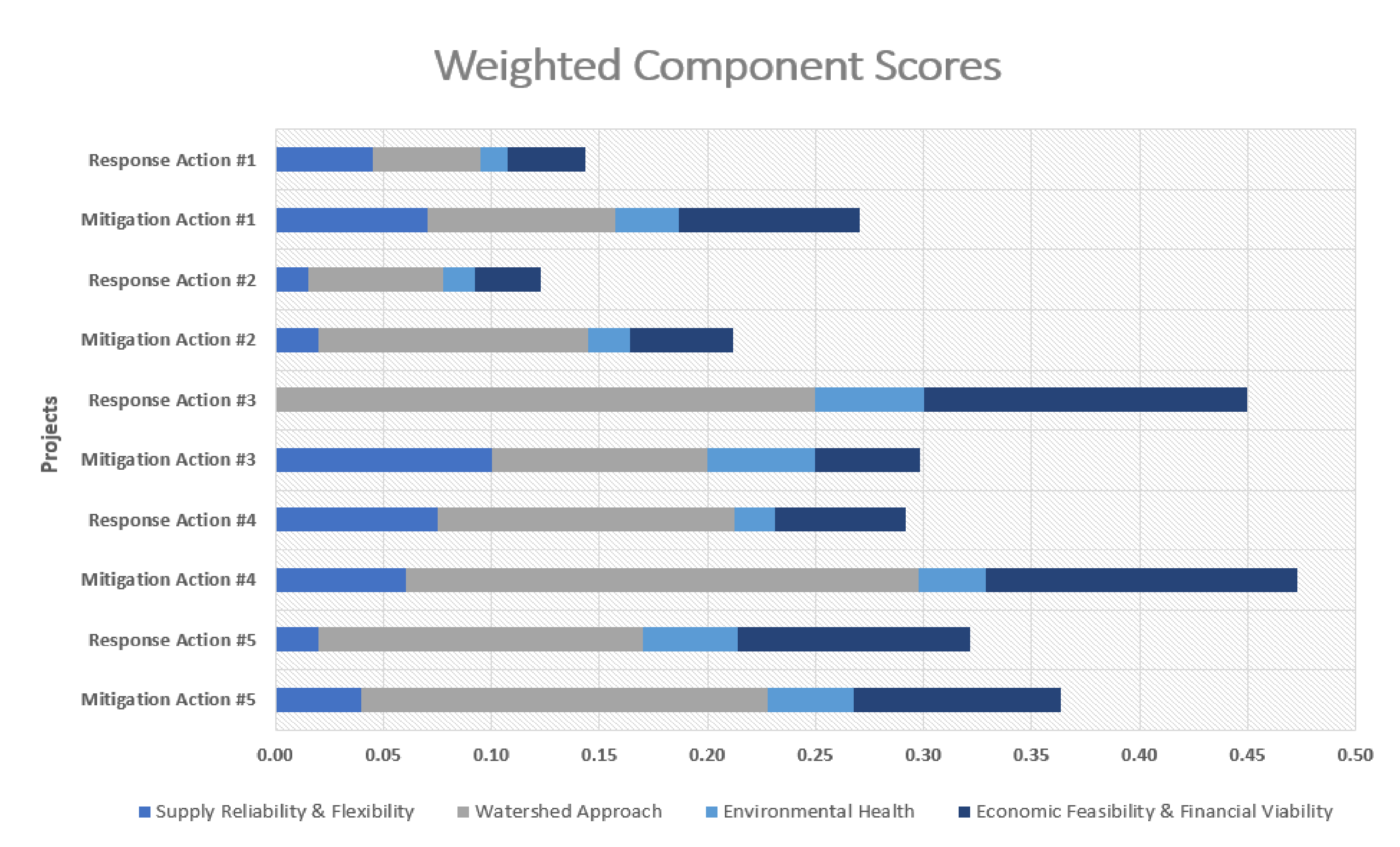
Weighting factors create a framework for numerical evaluation and basis for preliminary ranking

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives	*Suggested* Weighting Factor
Supply Reliability & Flexibility	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project	30%
Watershed Approach	• Interface with Groundwater Sustainability Agencies to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	25%
Environmental Enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems	15%
Economic Feasibility & Financial Viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	30%

Mike Savage

Weighting of Mitigation and Response Actions

- Weighted Goals and Objectives will be used to score/evaluate potential Mitigation and Response actions
- Process shows how a project performs against Goals and Objectives



Napa Valley Water
Management Agencies

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Preview to Drought Mitigation and Response Actions

Rene Guillen

What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
- Response actions can be quickly implemented and provide expeditious benefits

Drought Mitigation & Response Actions

- Identify preliminary comprehensive list of Mitigation and Response Actions that:
  - Build long term resiliency to drought
  - Mitigate risks posed by drought
  - Decrease regional vulnerabilities
  - Reduce need for response actions
- Develop regional understanding of projects by each agency (including yield, implementation timing, and potential impacts)
  - Identify opportunities for collaboration

Rene Guillen

Screening of Mitigation & Response Actions

- Screen projects to consider best way to equitability allocate:
  - Drought water resources to various types of water user needs
  - Rank projects in terms of regional benefit
  - Identify and propose projects to pursue for grant funding
- Implementation timing and funding opportunity will also play role in project screening

Administrative and Organizational Framework

Ginger Bryant

Administrative and Organizational Framework

Purpose: Identify who is responsible for implementing elements of the DCP

- Who owns the Administrative Framework?
  - Tasked with implementing Mitigation Measures, Response Actions, updating the DCP and communicating with the public

Who owns the Administrative Framework?

What does the Administrative Framework need to do for you?

- Do you want efficiencies of a single management entity
- Do you want to partner on drought mitigation projects, actions and manage water beyond established service areas
- Do you want financial assistance, ability to secure and manage project grants and or/financing

Ginger Bryant

LAFCO MSR Governance Structure Options

Figure 3-14: Governance Structure Options

Napa County Water and Wastewater Agency Governance Structure Options	
Affected Agency	**Governance Options**
City of American Canyon	• Clarification of LAFCO-approved service area • Inclusion of non-contiguous city-owned property in SOI or clarification of LAFCO policy • Participation in a county water agency
City of Calistoga	• County Water Agency
City of Napa	• Reorganization of Congress Valley Water District • Contract service to other agencies • Merger with Napa Sanitation District • Creation of a Water Commission • Inclusion of non-contiguous city-owned property in SOI or clarification of LAFCO policy • Participation in a county water agency
City of St. Helena	• Elimination of Municipal Sewer District No. 1 • Inclusion of non-contiguous city-owned property in SOI or clarification of LAFCO policy • Participation in a county water agency
Town of Yountville	• Collaboration with California Department of Veterans Affairs to develop a water management plan • Annexation of Domaine Chandon property • Participation in a county water agency
~~Los Carneros Water District~~	• Reorganization with Napa Sanitation District
~~Napa Berryessa Resort Improvement District~~	• Reorganization as a county service area • Reorganization into a county water agency or countywide county water district
Napa County Flood Control and Water Conservation District	• Establish zones of benefit • Reorganization with Napa River Reclamation District No. 2109 • Participation in a county water agency
~~Napa River Reclamation District No. 2109~~	• Expansion of services to include levee construction and maintenance • Reorganization into a community services district • Reorganization as zone of Napa County Flood Control and Water Conservation District
Napa Sanitation District	• Merger with City of Napa • Annexation of Los Carneros Water District • Contract service to other agencies

Source: Draft 2020 LAFCO Water and Wastewater Municipal Service Review

Ginger Bryant

Administrative and Organizational Framework Discussion

Specific to the Administrative and Organizational Framework:

- Thoughts on governance structure options in LAFCO report?
- Task Force Member agency recommendations, perspectives on LAFCO report?

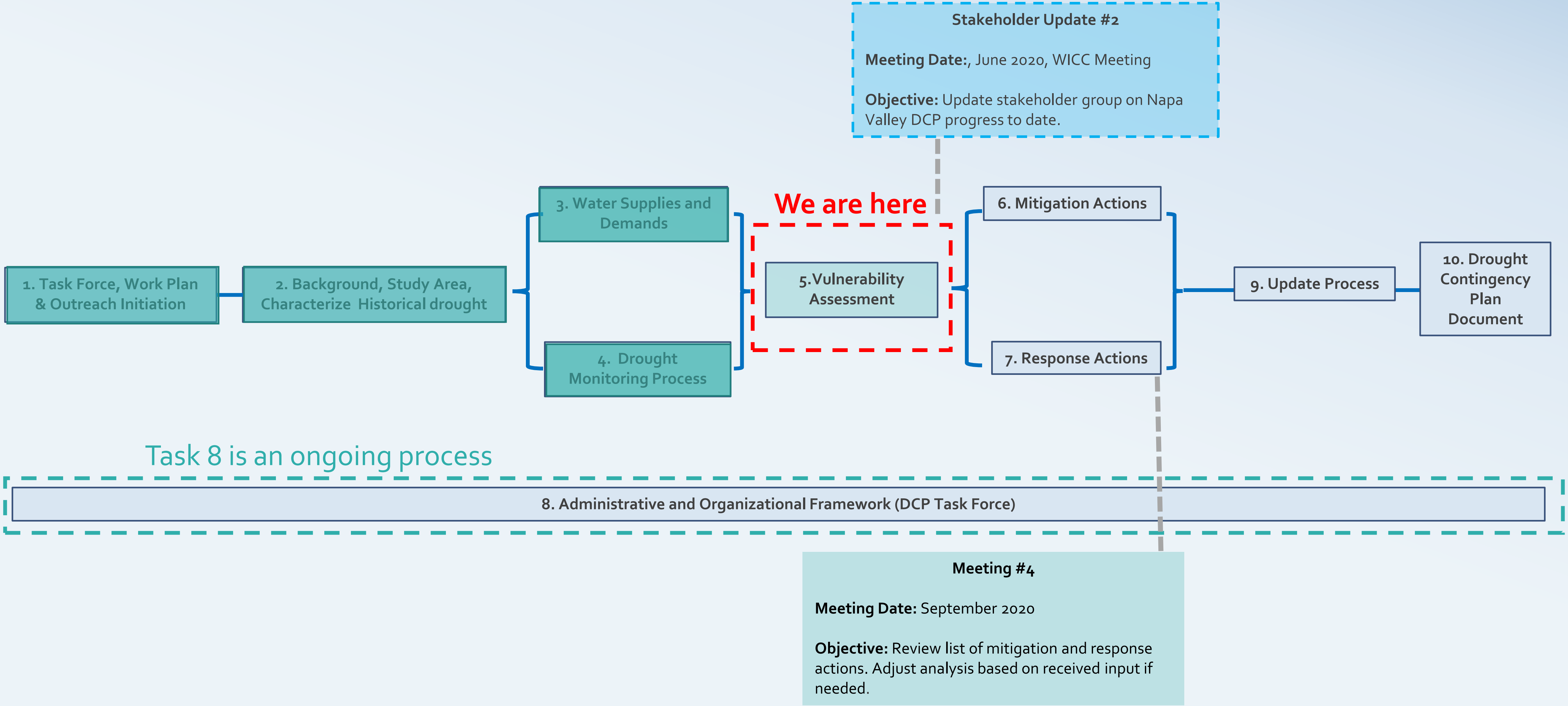
In Closing

- As part of the DCP Process and as required by Reclamation, we need to Identify who is responsible for implementing the DCP
- Part of the eligibility requirements for project funding
- We will continue work with you to make sure local priorities are considered in the development of the Administrative and Organizational Framework

Wrap up and Next Steps

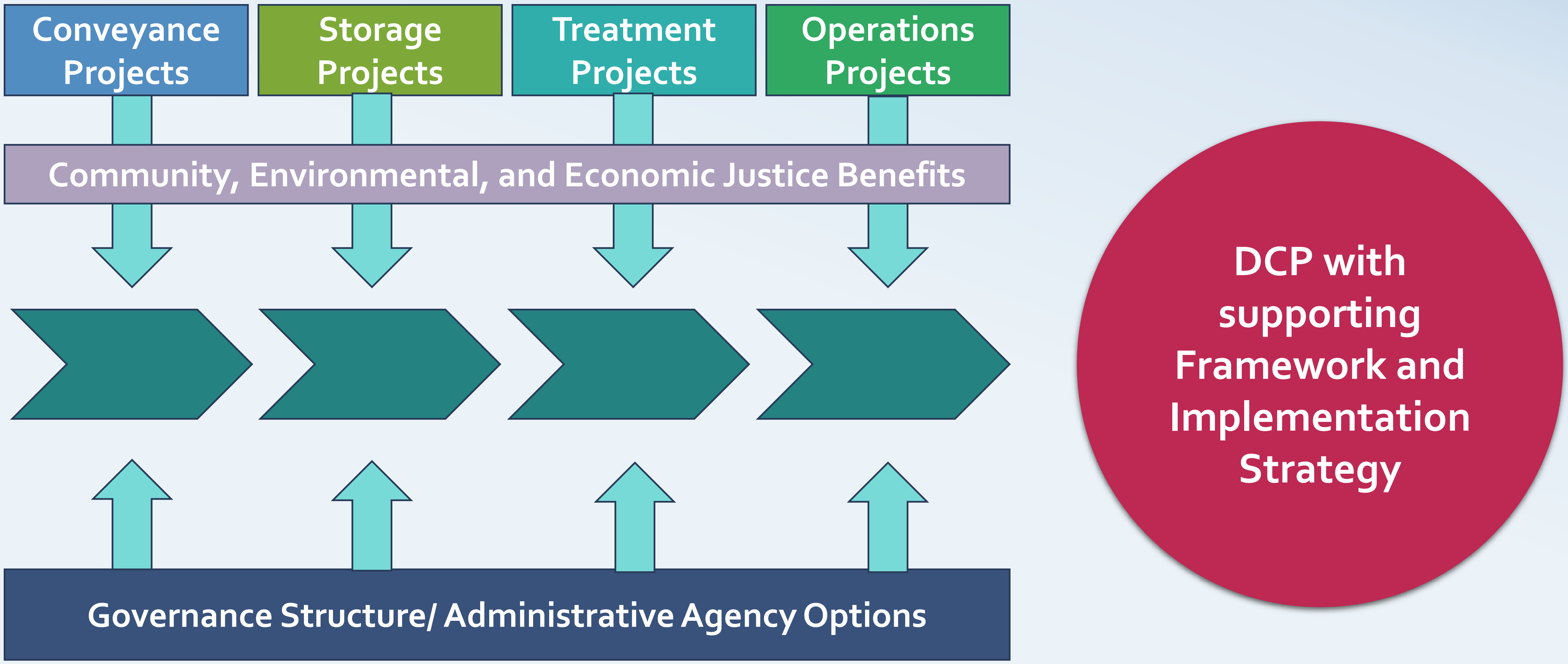
Rene Guillen

Where Are We?



Rene Guillen

Where we are going – The Napa Valley DCP



Rene Guillen

Next Steps

- Provide feedback on Vulnerability Assessment by July 1, 2020
- Compile preliminary project list and distribute for review and input
- Next Task Force meeting is tentatively scheduled for September 2020

Mitigation and Response Actions Worksession Agenda

Monday, September 14, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Discuss Preliminary Project List and conclude Worksession with:**
  - **Well-defined project list to carry forward into further DCP evaluation**
  - **For each project of interest, identify the following:**
    - **Who is involved?**
    - **Opportunities for collaboration**
    - **Potential yield**
    - **Implementation timing; and**
    - **Potential impacts**
- **Next Steps**

Mitigation and Response Actions Worksession Attendee List

Monday, September 14, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- **Patrick Costello**
- **Phil Brun**
- **Joy Eldredge**

Napa County

- **Phil Miller**
- **Jeff Sharp**

City of Calistoga

- **Derek Rayner**

City of St. Helena

- **Erica Ahmann Smithies**

City of American Canyon

- **Felix Hernandez**

Town of Yountville

- **John Ferons**

Napa Sanitation District

- **Tim Healy**
- **Andrew Damron**

USBR

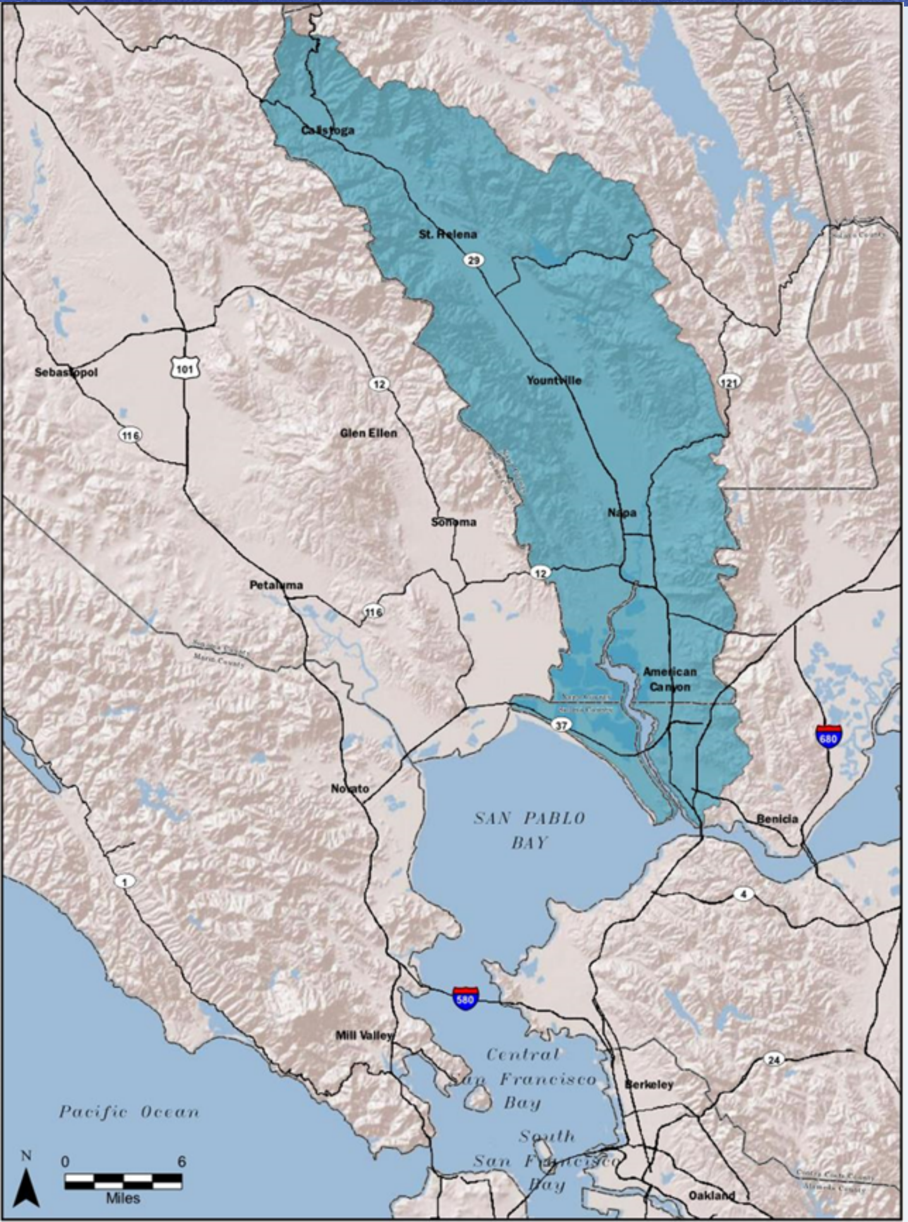
- **Vanessa Emerzian**

DCP Team

- **Rene Guillen**
- **Ginger Bryant**
- **Mike Savage**
- **Mark Millan**

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation



Napa Valley Drought Contingency Plan

Mitigation and Response Actions Worksession

August 27, 2020 1:30-3:00

Today's Worksession

Discuss Preliminary Project List and conclude Worksession with:

- Well-defined project list to carry forward into further DCP evaluation
- For each project of interest, we would like to identify:
  - Participating agencies
  - Opportunities for collaboration
  - Potential yield
  - Implementation timing, and
  - Potential impacts

Rene Guillen

Review: What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
- Response actions can be quickly implemented and provide expeditious benefits

Rene Guillen

Preliminary List of Drought Mitigation & Response Actions

- **Intent:** identify Mitigation and Response Actions that:
  - Build long term resiliency to drought
  - Mitigate risks posed by drought
  - Decrease regional vulnerabilities
  - Reduce need for response actions
- Projects/Actions are sorted into five drought mitigation project "categories"

Rene Guillen

Project/Action "Categories"

Groundwater Management	Conveyance	Storage	Treatment	Operations
• Projects that focus on aquifer storage, aquifer recovery, and groundwater basin recharge	• Projects that look to expand existing distribution systems such as to augment current use of recycled water	• Projects providing storage of existing or potential new water supplies to provide for drought resiliency through storage for future use	• Projects that look to expand and or upgrade existing treatment facilities	• Projects that provide for infrastructure improvements necessary to improve operational efficiency and flexibility

Notes on Projects/Actions

- Drought mitigation measures are at various stages of implementation ranging from concept level to construction/implementation
- Several of the projects included in the preliminary list have been previously studied and are fairly well defined
  - Projects 3-9 and 11-12
- Identify/refine any additional projects or concepts for further evaluation and ranking

**Please refer to the accompanying Mitigation and Response Actions document for further details*

Rene Guillen/ Mike Savage

Groundwater Management Projects/Studies

No.	Name	Engaged Agency	Description	Considerations
1	Aquifer Storage and Recovery with Potable Water	All Task Force Agencies	• Potable water produced at each respective agency's production facilities during winter and spring seasons would be injected into the groundwater basin. • Injection wells would introduce the water into the aquifer for later extraction at the same site during dry months or emergency situations. • Specific locations for injection or spreading and recovery will need to be identified and evaluated.	Which agencies are interested? Who does this make sense for? Would likely need to engage the Napa GSA to help assess project feasibility
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	All Task Force Agencies	• This project concept would explore the capability to increase the region's water supply through IPR. • IPR can be accomplished through GWR via surface spreading, GWR via direct injection, or SWA. Permitting requirements differ across specific types of IPR. • As the buffer diminishes in size, regulatory requirements for other project components increase.	Which agencies are interested? Who does this make sense for? Would likely need to engage the Napa GSA to help assess project feasibility

Conveyance Projects

- Projects 3 through 9 in this category were previously studied and are fairly well defined, suggest focusing on other projects/concepts

No.	Name	Engaged Agency	Description	Considerations
10	Lake Curry Purchase (Vallejo Lakes System)	City of American Canyon	• This project would involve the purchase of Lake Curry, which is owned by the City of Vallejo. • The lake is the largest lake in the Vallejo Lakes System and is located in southern Napa County. • Was a water supply source until the early 1990s, but closure of the Gordon Water Treatment Plant at Lake Curry meant that water could no longer be pumped and treated from the lake.	Is interest to pursue this still there even though Sites Reservoir allocation has been purchased?

Rene Guillen/ Mike Savage

Treatment Projects

- Projects 11 and 12 in this category were previously studied and are fairly well defined, suggest focusing on other projects/concepts

No.	Name	Engaged Agency	Description	Considerations
13 & 14	Purified Water Pilot Facility at Napa SD or American Canyon WRF	Napa SD, City of Napa, Napa County, City of American Canyon	• Would help determine an approach for full-scale implementation that satisfies regulatory requirements while minimizing cost and maximizing water produced. • The pilot facility would help demonstrate stable and reliable performance, demonstrate the proposed treatment train meets water quality goals, test and demonstrate online water quality monitoring for full scale application, and help verify major processes and systems for full-scale design.	Which agencies are interested? Who does this make sense for? Stakeholder outreach would likely be key.
15	Dunaweal Wastewater Treatment Plant Improvements	City of Calistoga, Napa County	• This project would look to assess treatment improvements to help the existing WWTP reduce Boron concentrations in their effluent. • Existing Boron levels limit the amount of recycled water that is used by the local vineyards. • By reducing the amount of Boron in their effluent, the City would be able to increase the use of recycled water and reduce the amount of effluent that is discharged into the Napa River.	Would improved recycled water quality attract more interest from local vineyards?

Operations Projects

No.	Name	Engaged Agency	Description	Considerations
16	Dunaweal Pump Station Replacement Project	City of Calistoga, City of Napa	• This project is looking to design a new pump station capable of providing increased supply and a single station (not two in series, like being operated currently). • Project would help improve the current operation and resiliency of Calistoga's critical water infrastructure to flooding, wildfire, and other hazards.	Are other agencies involved?
17	Putah South Canal Intertie	All Task Force Agencies	• Project would involve the installation of a pipeline connecting the Putah South Canal of the Solano Project to the North Bay Aqueduct of the State Water Project. • Project would provide an urgent water supply to agencies in the Napa Valley.	Would need to coordinate with Solano County. Extensive agency coordination What's the benefit to Solano County?
18	North Bay Aqueduct Expansion	All Task Force Agencies	• Capacity Improvements: One of the main alternatives consists of parallel pipelines from Barker Slough to the Travis tank and from Cordelia Forebay to Napa. • Intake Relocation: Would relocate the NBA intake from Barker Slough to the Sacramento River to help improve the quality of the raw water delivered through the NBA and would still require capacity improvements.	Costs for capacity improvements and potential intake relocation are steep. Extensive agency coordination

Operations Projects Continued…

No.	Name	Engaged Agency	Description	Considerations
19	Regional Water Conservation Program	All Task Force Agencies	• A Regional Water Conservation Program (RWCP) would help water utilities work together to help their customers use water efficiently and to meet best management practices (BMPs) for urban water conservation. • Elements of a RWCP could include public outreach campaigns, outreach materials and conservation devices, and community events and workshops.	Agencies have different supply portfolios with different drought stages and triggers.
20	Reservoir Operations Studies	All Task Force Agencies	• The potential of increased hydrologic variability and sedimentation could lead to a decrease in storage that reduces reliability of surface water delivery. • In addition, potential extreme weather events could challenge functionality of existing reservoir systems. • An operations study would look to identify and evaluate observed and projected changes to surface water availability and discern implications to reservoir operations arising from climate change.	Which agencies are interested? Who does this make sense for?

What’s next for the Project/Actions List?

Rene Guillen

Evaluation and Prioritization

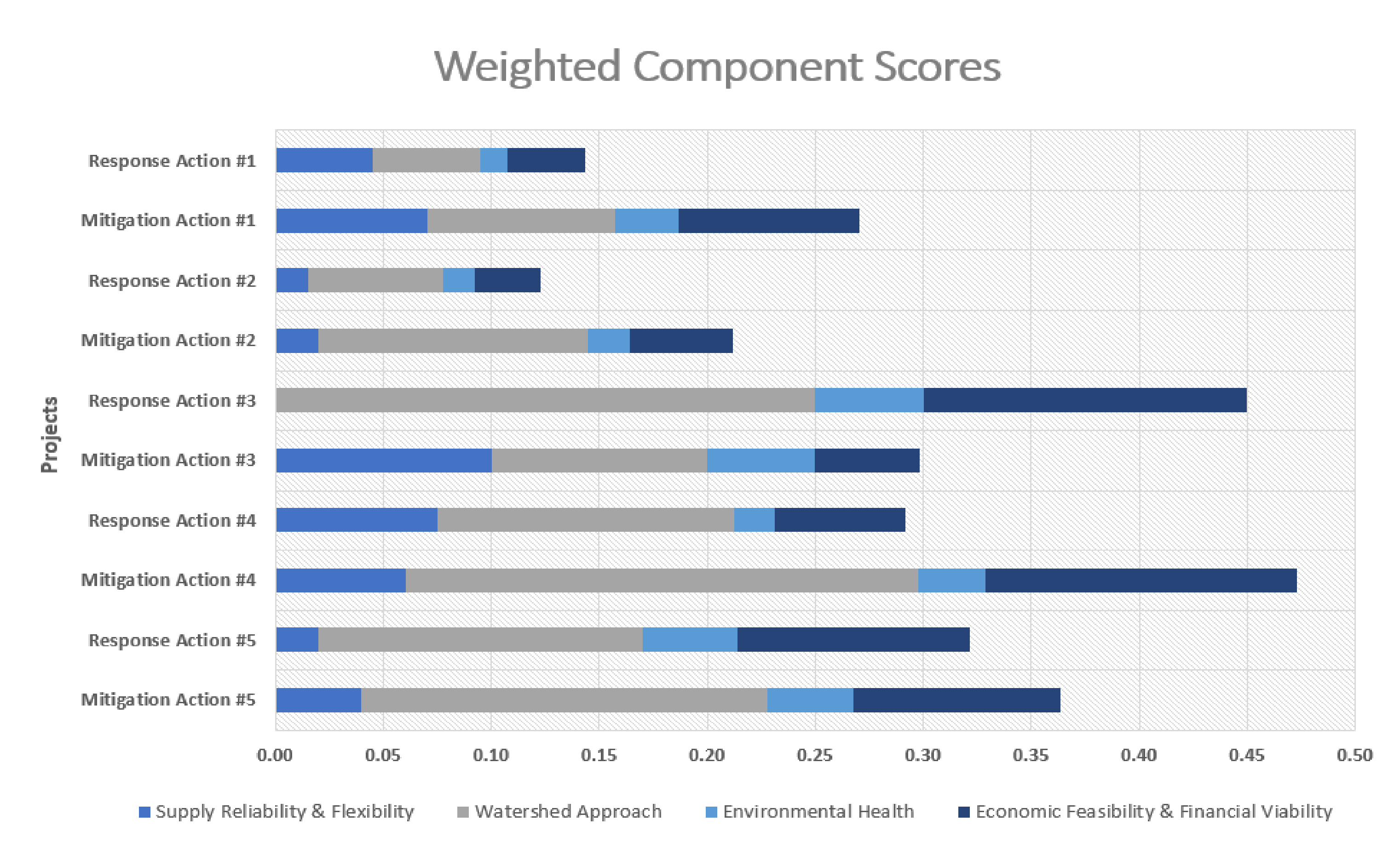
- Weighted Goals and Objectives will be used to score/evaluate potential Mitigation and Response actions

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives	Weighting Factor
Supply Reliability & Flexibility	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project	35%
Watershed Approach	• Interface with Groundwater Sustainability Agencies to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	20%
Environmental Enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems	15%
Economic Feasibility & Financial Viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	30%

Rene Guillen

Weighting of Mitigation and Response Actions

- Results of the project evaluation and prioritization will be used to score/evaluate potential Mitigation and Response actions
- Process shows how a project performs against Goals and Objectives



Next Steps for Mitigation and Response Actions

- Provide feedback on projects by September 4, 2020
- Finalize the project list and start evaluating and prioritizing projects

What's next for Administrative and Organizational Framework?

Administrative and Organizational Framework

Review:

- Identify who is responsible for implementing elements of the DCP

Early September:

- Informal outline of key points will be emailed to Task Force members
- Follow up calls will be scheduled to discuss priorities and preferences

October Task Force Meeting:

- Summary of outcomes will be presented for discussion

Worksession Wrap Up

Wrap Up

Questions or Comments?

Next Task Force meeting:

- Tentatively scheduled for October 2020

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Task Force Meeting #4a Agenda

Monday, November 9, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Review Mitigation and Response Actions:**
  - **Part 1: Introduction/ Recap**
  - **Part 2: Evaluation Process**
  - **Part 3: Discussion**
- **Discuss Next Steps – Task Force Meeting 4b, on November 16, 2020 from 1:30 pm to 3:30 pm.**

Task Force Meeting #4a Attendee List

Monday, November 9, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- **Patrick Costello**
- **Phil Brun**
- **Joy Eldredge**

Napa County

- **Phil Miller**
- **Steven Lederer**
- **Jeff Sharp**
- **David Morrison**

City of Calistoga

- **Derek Rayner**

City of St. Helena

- **Clayton Church**

City of American Canyon

- **Felix Hernandez**

Town of Yountville

- **John Ferons**

Napa Sanitation District

- **Andrew Damron**
- **Tim Healy**

USBR

- **Vanessa Emerzian**

DCP Team

- **Rene Guillen**
- **Ginger Bryant**
- **Mike Savage**
- **Mark Millan**

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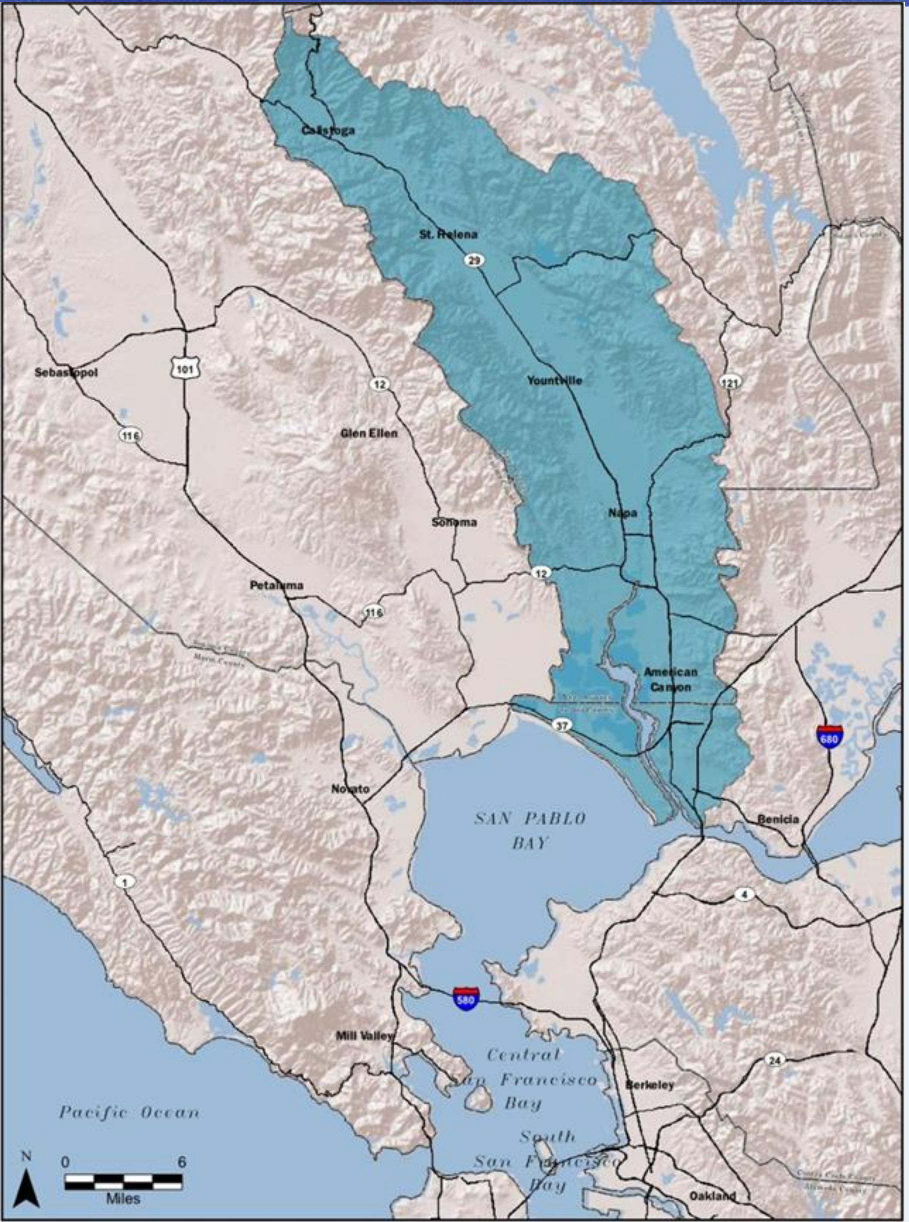


Napa Valley Drought Contingency Plan

Task Force Meeting #4a

November 9, 2020 1:30-3:00

Rene Guillen

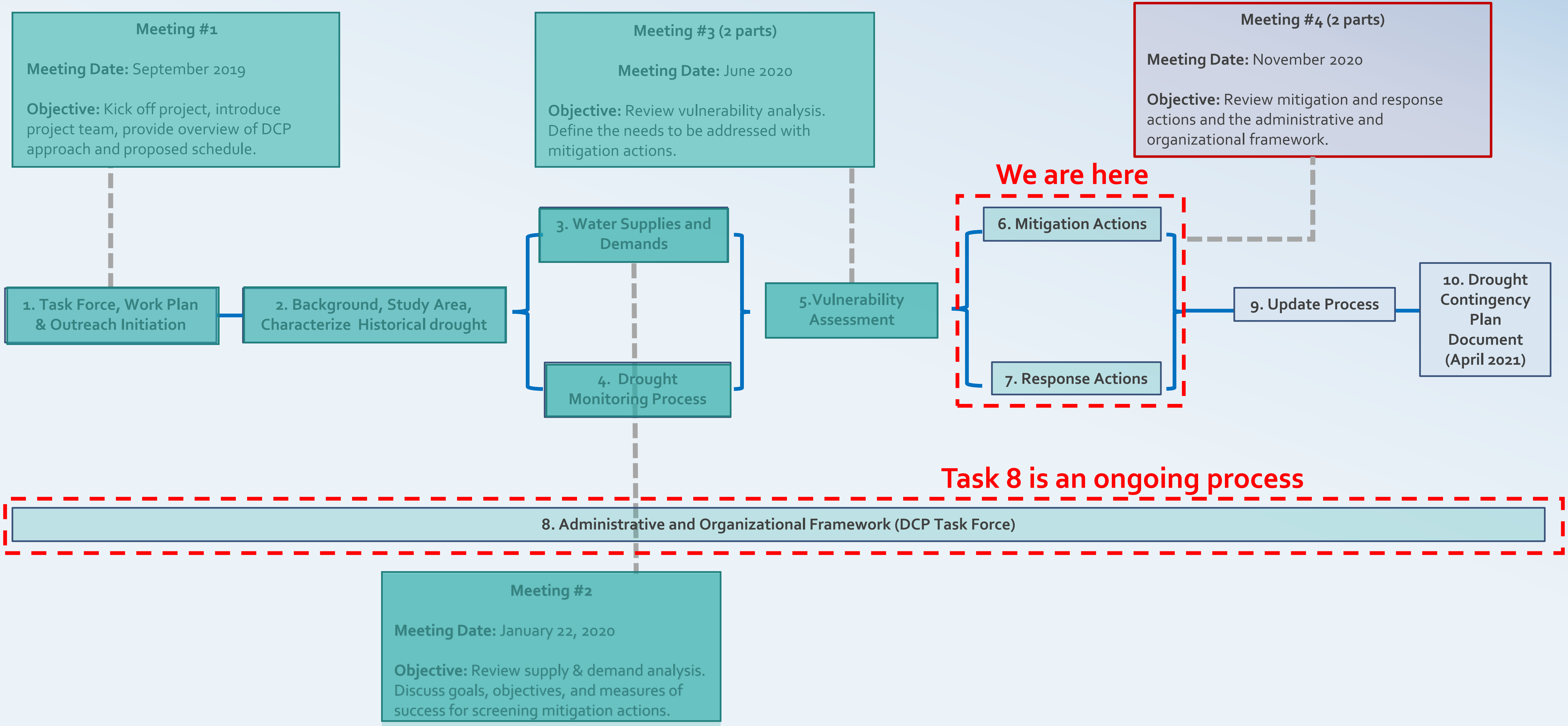
Meeting Agenda

Task Force Meeting 4a

- Mitigation and Response Actions
  - Part 1: Introduction/Recap
  - Part 2: Evaluation Process
  - Part 3: Discussion
- Next Steps – Task Force Meeting 4b

Rene Guillen

Where Are We?



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Mitigation and Response Actions

Part 1: Introduction/Recap

Review: What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Actions, triggered during stages of drought, to manage limited supply and decrease severity of impacts
- Response actions can be quickly implemented and provide expeditious benefits

Rene Guillen

Priorities from DCP Task Force (September 2019)

- Projects and actions that deliver real results
- Recommendations that are implementation driven
- Review and make recommendations on how to better utilize/manage existing facilities and supply
- Look at expanding applications for NapaSan winter water and explore potential of advanced purification efforts
- Develop a common platform for understanding surface supply water and groundwater interface, how this relates to State Water Project, and use this information for both DCP and regional educational purposes

Rene Guillen

Review of Worksession in August

Discussed the Preliminary Mitigation and Response Actions List to help:

- Develop a well-defined project list
- Identified Mitigation and Response Actions that:
  - Build long term resiliency to drought
  - Mitigate risks posed by drought
  - Decrease regional vulnerabilities
  - Reduce need for response actions

Rene Guillen

Preliminary List of Drought Mitigation & Response Actions

- Mitigation measures are at various stages of implementation; concept level to construction/implementation
- Some projects have been previously studied and are fairly well defined
- Projects/Actions were sorted into five drought mitigation project "categories"

Rene Guillen

Project/Action "Categories"

Groundwater Management	Conveyance	Storage	Treatment	Operations
• Projects that focus on aquifer storage, aquifer recovery, and groundwater basin recharge	• Projects that look to expand existing distribution systems such as to augment current use of recycled water	• Projects providing storage of existing or potential new water supplies to provide for drought resiliency through storage for future use	• Projects that look to expand and or upgrade existing treatment facilities	• Projects that provide for infrastructure improvements necessary to improve operational efficiency and flexibility

Outcomes from Worksession

- Task Force reviewed/provided input to refine Mitigation and Response Actions
- Added additional projects to help promote regional collaboration/solutions*
- Divided projects into two Stages:
  - **Implementation Ready** – well-defined implementable projects
  - **Planning** – concepts and/or implementable studies

**Please refer to the accompanying Mitigation and Response Actions document for further details*

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Mitigation and Response Actions

Part 2: Evaluation Process

Project Evaluation

- 23 Mitigation and Response Actions (projects) move forward with further evaluation*
- These were broken out into one of two Stages:

Implementation Ready Projects

Well defined and physically implementable projects

Projects: 14 Total (4-14, 18-19, and 21)

Planning Projects

Concept level projects or implementable studies

Projects: 9 Total (1-3, 15-17, and 20)

These are concurrent tracts designed to build long-term resilience to drought and improve supply reliability

**Please refer to the accompanying Mitigation and Response Actions document for further details*

Approach Overview

- Objectives and Weights for each of the DCP Goals were used to evaluate Mitigation and Response Actions
- Scores were assigned using both Quantitative and Qualitative criteria*
- “Implementation Ready” and “Planning” projects criteria/scoring differed slightly but approach was the same*

**Please refer to the accompanying Mitigation and Response Actions document for further details*

Mike Savage

Goals and Objectives

- Goals and Objectives were used to score/evaluate potential Mitigation and Response actions

Napa Valley DCP Task Force Goals	Weighting Factor	Napa Valley DCP Objectives	Weighting Factor (by Objective)
Supply Reliability & Flexibility	35%	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project	11.67% 11.67% 11.67%
Regional/Watershed Approach	20%	• Interface with Groundwater Sustainability Agencies to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	5% 5% 5% 5%
Environmental Enhancement	15%	• Maintain and protect public health and safety • Enhance local and regional ecosystems	7.5% 7.5%
Economic Feasibility & Financial Viability	30%	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	15% 15%

Rene Guillen

Scoring Example (Implementation Ready Projects)

Project: Phase 1 Recycled Water Distribution System Expansion

Step 1: Assigned Raw Scores – Includes both Quantitative and Qualitative Scores

- Scores were assigned based on available project information and scoring matrix

Improve local, regional, and State Water supply reliability (AFY)	Cost Effectiveness: Capital ($/AFY)	Cost Effectiveness: O&M ($/AFY)
102	30,392	294

Improve Reliance for non-drought disasters	Reduce Dependence on SWP	Interface with GSA	Alignment with Resilience Portfolio	Enhance Water use Efficiency	Climate Change Adaptation	Protect Public Health & Safety	Enhance Ecosystems	Ease of Implementation / Ready to Proceed
2	2	1	2	3	1	2	3	2

Scoring Example Continued (Implementation Ready Projects)

Step 2a: Normalize Raw Scores – Quantitative Objectives

- Quantitative scores were converted to a percentage of the maximum specified value amongst the projects being evaluated
- **Objective**: Improve Local, Regional, and State Water Supply Reliability
  - Range of Values: 0 to 10,000 AFY
  - Normalized Score for this Objective = 102 AFY / 10,000 AFY = 0.01

Improve local, regional, and State Water supply reliability	Cost Effectiveness: Capital ($/AFY)	Cost Effectiveness: O&M ($/AFY)
0.01	0.74	0.75

Scoring Example Continued (Implementation Ready Projects)

Step 2b: Normalize Raw Scores – Qualitative Objectives

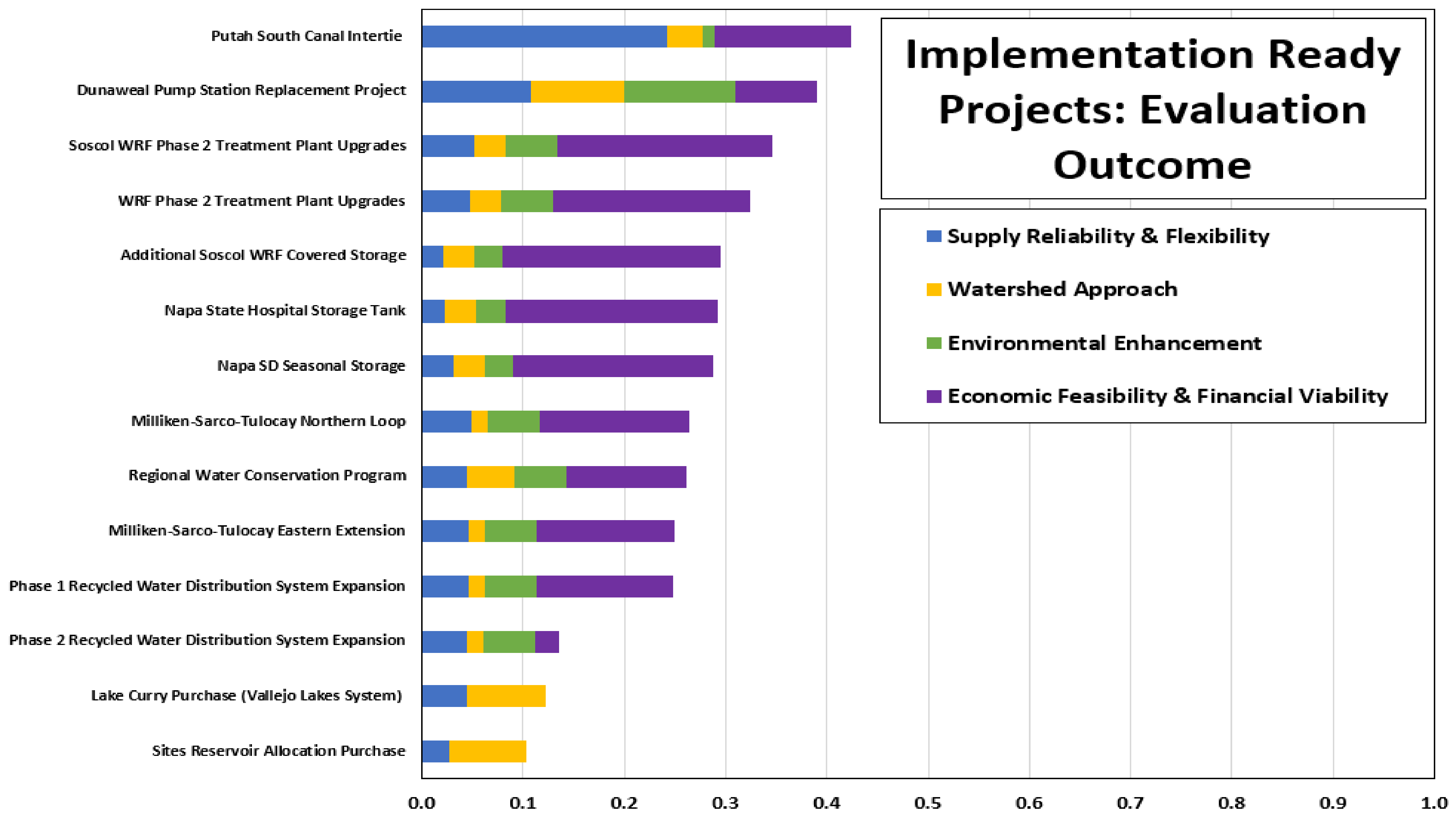
- Qualitative scores were converted to percentiles that reflect percentage of projects that are "less preferred"
- **Objective**: Improve Reliance for Non-Drought Disasters
  - Raw Score: 2
  - Number of other Projects: 13
  - How many projects did this specific project score better than? Answer: 3
  - Normalized Score for this Objective = 3 / 13 = 0.23

Improve Reliance for non-drought disasters	Reduce Dependence on SWP	Interface with GSA	Alignment with Resilience Portfolio	Enhance Water use Efficiency	Climate Change Adaptation	Protect Public Health & Safety	Enhance Ecosystems	Ease of Implementation / Ready to Proceed
0.23	0.15	0.0	0.0	0.31	0.0	0.23	0.46	0.15

Scoring Example Continued (Implementation Ready Projects)

Step 3: Apply Weighting Factors to Normalized Scores

- Weighting factors that were developed for the DCP Goals were further disaggregated and evenly distributed amongst the objectives identified for each respective goal
- **Objective**: Improve Reliance for Non-Drought Disasters
  - Normalized Score: 0.23
  - Weighting Factor: 11.67%
  - Final Score for this Objective = 0.23 * 11.67% = 0.03
- These scores were summed to form the bar chart for each individual project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Watershed Approach
Environmental Enhancement
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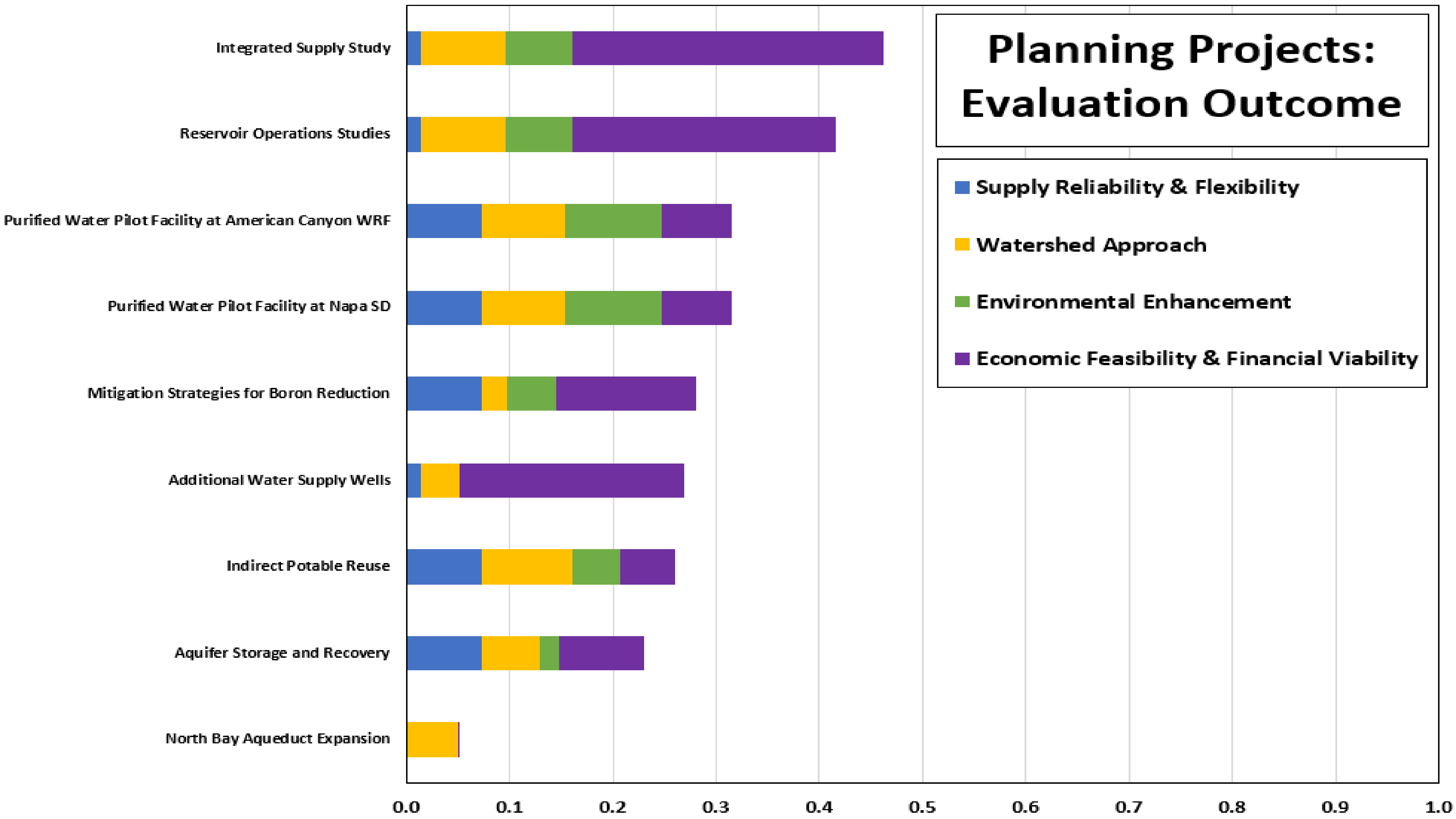
Mike Savage

"Implementation Ready" vs "Planning" Projects Evaluation

- Scoring for "Planning" projects was generally the same as "Implementation Ready"
- Minor differences in quantitative and qualitative objective scoring
  - Shifted "Improve local, Regional, and State Water supply reliability" from Quantitative to Qualitative
  - "Cost Effectiveness" was assessed on a "0 to 100" scale as there was insufficient information for scoring

**Please refer to the accompanying Mitigation and Response Actions document for further details*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Mitigation and Response Actions

Part 3: Discussion

Mitigation and Response Actions – Summary

Top 3 Implementation Ready Projects

- Putah South Canal Intertie
- Dunaweal Pump Station,
- Soscol WRF Phase 2 Plant Upgrades

- Both the Lake Curry Purchase and Sites Reservoir Allocation Purchase might perform better if we had more accurate cost data

Top 3 Planning Projects

- Integrated Supply Study
- Reservoir Operations Studies
- Purified Water Pilot Facility

- North Bay Aqueduct Expansion scored notably lower due in large part to project costs and continued reliance on imported water

Mitigation and Response Actions – Discussion

- Comments from the group given the results of the evaluation?
- Prioritization of another element of this assessment process - which projects would you like to see further developed?
  - Our scope allows us to carry three projects forward for further evaluation

Wrap up and Next Steps

Rene Guillen

Next Steps

- **Task Force Meeting 4b – November 16, 2020 1:30-3:00**
  - Discussion/Consider Action: Projects you'd like to see further developed
  - Administrative and Organizational Framework and Implementation discussion
- Provide feedback on Mitigation and Response Actions by November 23, 2020

Task Force Meeting #4a Agenda

Monday, November 16, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Review Mitigation and Response Actions:**
  - **Recap of last week's meeting**
  - **Continue discussion on projects**
- **Discussion on the Administrative and Organizational Framework and DCP Implementation**
- **Next Steps**

Task Force Meeting #4b Attendee List

Monday, November 16, 2020 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- Patrick Costello
- Phil Brun
- Joy Eldredge

Napa County

- Phil Miller
- Steven Lederer
- Jeff Sharp
- David Morrison

City of Calistoga

- Derek Rayner

City of St. Helena

- Erica Ahmann Smithies

City of American Canyon

- Felix Hernandez

Town of Yountville

- John Ferons

Napa Sanitation District

- Andrew Damron
- Tim Healy

USBR

- Vanessa Emerzian

DCP Team

- Rene Guillen
- Ginger Bryant
- Mike Savage
- Mark Millan

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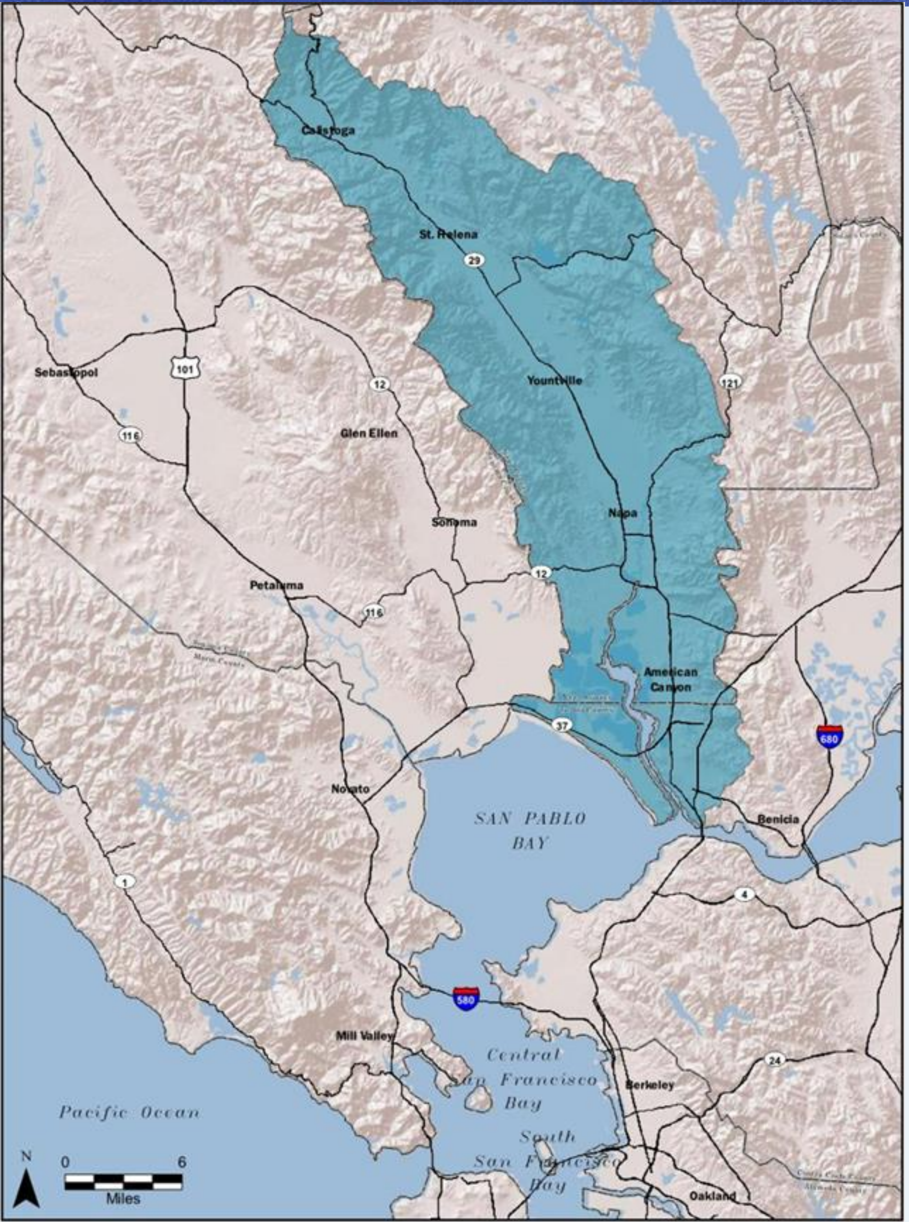


Napa Valley Drought Contingency Plan

Task Force Meeting #4b

November 16, 2020 1:30-3:00

Rene Guillen

Meeting Agenda

Task Force Meeting 4b

Part 1:

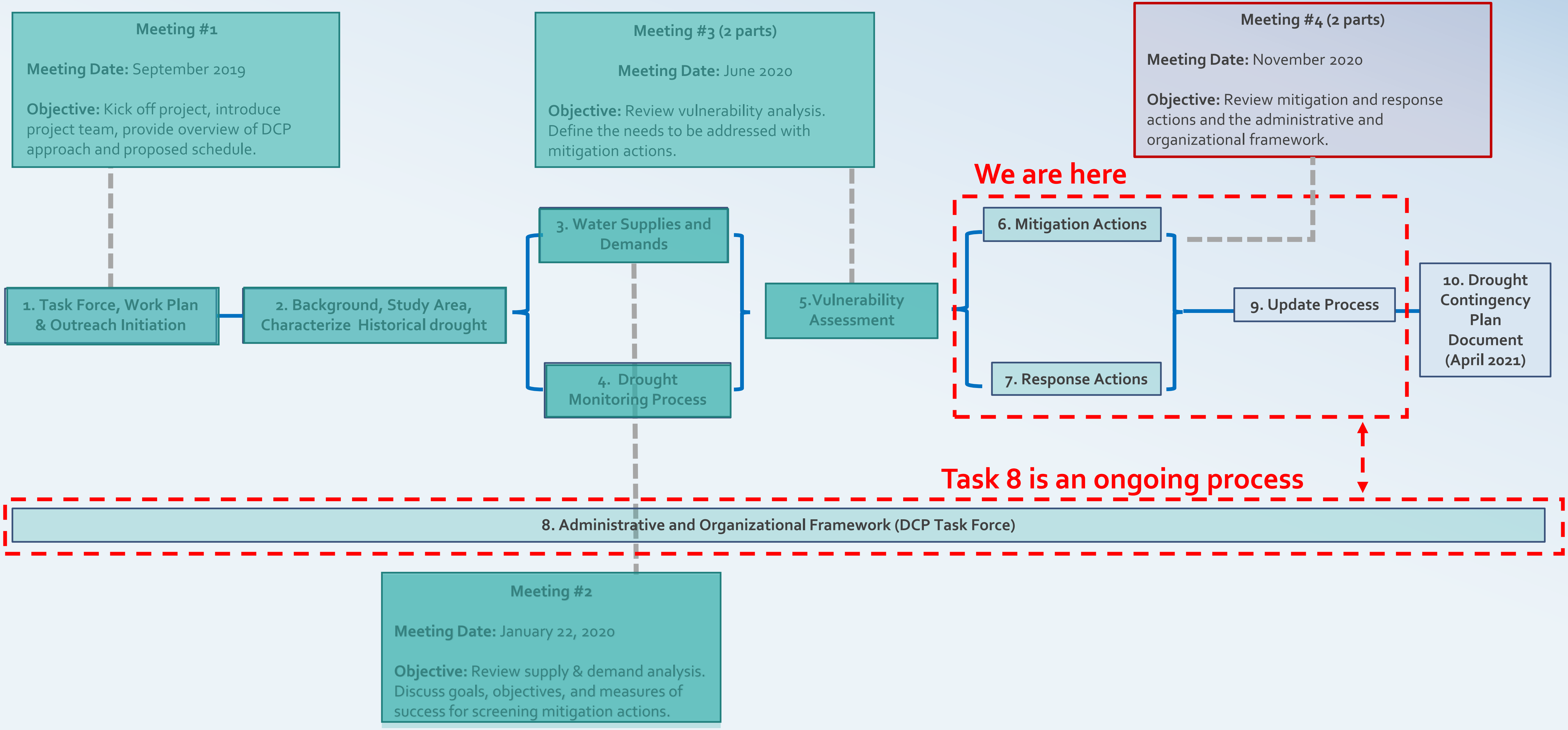
- Review Mitigation and Response Actions
- Discuss/Consider Action:
  - Top Projects you'd like see further developed

Part 2:

- Administrative and Organizational Framework/DCP Implementation

Rene Guillen

Where Are We?



Part 1: Mitigation and Response Actions

Rene Guillen

Outcomes from Worksession

- Task Force reviewed/provided input to refine Mitigation and Response Actions
- Added additional projects to help promote regional collaboration/solutions*
- Divided projects into two Stages:
  - **Implementation Ready** – well-defined implementable projects
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Please refer to the accompanying Mitigation and Response Actions document for further details

Rene Guillen

Project Evaluation

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Rene Guillen

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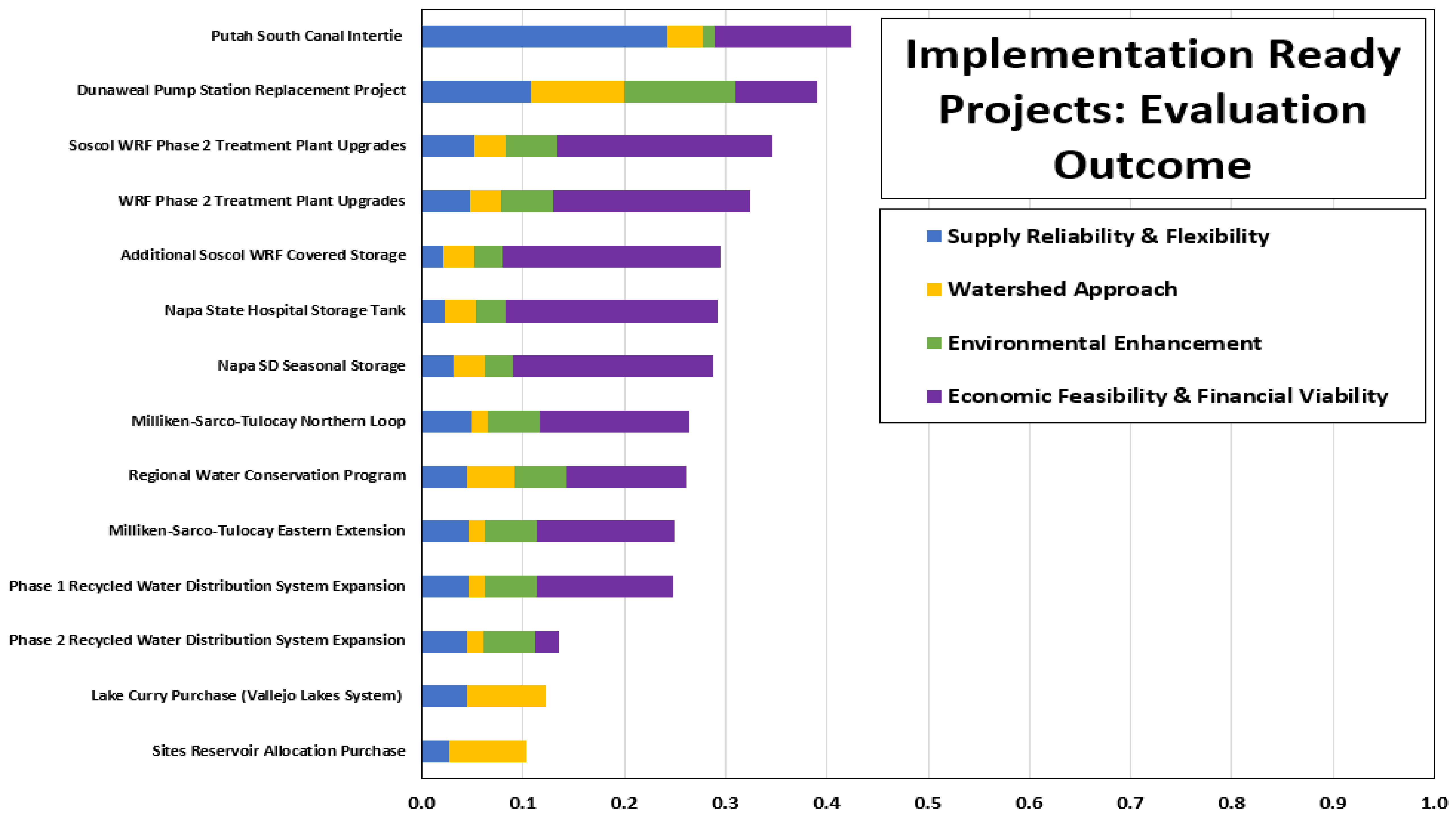
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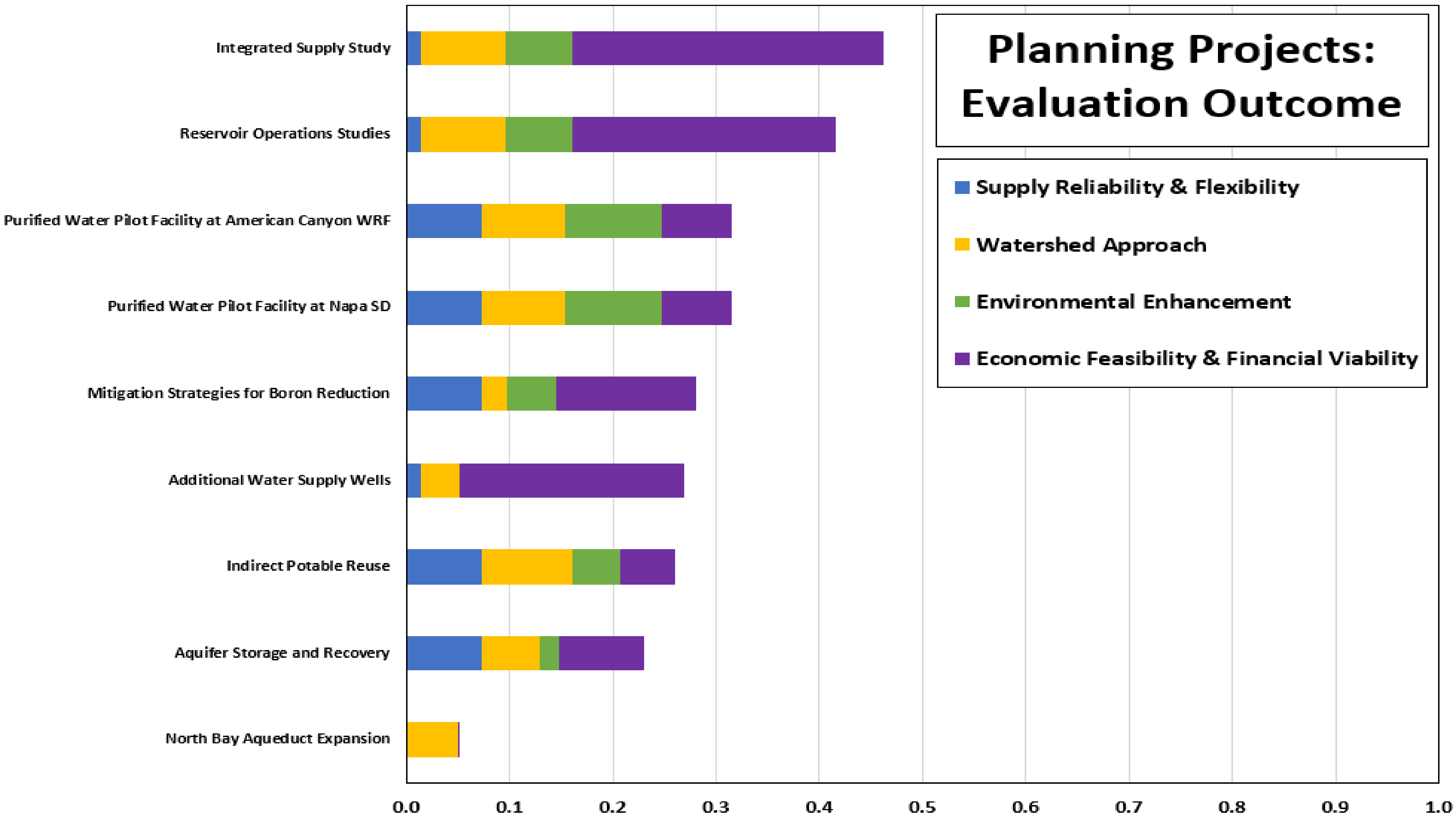
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Rene Guillen

Mitigation and Response Actions – Summary

Top 3 Implementation Ready Projects

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- Dunaweal Pump Station,
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Top 3 Planning Projects

- Integrated Supply Study
- Reservoir Operations Studies
- Purified Water Pilot Facility

- North Bay Aqueduct Expansion scored notably lower due in large part to project costs and continued reliance on imported water

Mitigation and Response Actions – Preliminary for Discussion

Rene Guillen/
Mike Savage

Comments from the group given the results of the evaluation?

Investigations of Interest:

- Integrated Supply and Reservoir Operations Study
  - Focus on in-valley includes SWP supply management
  - Focus on SWP/Sites supply, partnerships with out-of-valley entities
- Purified Water Pilot Facility Investigation

Part 2: Administrative and Organizational Framework/DCP Implementation

Administrative and Organizational Framework

Describes the Structure and Identifies who Implements the DCP Tasks

- Includes roles, responsibilities, and procedures necessary to:
  - Conduct drought monitoring
  - Initiate response actions, including emergency response actions
  - Initiate mitigation actions
  - Describe a process and schedule for monitoring, evaluating, and updating the DCP (generally every 5-yrs)

Administrative and Organizational Framework

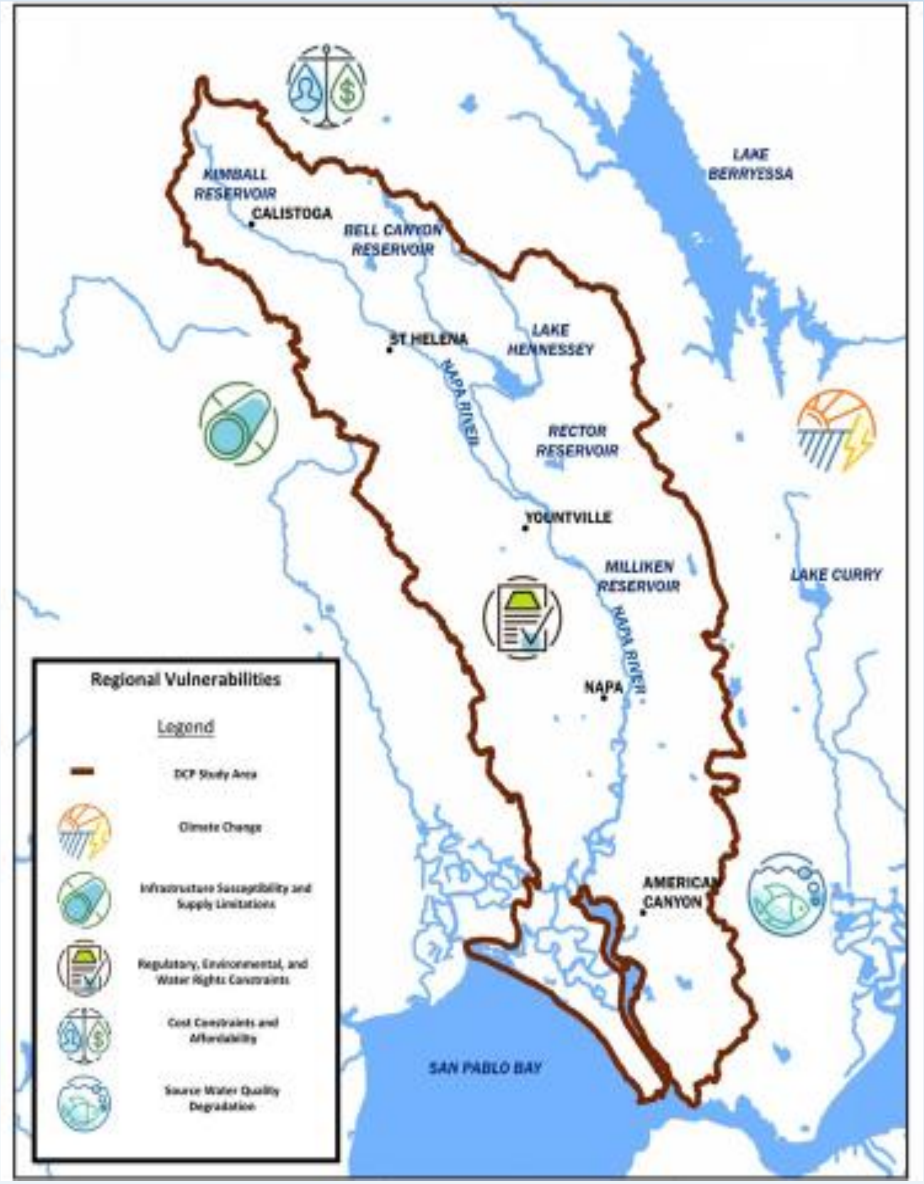
The DCP has identified regional water management challenges and developed strategies to address them. The Framework supports implementing the DCP and includes:

- The explanation as to **'Why'** you are doing the DCP:
  - Identifying water management challenges
  - Developing goals, objectives and performance measures that support local priorities
- The **'How'** is what you will do to build regional drought resiliency:
  - Mitigation and Response Actions
- Presents **Implementation Strategy** for the DCP:
  - Future actions for consideration

Ginger Bryant

The 'Why' of the DCP

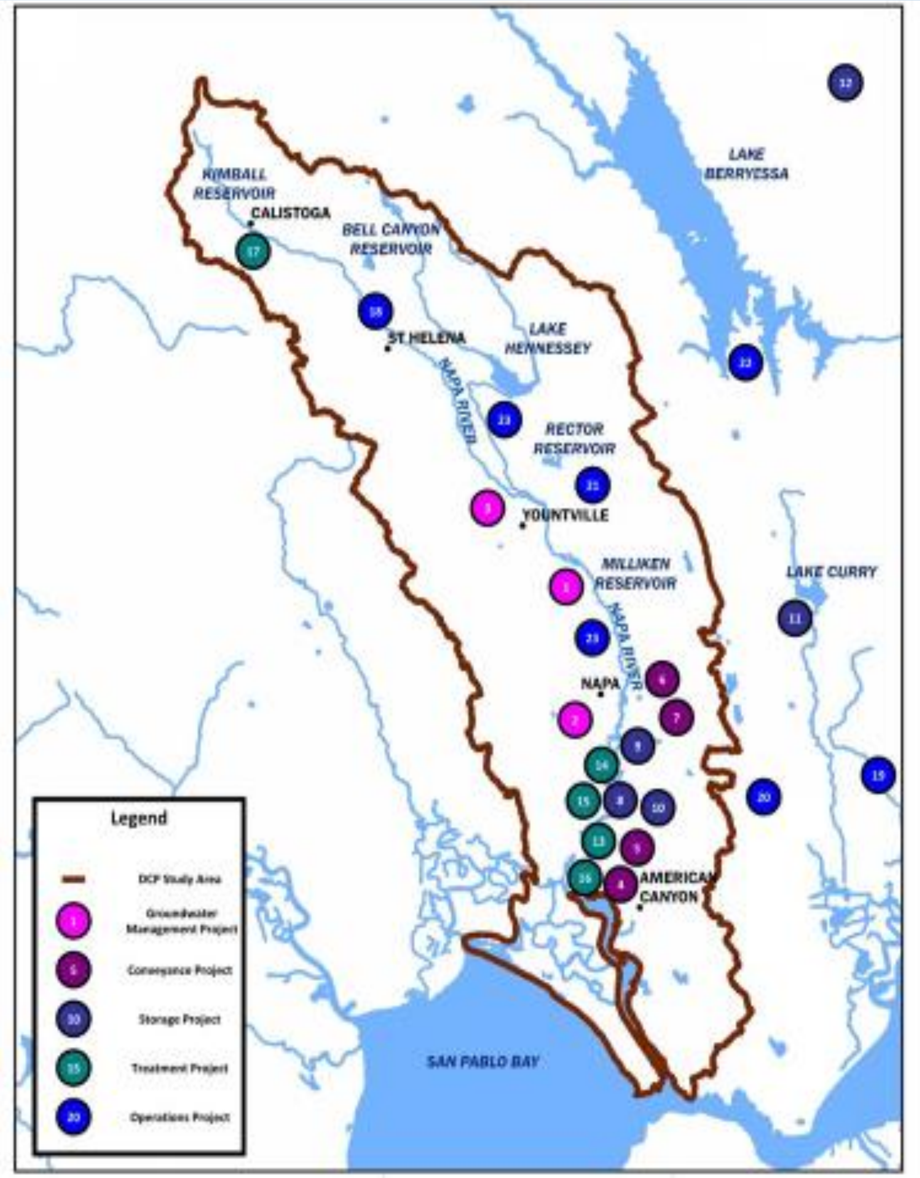
- The **'Why'** identifies challenges and priorities to be addressed in building capacity and resiliency into regional water supply



Ginger Bryant

The 'How' of the DCP

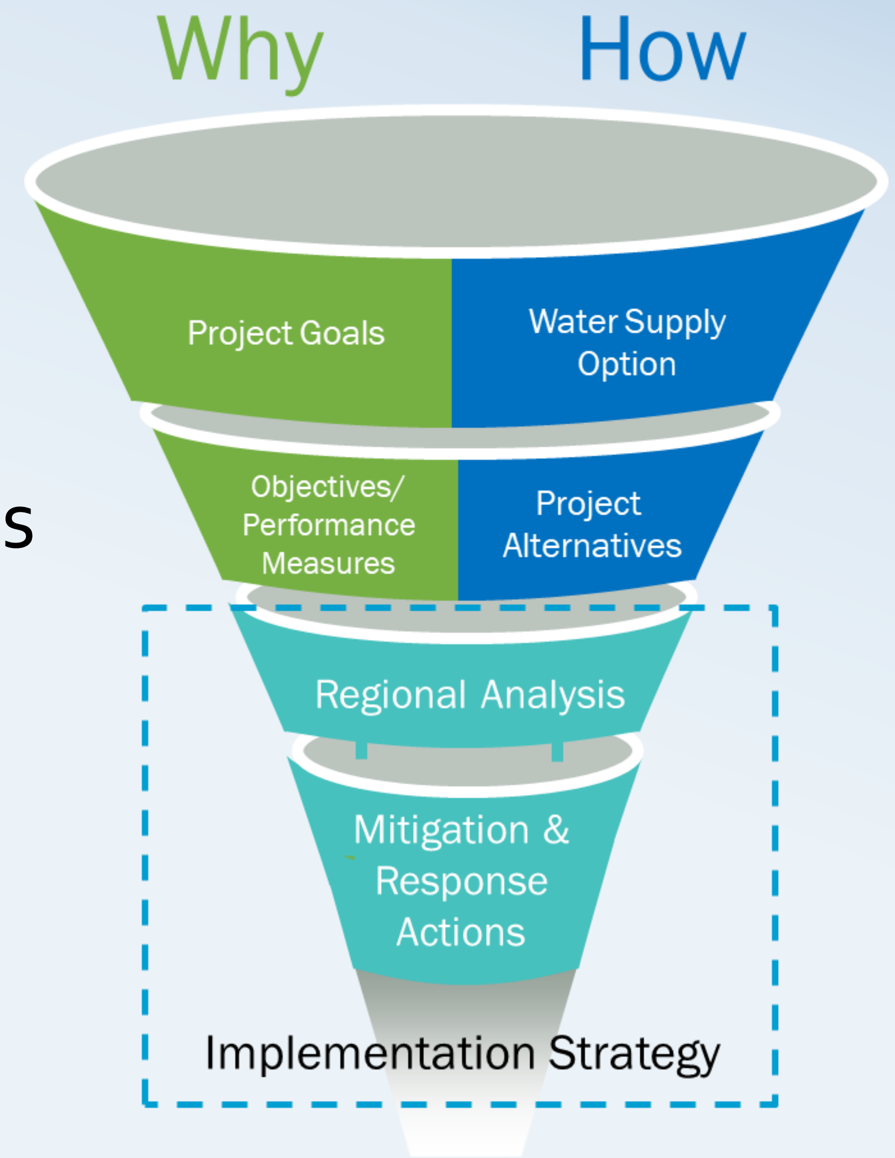
- The **'How'** identifies projects that incrementally contribute toward supply resiliency and mitigate drought impacts for the Napa Valley region .



Ginger Bryant

Separate the “Why” from the “How”

Equally inform development of strategies addressing needs of the region



Ginger Bryant

Implementing the DCP

- **Who is responsible for implementing the DCP:**
  - Given the collaborative working relationship of DCP Task Force members, there is an easy transition from initial planning activities to conducting studies and implementing projects
- **Implementation partnerships can emerge from these regional initiatives:**
  - Once the GSP is finalized, there maybe support from the GSA to implement projects that increase surface water supply thereby reducing potential demand on groundwater resources
  - The Municipal Service Review (MSR) introduced a diversity of local agency management options and prior to undertaking any of these, future financial, jurisdictional and operational issues would need to be clarified

Ginger Bryant

DCP Implementation

- Implementing this DCP will require preparation and support; both financially and with political support and leadership
- Task Force members have said they need outside funding in order to participate in future DCP activities
- Funding for future task force work may not be a high priority (at this time) as you prepare future budgets
- **Know that grants are available to help you build your new organization**

DCP Implementation Continued

The DCP is your vision document that establishes the need for further studies:

- In order to secure state and federal grant support, these studies should integrate priorities of the California Water Portfolio and federal water management agencies
- Completed studies put you at the front of the line for State and Federal grant assistance
- **Know that grants are available to help you develop regional feasibility studies**

Group Discussion

- General tasks under the Administrative and Organizational Framework have been described but, how this future work will be undertaken is the focus the following discussion

Introduction and Group Discussion

Thoughts to keep in mind - what does the Framework need to do for your agency?

- Do you want efficiencies of a single management entity?
- Do you want to partner on drought mitigation projects, actions and manage water beyond established service areas?
- Do you want financial assistance, ability to secure and manage project grants and or/financing?

Group Discussion – Refining Projects for Implementation

This program has many kinds of projects, including a multi-benefit approach (e.g. adding environmental benefits), this could attract additional funding sources for implementation

1. Would your agency generally support regional approaches that provide additional benefits as long as infrastructure identified in the DCP was the foundational project?
2. Does your agency have any specific priorities or preferences for securing funding assistance (grants) for the entire region, individual agencies, or a sub-group of agencies?

Ginger Bryant

Group Discussion – Future Work of the Task Force

Implementation requires continued work by the Task Force - the Napa Water TAC members could assume DCP responsibilities

1. Does your agency see future DCP activities continuing by a lead local agency, with existing staff and/or, supported with outside consultants?

2. For your agency to be engaged, the Water TAC would need to meet regularly. Would meeting on a bi-monthly or quarterly basis meet your agency's needs?

3. As a Water TAC member, would your agency be willing to financially contribute toward activities associated with identifying and securing grants and funding options for DCP task implementation?

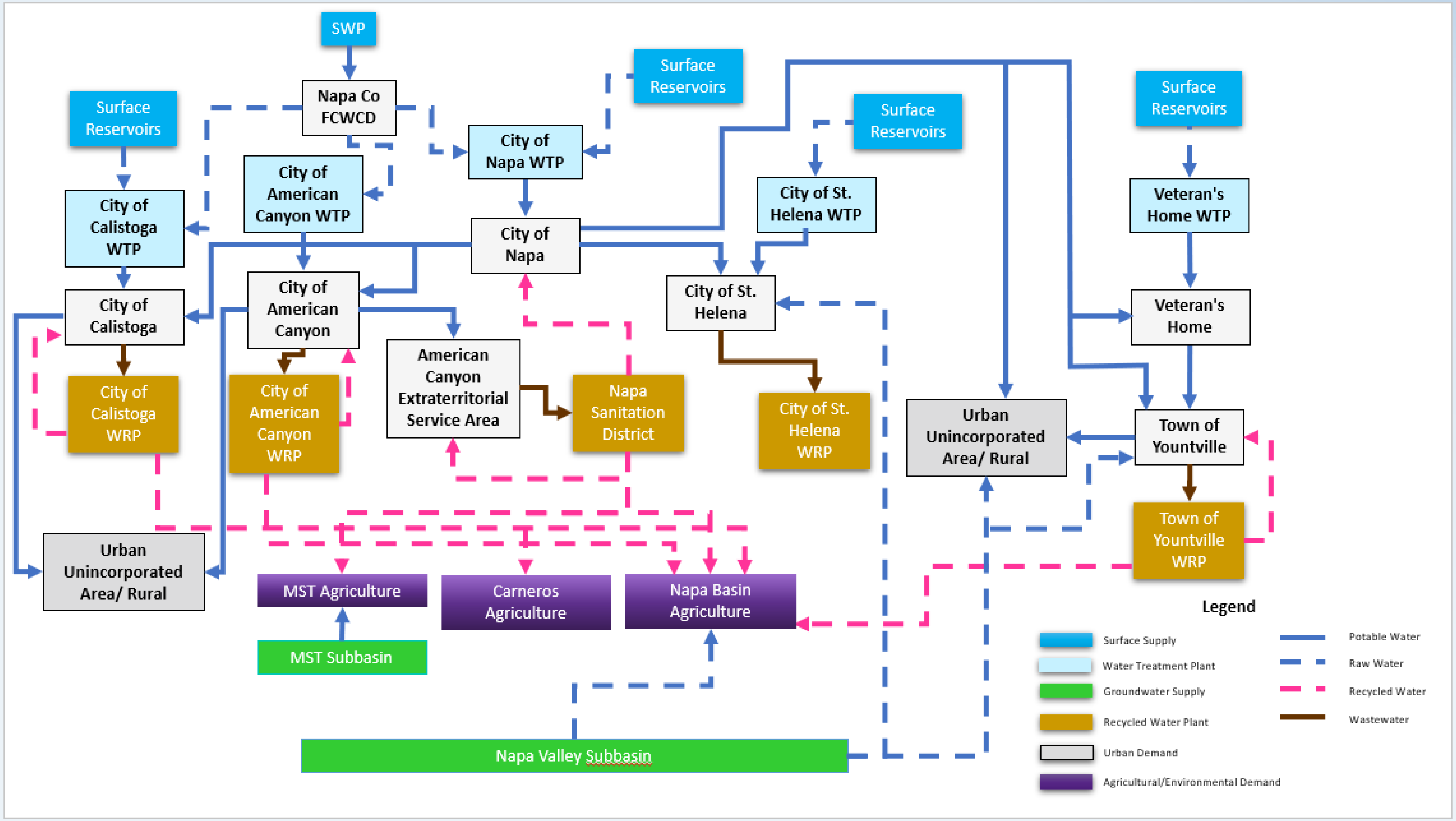
Wrap up and Next Steps

Rene Guillen

Next Steps for DCP

- Provide feedback on Mitigation and Response Actions by November 23, 2020
- Provide feedback on Administrative and Organizational Framework by November 23, 2020
- DRAFT DCP due early 2021
- Questions or Comments?

Integrated Supply and Reservoir Operations Study



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Task Force Meeting #5 Agenda

Wednesday, April 14, 2021 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Update on the Mitigation and Response Actions:**
  - **Sites Reservoir**
  - **Purified Water Assessment**
  - **Integrated Supply and Reservoir Operations**
- **Discussion on the Administrative and Organizational Framework and DCP Implementation**
  - **Includes discussion on potential near term availability of a State grant**
- **Next Steps**

Task Force Meeting #5 Attendee List
Wednesday, April 14, 2021 • 1:30 pm - 3:00 pm
Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- Patrick Costello
- Phil Brun
- Joy Eldredge

Napa County

- Steven Lederer
- Jeff Sharp
- Christopher Silke

City of Calistoga

- Derek Rayner

City of St. Helena

- N/A

City of American Canyon

- Felix Hernandez

Town of Yountville

- John Ferons

Napa Sanitation District

- Andrew Damron

USBR

- Vanessa Emerzian

DCP Team

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Napa Valley Water
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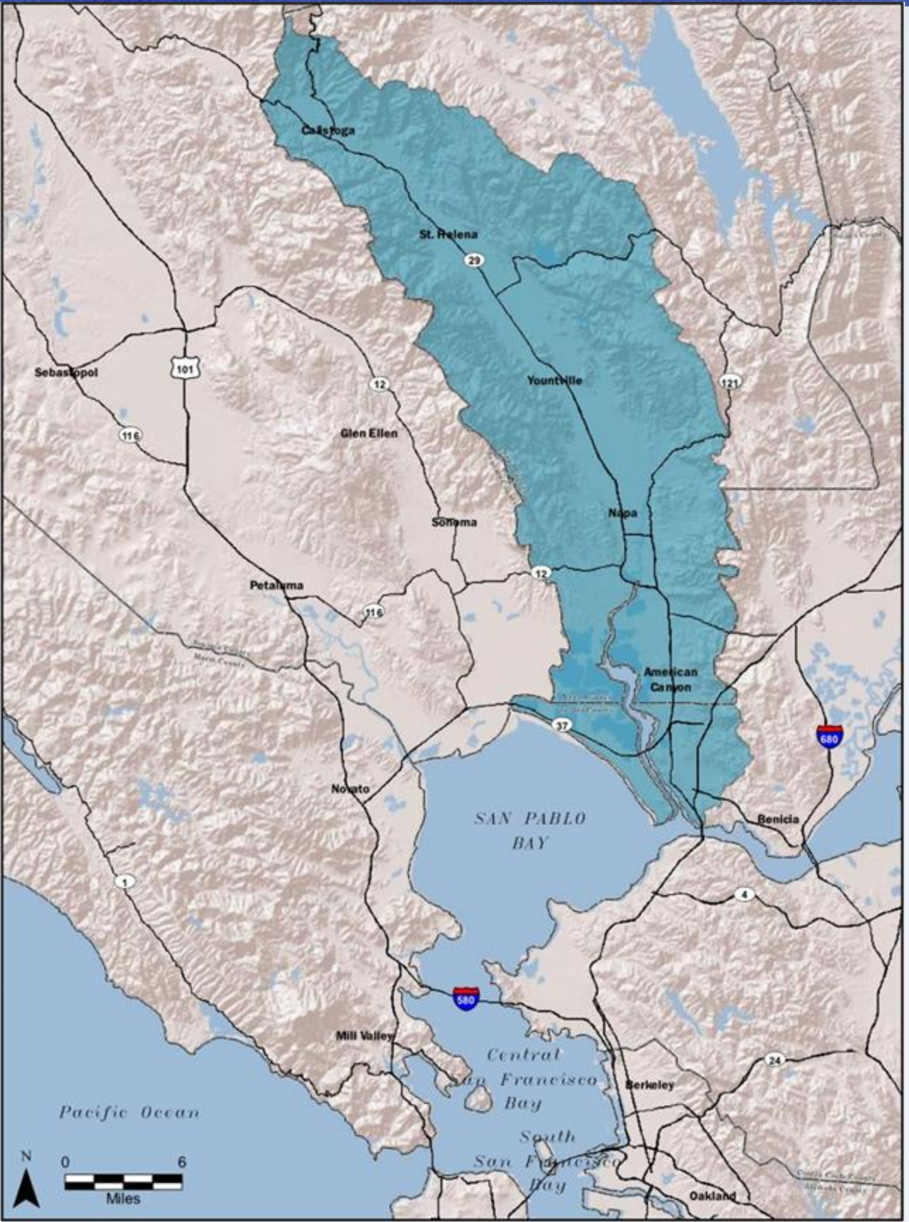


Napa Valley Drought Contingency Plan

Task Force Meeting 5

April 14, 2021 1:30-3:00

Meeting Agenda

- Update on the Mitigation and Response Actions
  - Sites Reservoir
  - Purified Water Assessment
  - Integrated Supply and Reservoir Operations
- Administrative and Organizational Framework
- Next Steps for the DCP

Where Are We?

Completed DCP Tasks

- Task Force Formation, Work Plan & Outreach Process
- Background, Study Area, Characterize Historical Drought
- Water Supplies and Demands
- Drought Monitoring Process
- Vulnerability Assessment

Concludes Task Force Discussion

- Mitigation Measures and Response Actions
- DCP Update Process
- Administrative and Organizational Framework (DCP Implementation)

Finishing the DCP

- Present DRAFT DCP
- USBR Review
- Final DCP

Napa Valley Water
Management Agencies

U.S. Bureau of Reclamation

Mitigation and Response Actions: Sites Reservoir

Rene Guillen

Sites Reservoir Project Overview

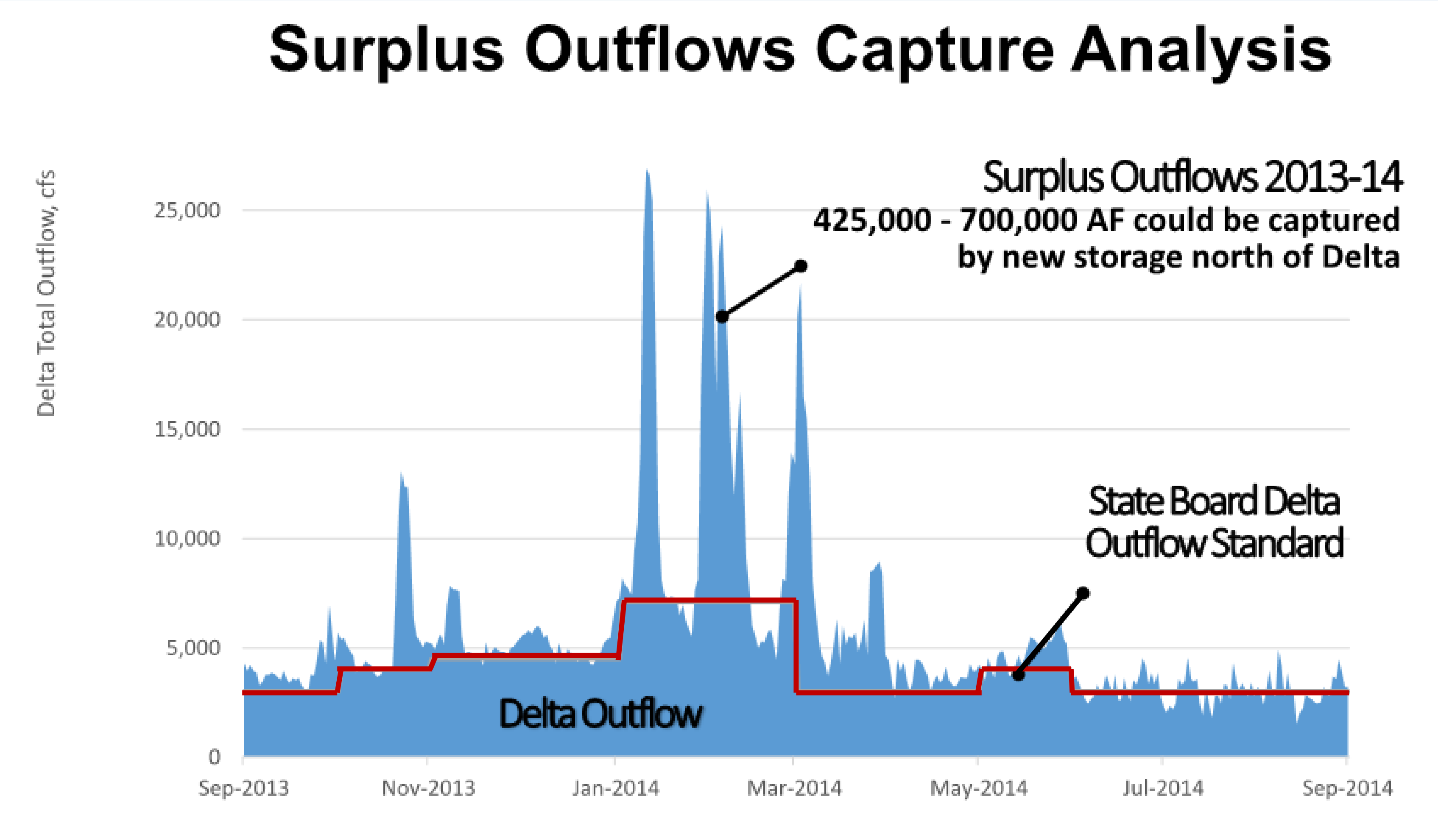
- Reservoir will utilize available surplus flows from Sacramento River
- Water will be stored in an Off-stream Sacramento River Storage (1.3 – 1.5 million AF)
- Project objectives:
  - Improve water supply reliability for participants and environment
  - Provide opportunities for recreation and flood damage control

Key Attributes of the Project

- Project Cost: $3.3 Billion
- 29 active participants
- Average Annual Supply: 230,000 acre-feet
  - About 190,000 for public water agencies
  - About 40,000 for the State
- Goal is to have the project completed in December 2030
  - Start filling the reservoir in 2029
  - Start of actual water deliveries will depend on hydrology, two wet years likely fill up the reservoir

Rene Guillen

Where is the Water Coming from?



**Analysis of the October 2013 through September 2014 drought period conducted by Metropolitan Water District*

What are the Costs?

- Agencies responsible for the following:
  - **Planning/Engineering Costs: $508 per acre-foot** ($208 per acre-foot covers work through December 2021, additional $300 likely carries project through July 2023)
  - **Annual Costs: $600 to $700 per acre-foot**
- Bank financing set to kick in July 2023
  - Agencies likely won't start paying debt service until the facility is operational
  - Share of the debt service will be based on whatever allotment you have on the project

How to get Involved?

- Sites Project has periods of "Rebalancing"
  - Exercise to confirm how much allotment each agency has and adjust allotments if needed
- Last "rebalancing" happened in September 2020, next is likely to occur in January 2022
- Existing project participants get first shot at adjusting their allotment
- Once the readjustment in January happens, Sites Project Authority will be able to determine if space is available. **As of right now, none is available**

Potential Next Steps

- For Napa DCP agencies, best option for involvement is through American Canyon
  - As an existing partner, would be able to increase their existing allotment before other outside agencies can participate
- Decision for involvement would need to happen by July 2023 (last anticipated "rebalancing" event), that's when bank financing kicks in
- After July 2023, each agency would be responsible for paying their share of the debt service

Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

Mitigation and Response Actions: Purified Water Assessment

Rene Guillen

Project Refinement

- Original project concept involved developing a demonstration project to explore potable reuse application and stakeholder acceptance
- Project evolved after conversations with City of Napa, American Canyon, and Napa San
- Modified project is looking to develop purified water alternatives for the region

Water Reuse Type

- Assessment is focused on both types of direct potable reuse
  - **Raw Water Augmentation (RWA) –** planned placement of purified water into a raw or untreated water distribution system
  - **Treated Water Augmentation (TWA) –** planned placement of purified water into the treated water distribution system

Rene Guillen

Assessment Alternatives

- All alternatives assume available effluent from both Napa San and American Canyon go to the Advanced Water Purification Facility (AWPF) for purified water production
- Alternatives Summary:
  - **Alternative 1:** AWPF for **RWA** at Jamieson WTP/American Canyon WTP
  - **Alternative 2:** AWPF for **RWA** at Napa San
  - **Alternative 3:** AWPF for **TWA** at Jamieson WTP/American Canyon WTP

Rene Guillen

Next Steps

- Napa San and American Canyon to confirm available effluent
  - Estimate should consider existing recycled water demands and future commitments
- Confirm proposed alignments with both Napa San and American Canyon
  - Which existing facilities can be leveraged to reduce potential costs?

Napa Valley Water
Management Agencies

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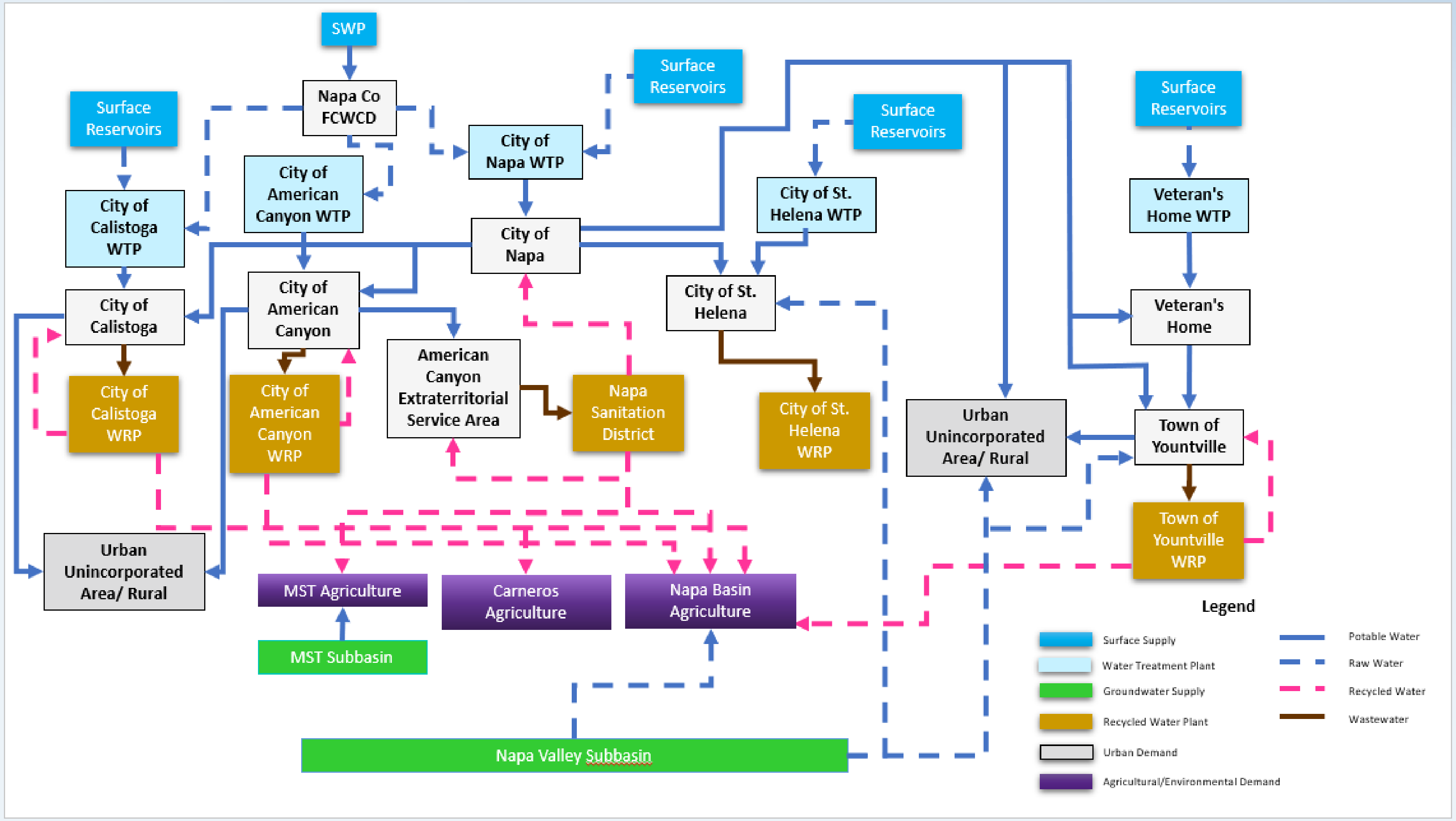
Mitigation and Response Actions: Integrated Supply and Reservoir Operations

Michael Savage

Physical Linkages between Agencies

- Each of the water supply agencies has shared water supplies or linkages
- Understanding the linkages is critical to addressing drought responses
- Future modeling is needed to adequately assess these linkages



Summary of Water Supply Projections

- Surplus of water exists within the Valley, even in the critical dry year condition
- Demands stemming from the agriculture sector seem to be driving largest water supply deficit
- How can this surplus in water be distributed to other areas in the Valley?
- **Goal should be to identify opportunities to maximize existing water supplies in the Valley**

Michael Savage

Integrated Supply Assessment

- Looking for opportunities to optimize use of existing water supplies and help create new and or augment existing ones
- Assessment can be broken out into two phases:
  - **Phase 1** – Look for projects that help maximize and optimize the use of existing water supplies and develop scope for Phase 2 (DCP)
  - **Phase 2** – Look for projects that create new or help augment existing water supplies (Future Study)

Michael Savage

Integrated Supply Assessment – Phase 1 and 2

Status Quo | **Action** | **Implementable Projects** | **Impact**

Phase 1 –Based on Desktop Assessment (DCP)

Supply shortfalls present? Where and magnitude?

→ Look for opportunities to maximize existing water supply

→ Near Term Project 1

→ Near Term Project 2

→ Help improve reliability and flexibility

→ Increase in the amount of water that can be delivered

Phase 2 – Based on Integrated Hydrologic Model (Future Study)

Supply shortfalls present? Where and magnitude? Opportunities to augment supply?

→ Look for opportunities to create new or help augment existing water supplies

→ Long Term Project 1

→ Long Term Project 2

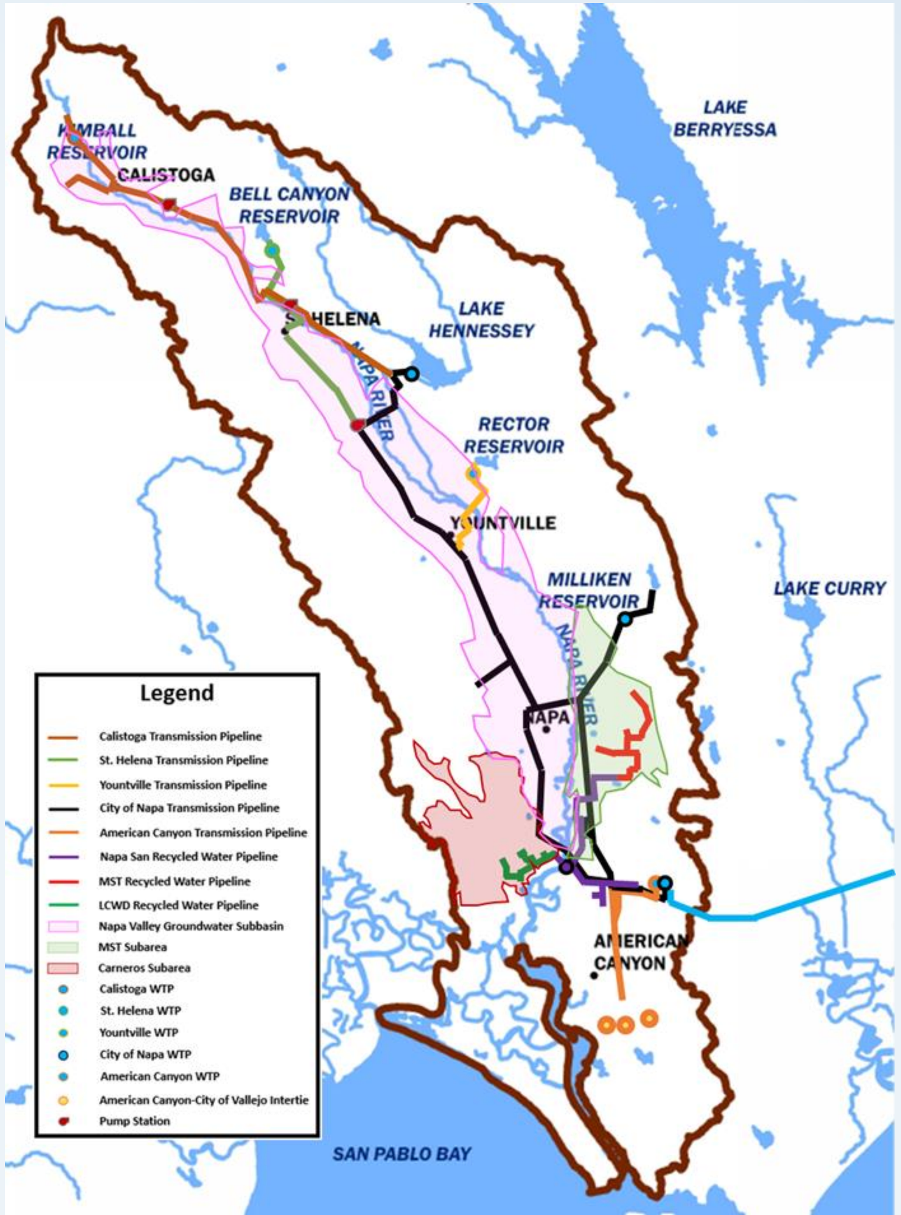
→ More diverse water supply portfolio for the region

→ Reduced vulnerability to long term impacts of drought

Near Term Projects for Implementation

- Dunaweal Pump Station Project
  - Improves flexibility and efficiency for water deliveries
  - Improves reliability of critical infrastructure
  - Allows for increase in supply deliveries
- Dwyer Road Pump Station Project
  - Improves flexibility and efficiency for water deliveries
  - Improvements to water quality being delivered
- Integrated Water Supply Wells
  - Use surface water to augment groundwater use (i.e., conjunctive use)

Integrated Water Supply and Reservoir Operations Studies



- Integrated hydrologic model is developed and being calibrated as part of the GSP
  - Some of this work can be leveraged for Phase 2 (Future Study)
- Phase 2 (Future Study) would look to build on existing model to assess:
  - Expanded Recycled Water Irrigation
  - Reservoir Operations Studies
  - Potable Reuse
  - Imported Water Options

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Administrative and Organizational Framework/DCP Implementation

Reclamation DCP Requirements for Administrative and Operational Framework

Ginger Bryant

- **Responsibilities** – what types of things should the Administrative and Operational Framework do?
  - Drought monitoring, initiation of drought response actions and mitigation action (i.e., projects), updates the DCP
- **Roles** – who does what?
  - Identify any Task Forces or working groups with ongoing drought-related responsibilities
- **Procedures** – document processes and procedures
  - Drought declaration process, process for initiating working group, process for requesting State or Federal assistance
- **Resources** – what tools do you have available?
  - A description of Federal, State, and local drought relief and mitigation programs and drought resources

Administrative and Organizational Framework: What is Needed to Implement the DCP

Ginger Bryant

- Thank you for completing the Administrative and Organizational Framework Questionnaire
- Responses provided critical direction for future work
- Focused on what's needed for DCP implementation
  - Recognized planning priorities may differ
  - Identified priorities for implementing Studies and Projects
  - Described organizational needs for future work together

Questionnaire: General Questions

- Do you want the efficiencies of a single management entity?
  - General consensus. An MOU or JPA could be formed as a high-level entity to support regional collaboration and project implementation. Give consideration to specific municipal water resource management programs due to respective budgets, supply sources, and drought triggers in the region
- Do you want to partner on Drought Mitigation projects/actions and manage water beyond established service areas?
  - General consensus. The MOU or JPA should be tasked with providing clear project benefits, costs, and equitable decision-making structure to all members

Questionnaire: General Questions – continued

- Do you want financial assistance, ability to secure and management project grants and/or financing?
  - General consensus: Consideration should be given to costs of securing and managing grants relative to the amount of funds received

Questionnaire: Refining Projects for Implementation

- Would your agency generally support regional approaches that provide additional benefits as long as infrastructure identified in the DCP was the foundational project?
  - General consensus: Projects should not be limited to those identified in the DCP and that decisions be made with respect to local priorities and budget constraints
- Does your agency have any specific priorities or preferences for securing funding assistance (grants) for the entire region, individual agencies, or a sub-group of agencies?
  - Two priorities: 1) Specific support for both the Integrated Supply and Reservoir Operations and Purified Water Options Studies and, 2) Recognition that some grant programs may be specific to/benefit different sub-regions

Ginger Bryant

Questionnaire: Future Work of the Task Force

- Does your agency see future DCP activities continuing by a lead local agency with existing staff and/or, supported with outside consultants?
  - Responses were mixed. Most agreed that local agencies should retain autonomy but could work under a lead agency, MOU or JPA supported by a mix of staff and consultants. Recognize that continued regional planning efforts have costs issues to be addressed
- For your agency to be engaged, the Water TAC would need to meet regularly. Would meeting on a bi-monthly or quarterly basis meet your agency's needs?
  - General consensus: That the Water TAC was a good, staff level forum for discussing water resource issues. Support for monthly or quarterly Water TAC meetings with SWP subcommittee

Questionnaire: Future Work of the Task Force - continued

- As a Water TAC member, would your agency be willing to financially contribute toward activities associated with identifying and securing grants and funding options for DCP implementation?

  General consensus:
  - The Water TAC should remain staff level forum for discussing projects, potential partnerships, and information exchange
  - If a MOU or JPA was proposed, costs and benefits to participating agencies need to be developed and approved by agency boards
  - Additional regional studies, project analysis, grants, and/or financing proposals would need approval of individual agency boards and could be administered under a potential MOU or JPA
  - Agencies would consider partnering in a local, project specific funding initiative

Additional Considerations

- Local agency responses to the LAFCO MSR were in support of regional collaborations but not in forming a county water agency at this time
- The Napa Valley GSA was formed after the DCP was initiated; the Task Force has identified these two entities need to continue collaborations
- The GSP will be completed later this year, the model being developed under the GSP would be needed in undertaking the Integrated Water Resources and Reservoir Operations investigation

Additional Considerations – continued

- Both the DCP and the GSP need to be updated in 5-years and should include actions on how these two initiatives contribute toward building resiliency into the regions water supply.
- There is no established regional entity responsible for implementing the DCP
  - Reclamation requires we identify an agency or regional entity responsible for implementing the DCP and updating the Plan
- It is anticipated that new State grant funding will prioritize collaboration between GSA's and IRWM groups. There are many on-line forums discussing how these plans could be integrated for example, see the IRWM website: https://roundtableofregions.org
- **Agencies need to consider funding opportunities early, think how to best position for the future**

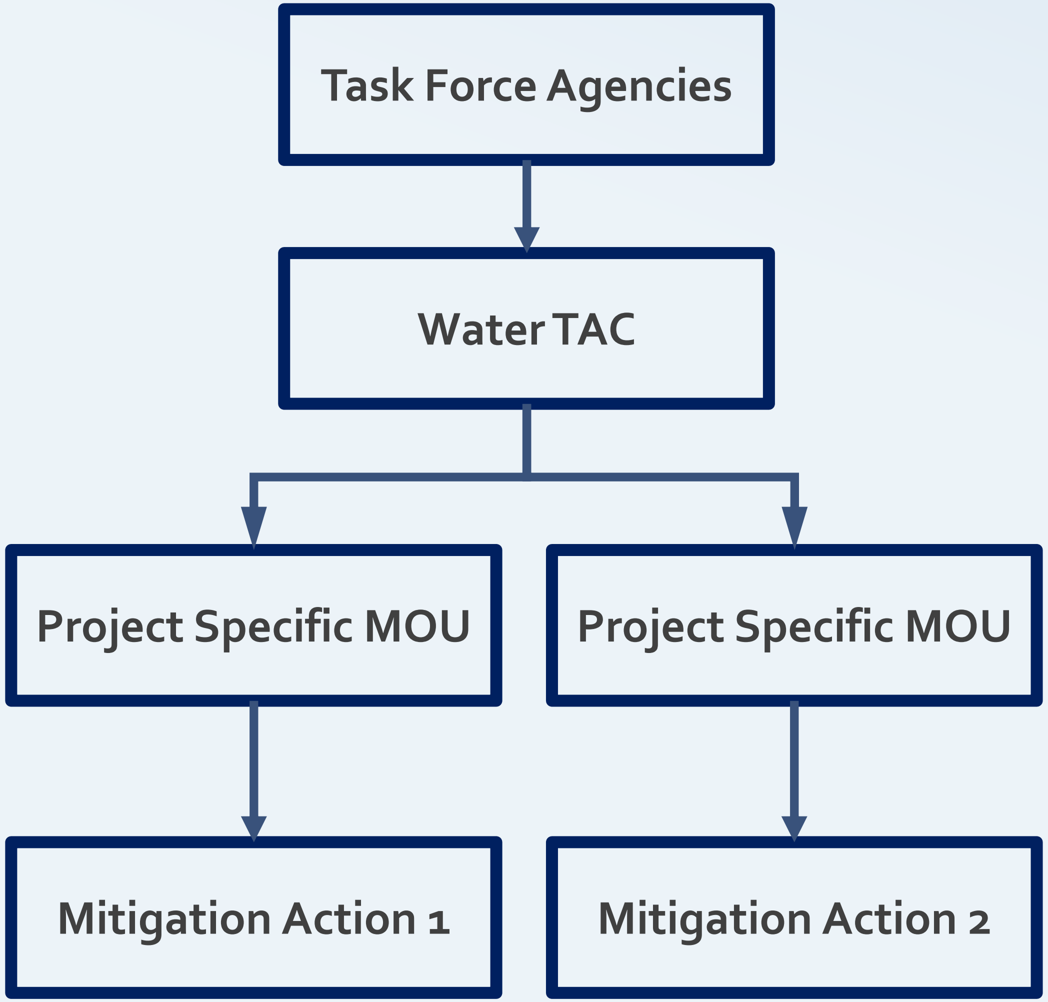
Ginger Bryant

Results from Task Force's work

- Mitigation Measures and Response Actions have been prioritized and next steps for studies and projects identified.
  - Integrated Supply and Reservoir Operations
  - Purified Water Options Studies
  - Sites Reservoir
- Key criteria were identified for an MOU or JPA to support implementation.
  - High-level entity that supports member agency autonomy
  - Provide clear benefits, costs, and equitable decision-making structure to all members
  - Approved by all agency governing boards

Potential Implementation Strategies

Option 1



Option 2

Ginger Bryant

Potential Funding Opportunity

- Investigating near term availability of State grant
- Could fund results of the DCP Task Force work
  - Support formation of an MOU
  - Integrated Supply and Reservoir Operations Study
  - Purified Water Assessment

Wrap up and Next Steps

Rene Guillen

Next Steps for DCP

- Questions or Comments?
- What's next:
  - Finalize mitigation and response actions
  - Draft DCP due June 2021
  - USBR Review in Summer 2021
  - Final DCP due Fall 2021

Task Force Meeting #6 Agenda

Tuesday, October 12, 2021 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Finishing up the DCP:**
  - **Discuss DCP Administrative Draft**
  - **Tentative Schedule to complete DCP**
- **Next Steps**

Task Force Meeting #6 Attendee List

Tuesday, October 12, 2021 • 1:30 pm - 3:00 pm

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- Patrick Costello
- Phil Brun
- Joy Eldredge

Napa County

- Steven Lederer
- Jamison Crosby
- Christopher Silke
- David Morrison

City of Calistoga

- Derek Rayner

City of St. Helena

- N/A

City of American Canyon

- Felix Hernandez

Town of Yountville

- John Ferons

Napa Sanitation District

- Andrew Damron
- Tim Healy

USBR

- Vanessa Emerzian

DCP Team

- Rene Guillen
- Mike Savage
- Mark Millan

Napa Valley Water
Management Agencies

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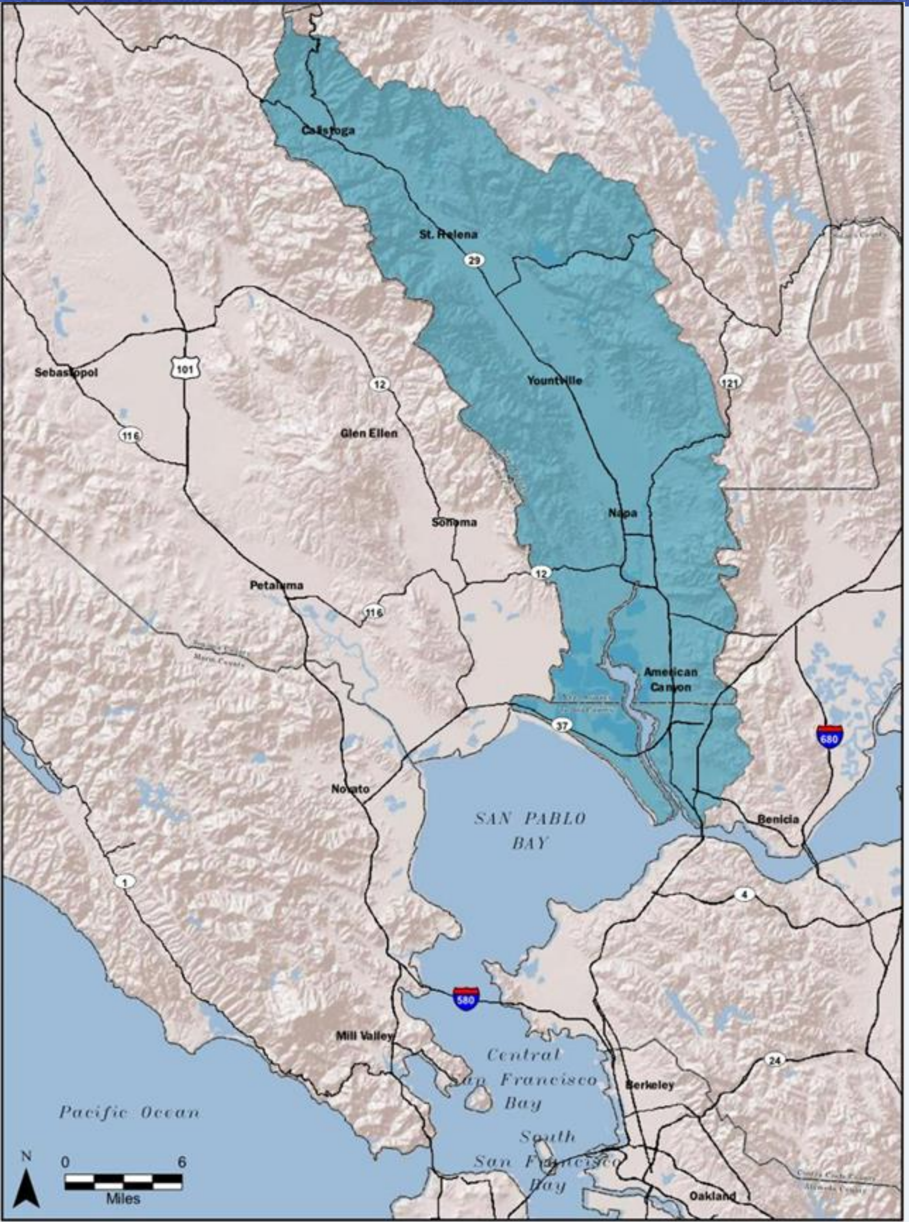

Napa Valley Drought Contingency Plan

Task Force Meeting 6

October 12, 2021 1:30-3:00

Rene Guillen

Meeting Agenda

- Finishing up the DCP
  - Discuss DCP Administrative Draft
  - Tentative schedule to complete DCP
- Next Steps

Rene Guillen

Where Are We?

Completed DCP Tasks

- Task Force Formation, Work Plan & Outreach Process
- Background, Study Area, Characterize Historical Drought
- Water Supplies and Demands
- Drought Monitoring Process
- Vulnerability Assessment
- Mitigation Measures and Response Actions
- DCP Update Process
- Administrative and Organizational Framework (DCP Implementation)

Finishing the DCP

- Present DRAFT DCP
- USBR Review
- Final DCP

Finishing up the DCP

Rene Guillen

Drought Contingency Plan Review

- Drought Contingency Plans address
  - How will we recognize the next drought in early stages
  - How will drought affect us
  - How can we protect ourselves from the next drought
- Drought Resiliency Projects
  - These projects are referred to as "mitigation actions" in the DCP
  - Are implemented to mitigate effects of drought

BUREAU OF RECLAMATION

Rene Guillen

DCP Development and Outcomes

- Detailed work plan that included a Communication and Outreach Plan
- Local Agency and Stakeholder Engagement
  - 9 DCP Task Force Meetings (includes worksession for Mitigation and Response Actions)
  - 6 Outreach Meetings (includes WICC and GSPAC presentation)
- DCP Summarized the results of the DCP Task Force's work:
  - Provided an overview of the region's water supply and demand conditions
  - Identified regional vulnerabilities to critical resources
  - Mitigation and Response Actions were evaluated and next steps for studies and projects were identified
  - A framework to support implementation of the various components of the DCP was developed

Rene Guillen

Tentative Schedule

- Current agreement with Reclamation expires at the end of this year (December 31, 2021)

Item	2021											
	October				November				December			
DCP Task Force Review of DCP												
Update DCP per Task Force Review												
Reclamation Review of DCP												
Update DCP per Reclamation Review												

Rene Guillen

Schedule Assumptions

- Extension might be needed to accommodate Reclamation review period
  - Contract with Reclamation
  - Contract with Consultant Team
  - Interagency Agreements?
- We expect no project activity during Reclamation's review
- Comments from Reclamation in previous DCP's have been minimal, don't anticipate significant engagement of the DCP Task Force to respond

Rene Guillen, Mike Savage, Mark Millan

Administrative Draft – Discussion

- Administrative draft of the DCP was distributed to DCP Task Force on September 24, 2021
- Organization of the DCP:
  - Section 1 – DCP Introduction and Background
  - Section 2 – Water System Overview
  - Section 3 – Drought Monitoring
  - Section 4 – Vulnerability Assessment
  - Section 5 – Regional Drought Response Actions
  - Section 6 – Regional Drought Mitigation Measures
  - Section 7 – DCP Implementation: Administrative and Organizational Framework
- **Comments from the group given the draft of the DCP?**

Wrap up and Next Steps

Rene Guillen

Next Steps

- Provide feedback on DCP Administrative Draft by October 15, 2021
- Review and integrate edits/comments in to Draft Final DCP
- Submit DCP Draft Final to Reclamation for their review by the end of this month (October 2021)

Task Force Meeting #7 Agenda

Tuesday, September 6, 2022 • 10:00 am - 11:30 am

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Agenda

- **Finishing up the DCP:**
  - **Reclamation Review Comments**
  - **Tentative Schedule and DCP Rollout**
- **DCP Review and Wrap up**

Task Force Meeting #7 Attendee List

Tuesday, September 6, 2022 • 10:00 am - 11:30 am

Location: Virtual Meeting through Microsoft Teams, see calendar invite for Call-in Information.

Attendee List

City of Napa

- **Patrick Costello**
- **Phil Brun**

Napa County

- **Steven Lederer**
- **Christopher Silke**
- **David Morrison**

City of Calistoga

- **Derek Rayner**

City of St. Helena

- **Eric Janzen**

City of American Canyon

- **Felix Hernandez**

Town of Yountville

- **John Ferons**

Napa Sanitation District

- **Andrew Damron**
- **Tim Healy**

DCP Team

- **Rene Guillen**
- **Mike Savage**
- **Mark Millan**

Napa Valley Water
Management Agencies

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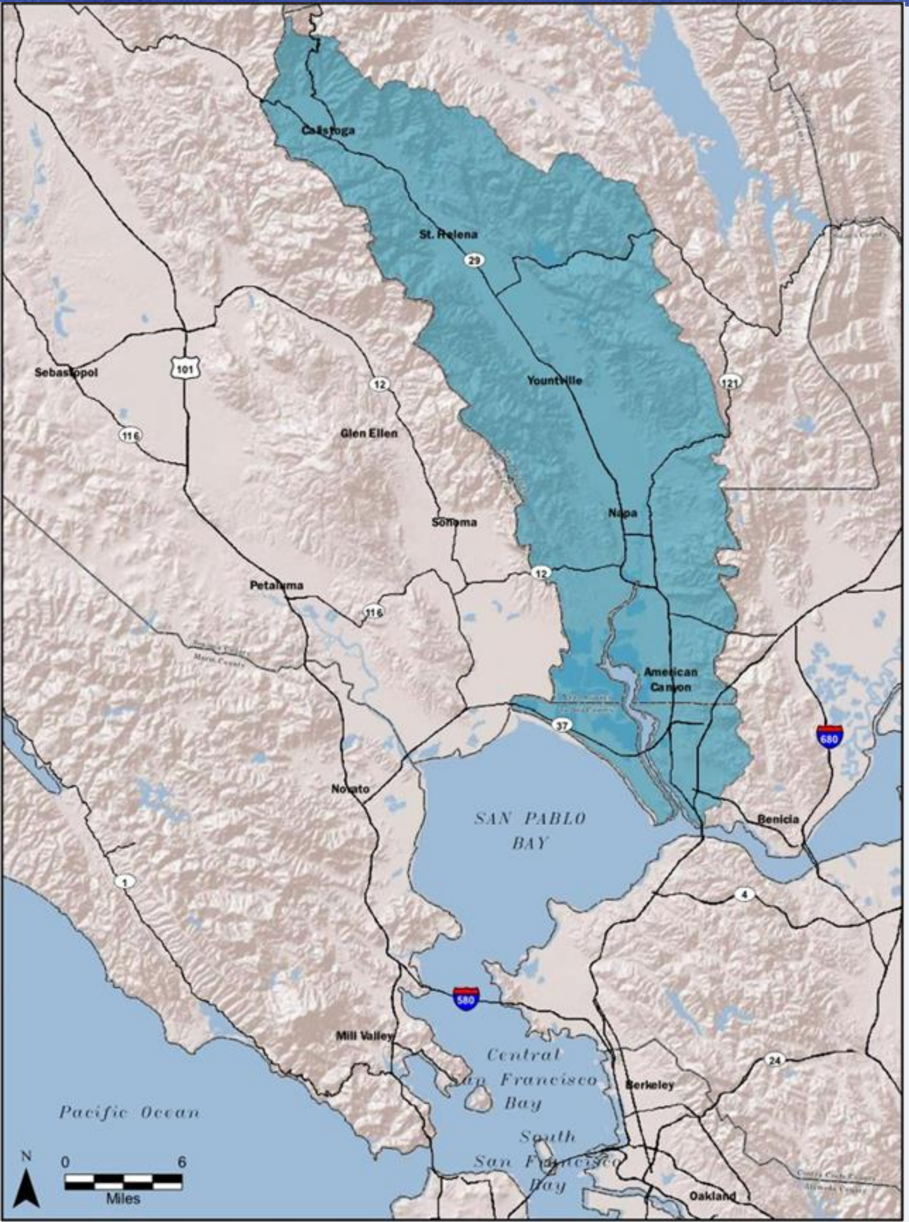

Napa Valley Drought Contingency Plan

Task Force Meeting 7

September 6, 2022, 10:00-11:30

Rene Guillen

Meeting Agenda

- Finishing up the DCP
  - Reclamation Review Comments
  - Tentative Schedule and DCP Rollout
- DCP Review and Wrap up

Rene Guillen

Where Are We?

Completed DCP Tasks

Task Force Formation, Work Plan & Outreach Process

Background, Study Area, Characterize Historical Drought

Water Supplies and Demands

Drought Monitoring Process

Vulnerability Assessment

Mitigation Measures and Response Actions

DCP Update Process

Administrative and Organizational Framework (DCP Implementation)

Present DRAFT DCP

USBR Review

Finalizing the DCP

Final DCP

Finishing up the DCP

Rene Guillen

Reclamation Review Comments

- Review comments were minimal
- Comment #1 – Section 3 (Drought Monitoring) summarizes drought monitoring but doesn't explain how these procedures are used to determine drought stages. Drought stages and triggers are covered in Section 5 (Drought Response Actions). Please add text to Section 3 that points readers to Section 5.
- Comment #2 – Questions on some of the drought response actions. Review team felt some of these read more like mitigation actions.
- Comment #3 – Asked that a responsible agency be identified for implementing the various elements of the DCP.
- **Any questions or concerns with the proposed responses/additions to the DCP?**

Rene Guillen

Tentative Schedule and DCP Rollout

- If the updates/revisions to the DCP are good to go, I will send it back to Reclamation for one final check
  - Anticipate that Reclamation will be good with the proposed updates, will circle back if any other issues arise
- **DCP rollout – the final document will likely be posted on the DCP website, is there interest in having the team prepare some sort of announcement to accompany the posting of the document?**

Wrap up and Next Steps

Rene Guillen

DCP Development and Outcomes

- Detailed work plan that included a Communication and Outreach Plan
- Local Agency and Stakeholder Engagement
  - 10 DCP Task Force Meetings (includes worksession for Mitigation and Response Actions)
  - 7 Outreach Meetings (includes WICC, GSPAC presentation, and a presentation to the North Bay Water Reuse Authority)
- DCP Summarized the results of the DCP Task Force's work:
  - Provided an overview of the region's water supply and demand conditions
  - Identified regional vulnerabilities to critical resources
  - Mitigation and Response Actions were evaluated and next steps for studies and projects were identified
  - A framework to support implementation of the various components of the DCP was developed

Next Steps

- At this point, the DCP can be used to apply for federal grants
- If there are projects that were included in the DCP that the group is interested in moving forward with, Reclamation periodically posts funding opportunity announcements for Drought Resiliency Projects
- The project list was also included as part of the Napa Valley GSP, there might be opportunities to procure state funding through SGMA too
- Remember that the DCP is meant to be a living document, if new projects or needs arise, these can be covered in future updates to the DCP to help fund future projects and or studies

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Napa Valley Watershed Information and Conservation Council Meeting Documentation

Brown AND Caldwell

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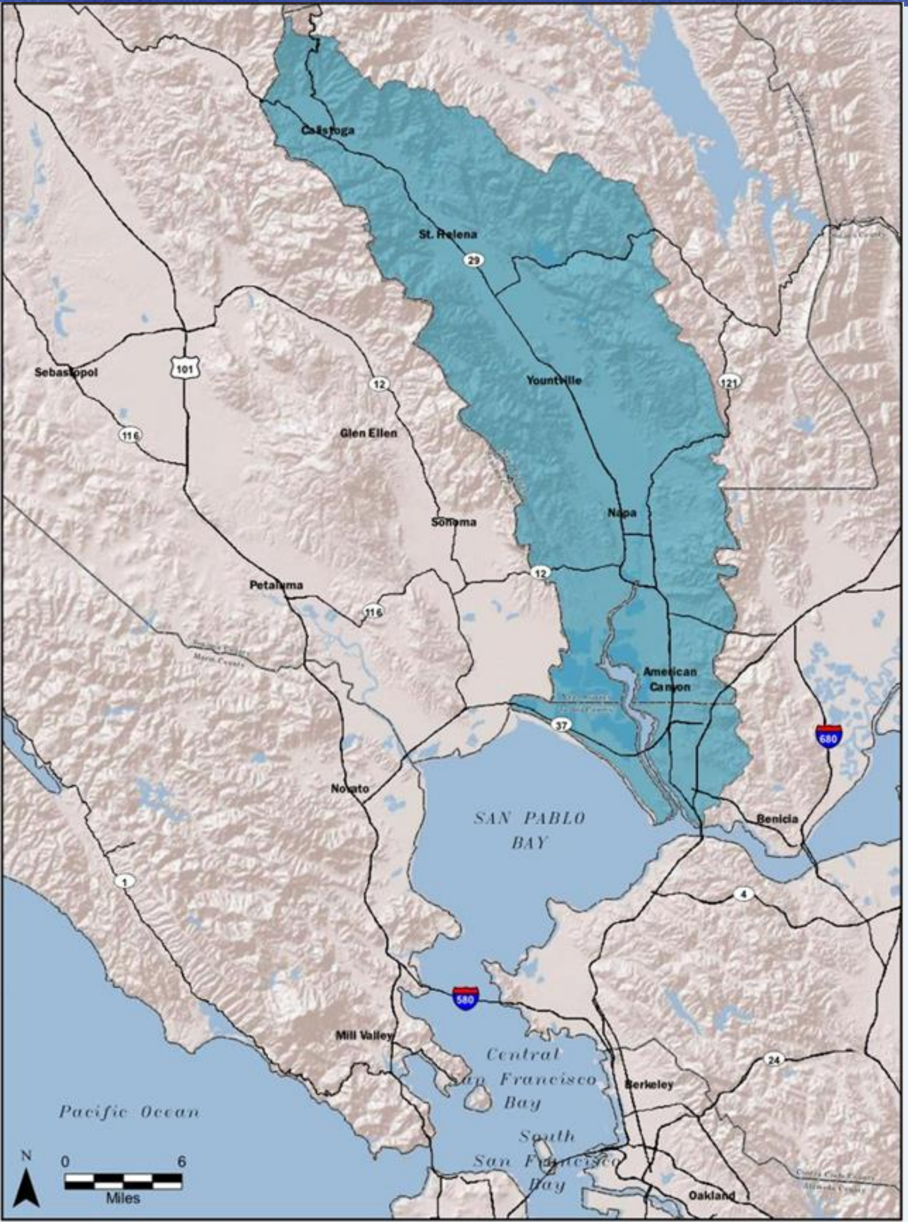


Watershed Information and Conservation Council of Napa County

Napa Valley
Drought Contingency Plan

February 27, 2020

What is a Drought Contingency Plan?

US Bureau of Reclamation's Drought Response Program

Drought Response Program Grants provide proactive approach for non-Federal partners to prepare for and respond to drought

- Drought Contingency Plans (DCP) address
  - How will we recognize the next drought in the early stages
  - How will drought affect us
  - How can we protect ourselves from the next drought
- Drought Resiliency Projects
  - Drought Resiliency is defined as the capacity of a region to cope with and respond to drought
  - Reclamation provides grant assistance for drought resiliency projects identified in a DCP
  - These projects are referred to as "mitigation actions" in the DCP

What is a Drought Contingency Plan?

- Collaborative planning approach to building long-term resiliency to drought
- Requires stakeholder Task Force to support plan development
- Must include agricultural, municipal, and environmental perspectives to ensure broad support for mitigation and response actions
- Must include consideration of climate and drought impacts to water supplies as part of building long-term supply resiliency
- Mitigation and Response actions are projects that could compete for implementation funding under US Bureau of Reclamation's WaterSMART Program

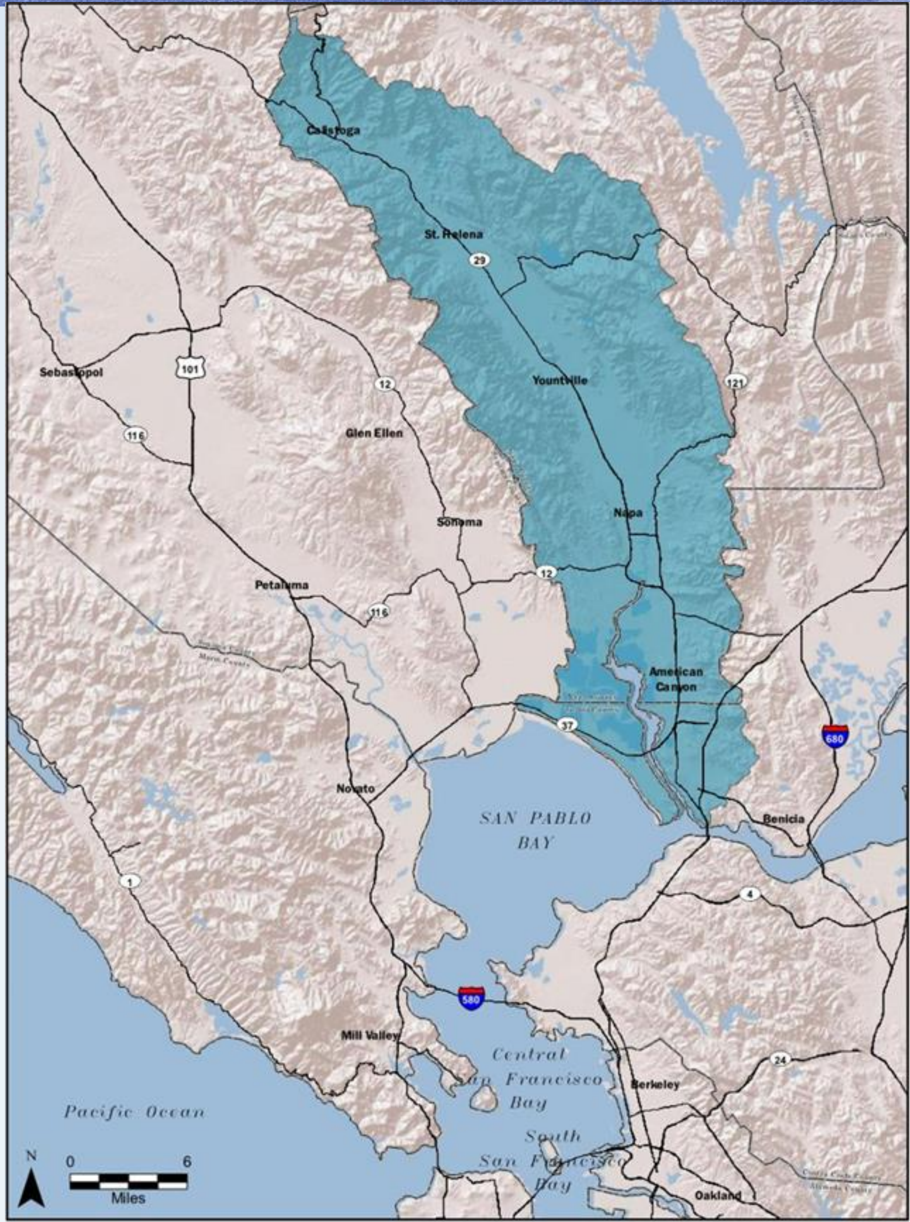
Napa Valley Water Management Agencies

U.S. Bureau of Reclamation

Study Area, Tasks and Schedule

Napa Valley DCP Study Area

- Napa River watershed that drains into the northern edge of San Pablo Bay and includes an area of 430 square miles
- Study area is composed of urban and residential areas, extensive vineyards and agriculture, and diverse environmental habitat
- Water users in the area rely on a mixture of water supplies that include local surface water, imported surface water, groundwater, and recycled water

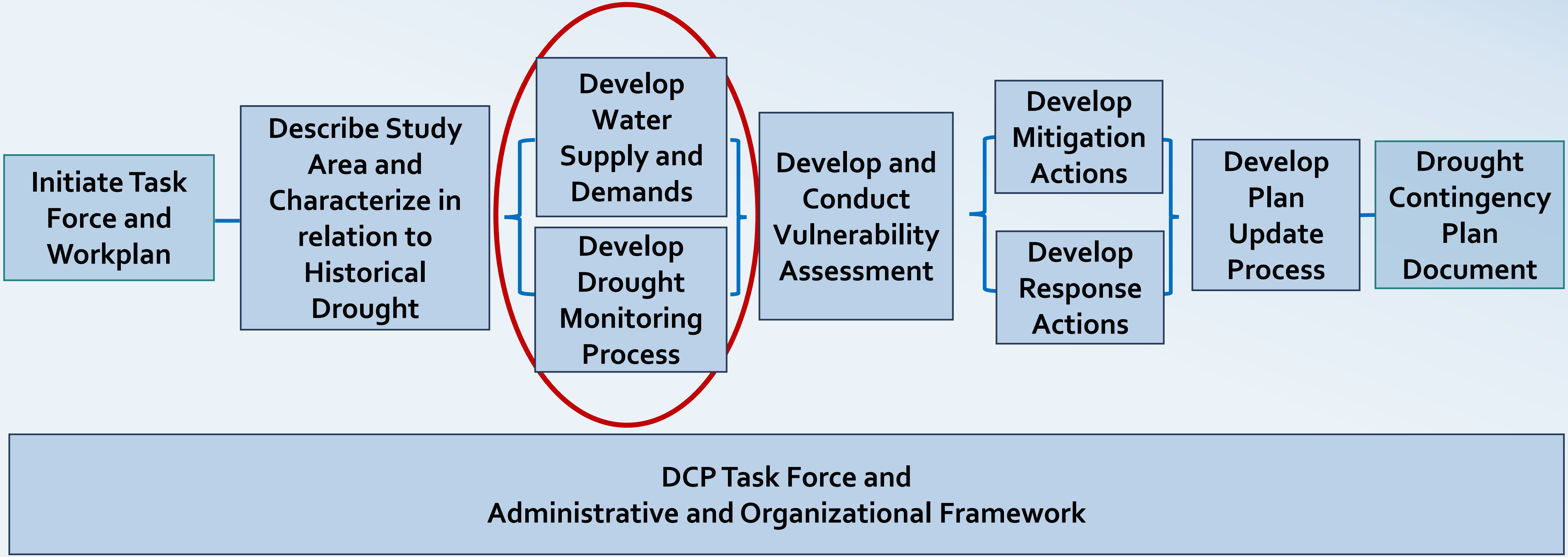


The Six Required Elements of a DCP

Element	Purpose
Drought Monitoring	• Establish a **process for monitoring** water availability, and a **framework** for predicting the probability of future droughts or confirming an existing drought. • The collection, analysis, and dissemination of data to **define stages of drought**, mitigation and response actions.
Vulnerability Assessment	• Evaluate and assess the **risks and impacts of drought** and the contributing factors that could impact critical resources in the Plan area. • This supports development of potential mitigation and response actions.
Mitigation Actions	• Identify, evaluate and prioritize actions and activities that will build **long-term** water supply resiliency and mitigate risks
Response Actions	• Identify, evaluate and prioritize actions and activities that can be implemented in a drought and triggered during different stages of drought to provide **quick benefits**
Operational and Administrative Framework	• **Determine local responsibility** for undertaking the actions necessary to implement the DCP.
Plan Update Process	• Develop a process and schedule for monitoring, evaluating and updating the Plan.

Building Blocks of the DCP

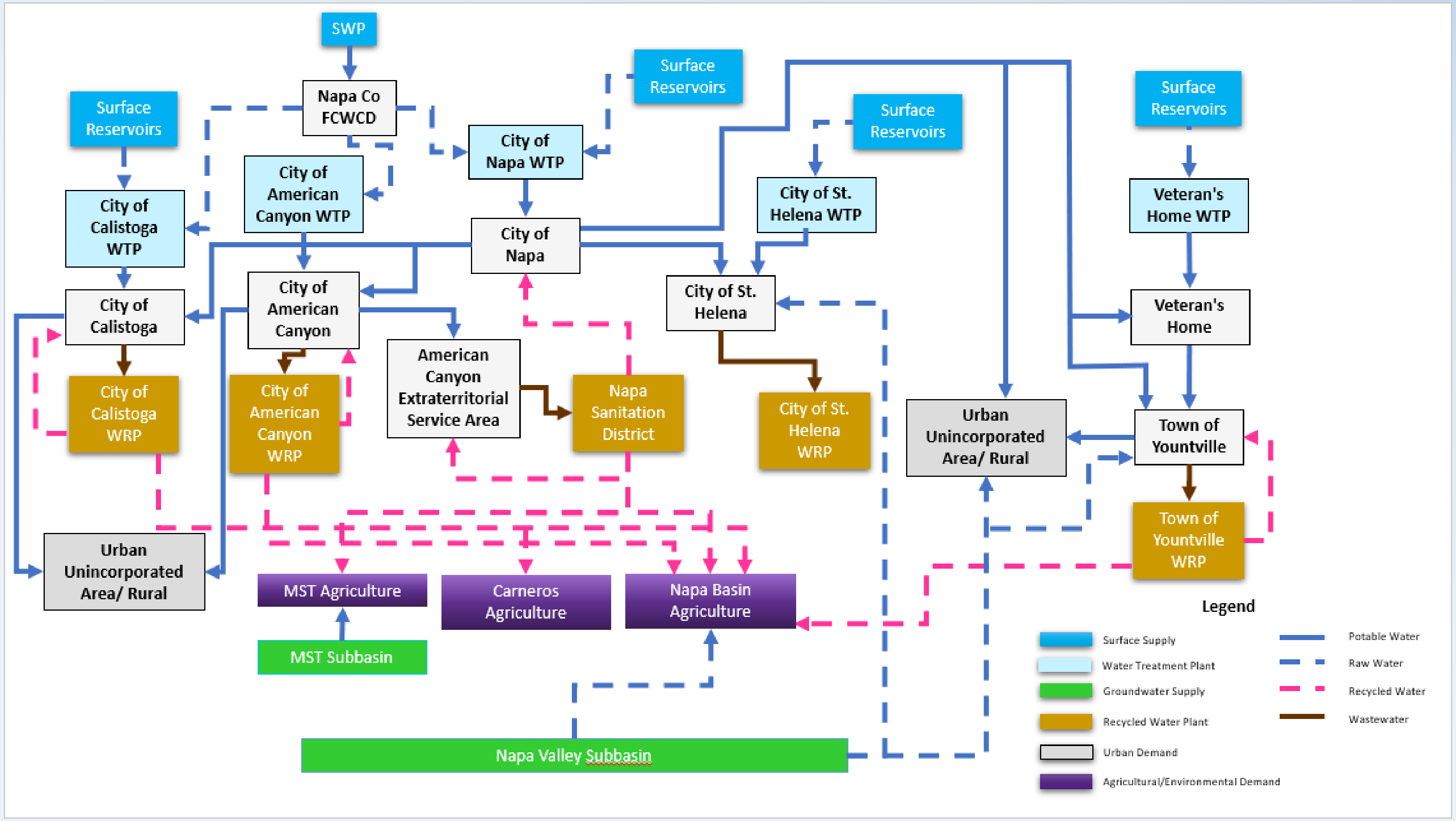
Current Status of DCP Tasks



Supply & Demand Analysis

The Task Force Partner Agencies are Physically Linked

- Each of the water supply agencies has shared water supplies or linkages
- Understanding the linkages is critical to addressing drought responses



Understanding the Water Resource Systems

- Water supply and demand data is currently being collected from the participating agencies to conduct a water supply and demand analysis
- This data will be utilized in the vulnerability assessment that will evaluate and assess the risks and impacts of drought and the contributing factors that could impact critical water resources in the Plan area

Objectives & Measures for Screening Mitigation Actions

Develop Objectives for Evaluating Mitigation Actions

Why develop objectives?

- Gain stakeholder acceptance and increase "implementability" of proposed projects
- Need to recognize and address externalities and impacts on others
- Often there are social goals (e.g., maintain agricultural culture)
- Satisfy the objectives of funding programs from the State or Federal government
- Incorporate separate goals and objectives of the DCP partners

How Objectives will be Used

Why develop objectives "early" in the study?

- Formulate projects that have a high degree of economic, social, and institutional benefits
- Formulate projects that have a greater chance of funding support

The Objectives and Measures are currently under development

- These will be used to score or evaluate potential mitigation or response actions
- Process shows how a project performs against objectives

Administrative and Organizational Framework

Administrative and Organizational Framework

Purpose

Identify who is responsible for implementing the Plan and/or individual elements of the DCP

Local Task Force Partner Considerations

Who owns the Implementation Roles and Responsibilities

- Tasked with implementing Mitigation Measures, Response Actions, updating the DCP and communicating with the public
- Are there efficiencies of a single management entity
- Who are partners on drought mitigation projects, actions and manage water beyond established service areas
- Who secures and manages financial assistance for project grants and or/financing

Stakeholder Engagement

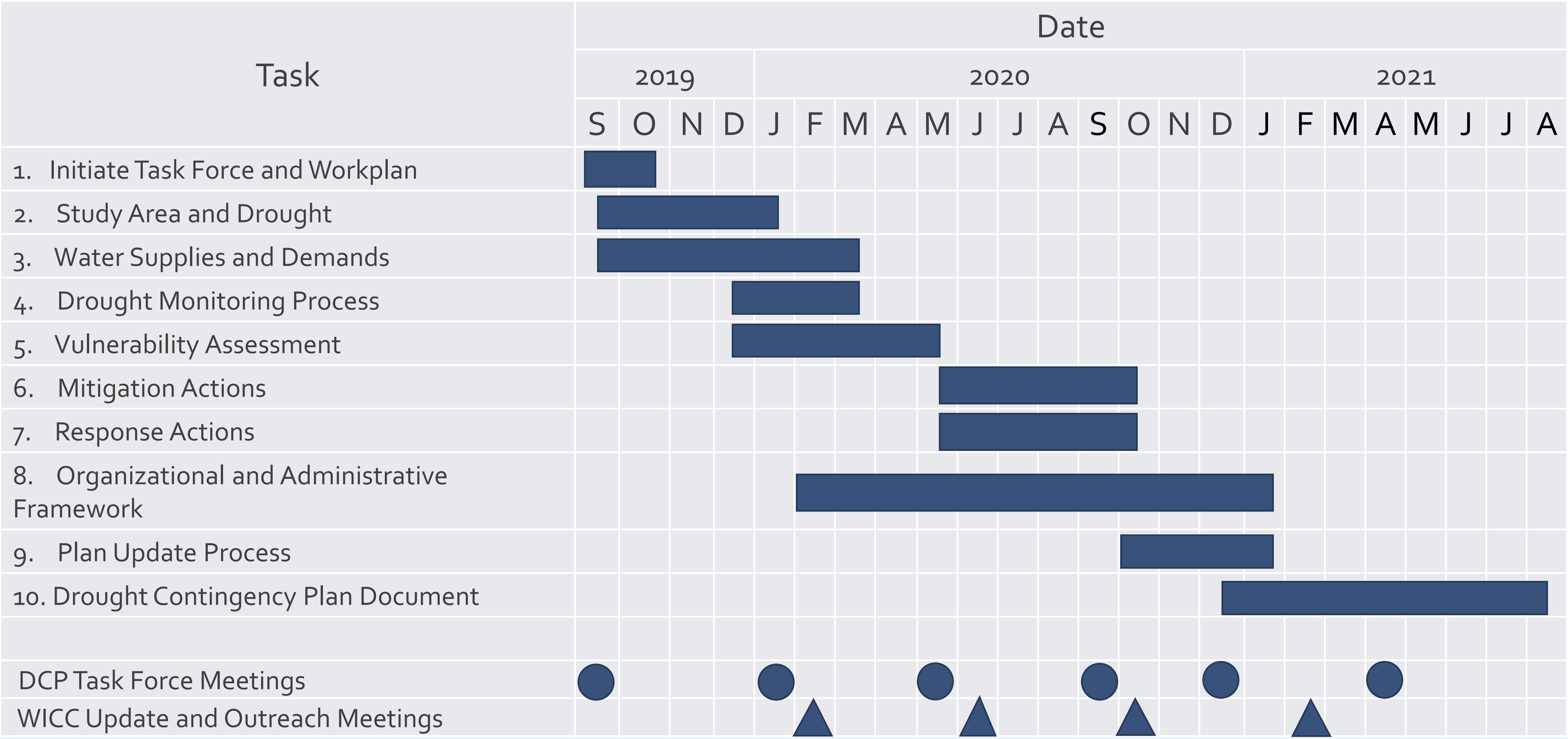
Stakeholder Engagement

- Napa Valley DCP website for information and input is now up and running

  www.napawatersheds.org/dcp

- City of Napa will provide DCP Updates at WICC Meetings
  - February 27, 2020
  - June 25, 2020
  - October 22, 2020

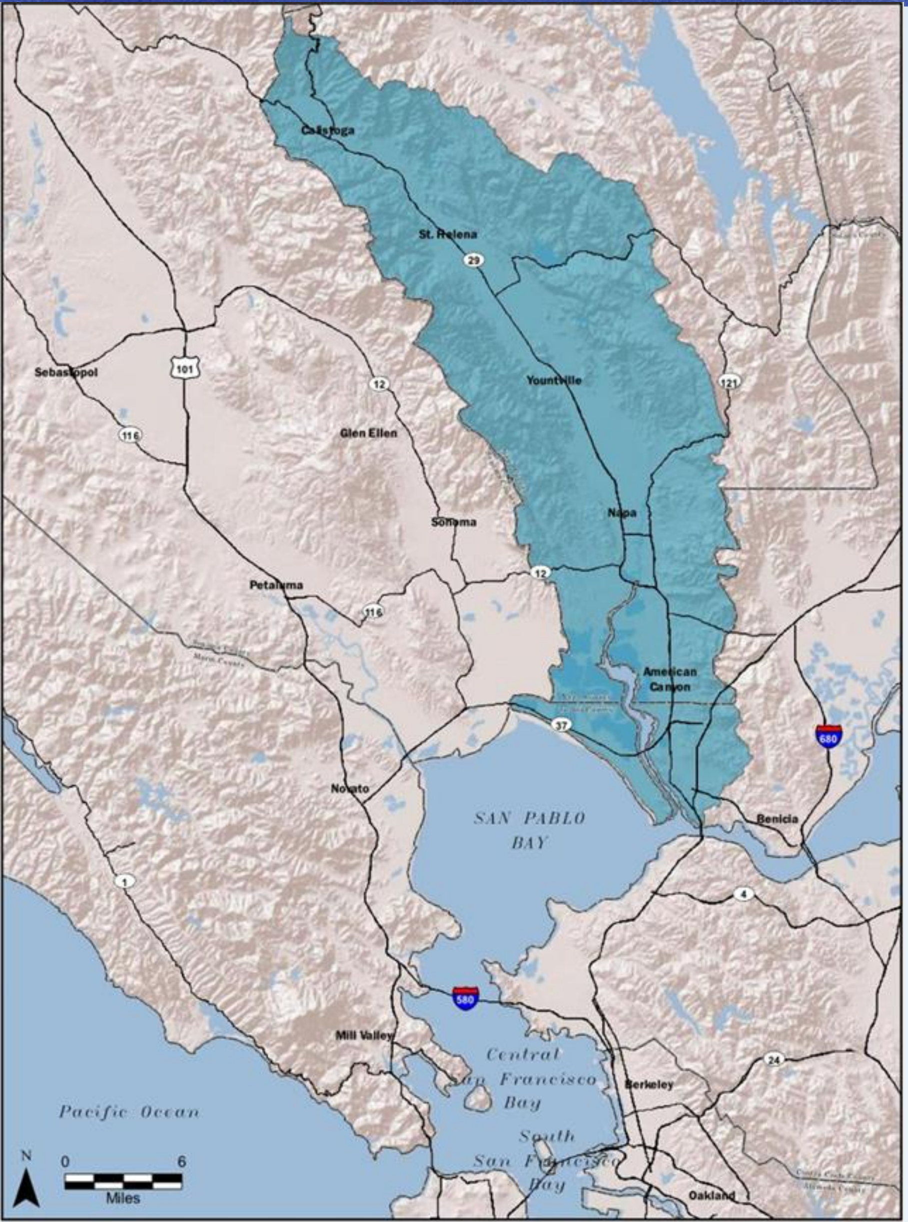
DCP Schedule



Questions or Comments

Napa Valley Water
Management Agencies

U.S. Bureau of Reclamation



Watershed Information and Conservation Council of Napa County

Napa Valley Drought Contingency Plan Update #2

July 2020

Review: What is a Drought Contingency Plan (DCP)?

Drought Contingency Plan

- Drought Contingency Plans address
  - How will we recognize the next drought in early stages
  - How will drought affect us
  - How can we protect ourselves from the next drought
- Drought Resiliency Projects
  - These projects are referred to as "mitigation actions" in the DCP
  - Are implemented to mitigate effects of drought

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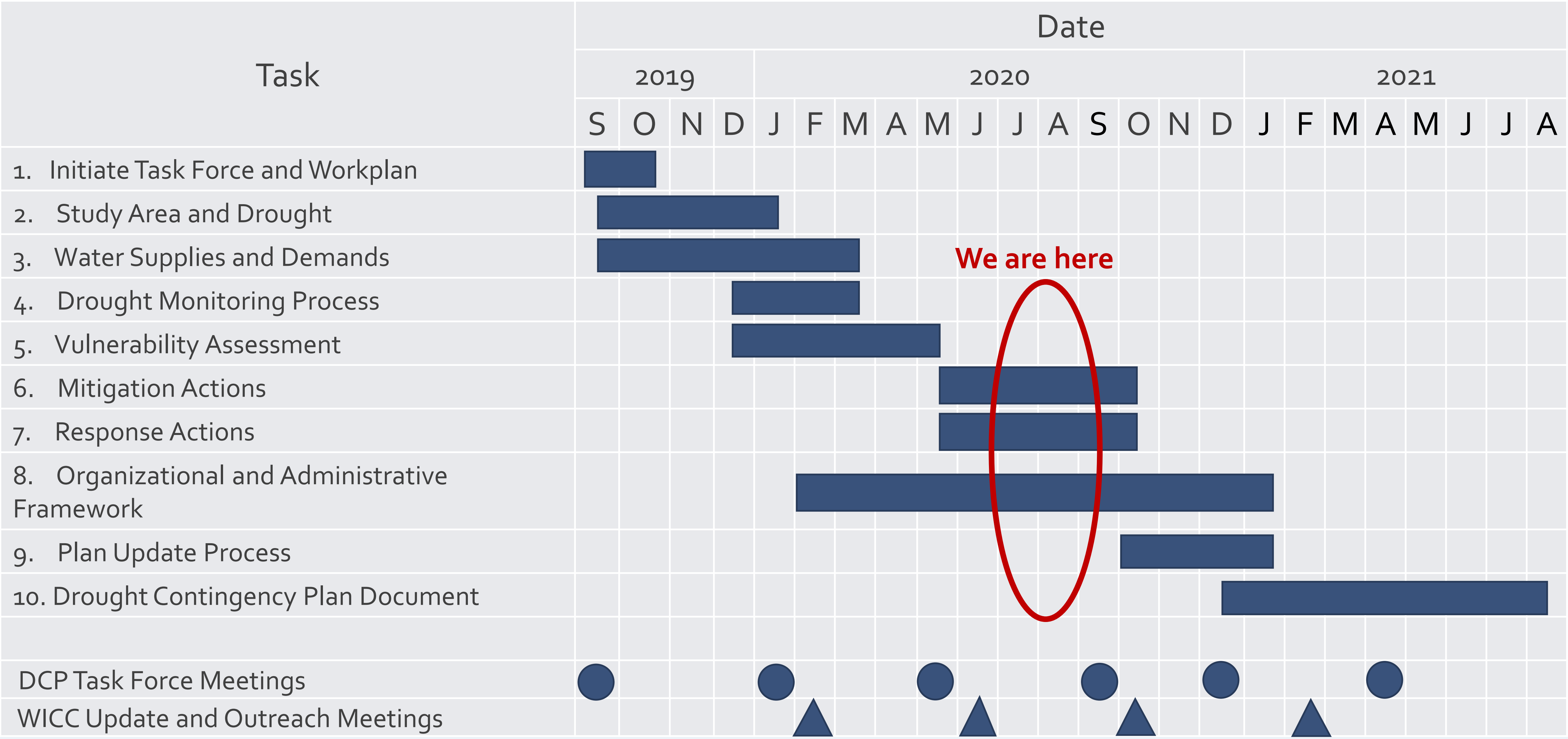
DCP Schedule



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Supply & Demand Analysis

DCP Approach

- The water supply data we are working with is based on *three different year types*:
  - **Normal Year:** The amount of water that most closely represents the average water supply available to your agency
  - **Multiple Dry Year:** This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean third dry year
  - **Critical Dry Year:** This is meant to represent the lowest water supply available to your agency
- **The Critical Dry Year Scenario is used for the Vulnerability Assessment**

Understanding the Water Resource Systems

- Water supply and demand data is being finalized with Task Force member agencies
- Data is being utilized in the vulnerability assessment to understand the risks and impacts of drought

Initial Water Supply and Demand Assessment

- Water supply and demand assessment identified a heavy reliance on limited number of supply sources
- **As a region, there is enough water supply across all year types**
  - ***However, some municipalities face supply deficits during drought conditions***

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Vulnerability Assessment

Vulnerability Assessment

- Evaluates specific threats to critical water resources
  - Forms the basis for development of drought response and mitigation actions (i.e., projects)
- **In the context of this DCP:**
  - ***Drought Vulnerability is the extent to which the Partner Agencies, and the region, are exposed or susceptible to risk***

How Can We Assess Vulnerability?

- Risk is a combination of:
  - Likelihood of occurrence
  - Consequences of occurrence
- **Risk = Consequence x Likelihood**
  - Consequence = significance of the supply source
  - Likelihood = uncertainty factors that contribute to loss of supply

Consequence – Depends on your Perspective

We can look at the consequences from two perspectives

- **Regional Consequence**
  - How much does an individual supply help meet the Napa watershed's water needs
  - Imported water and groundwater basin supply the largest percentage of the regional
  - Local reservoirs contribute less to the region
- **Local Consequence**
  - How much does an individual supply contribute to an individual agency or group of users
  - Relying solely on "Regional Consequence" can be misleading
  - While some local reservoirs account for a small portion of the regional supply, they are critical to each agencies respective portfolio

Likelihood – Related to Uncertainty Factors

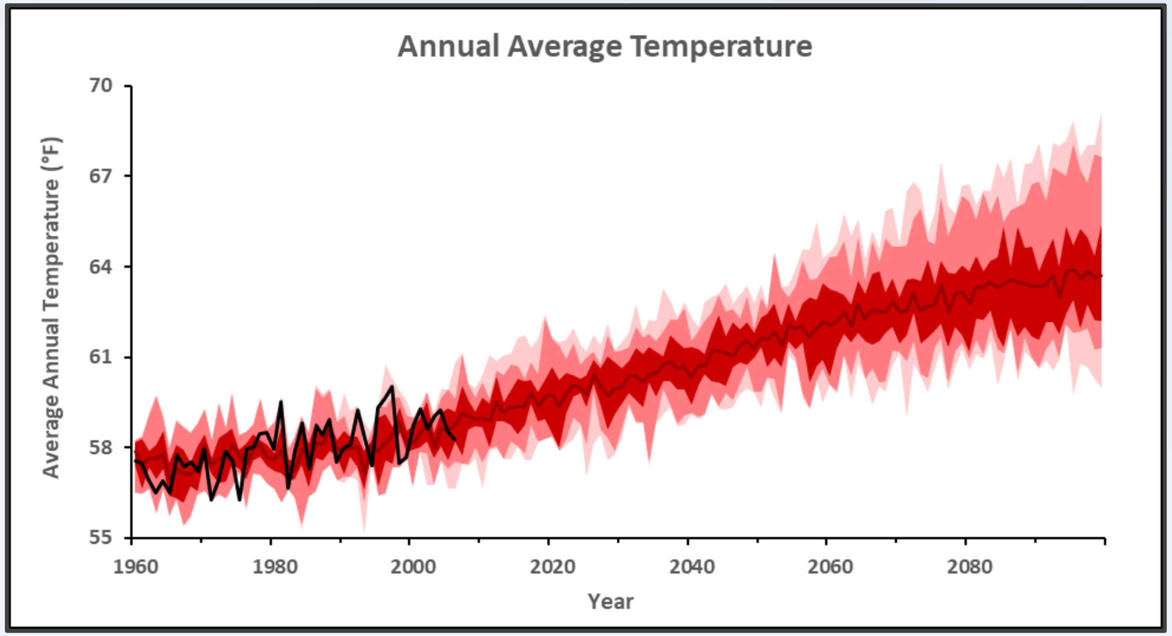
- Critical water supplies in the Valley face a number of threats and uncertainties, these include:
  - **Climate Change**
  - **Infrastructure Susceptibility and Supply Limitations**
  - **Regulatory, Environmental, and Water Rights Constraints**
  - **Cost Constraints and Affordability**
  - **Source Water Quality Degradation**

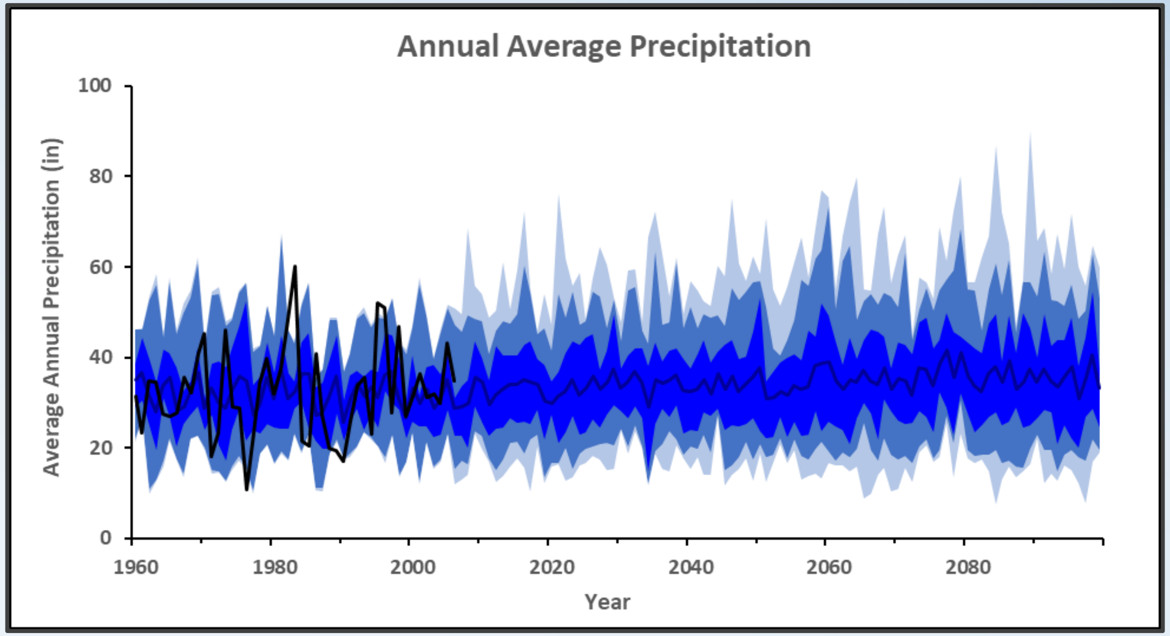
Climate Change is also Considered

High level assessment of climate change in the Napa Valley:

- **Climate Change is projected to make planning for water supply and demand imbalances even more challenging**
- While existing water supply data does account for climate variability, climate change has the potential to impact the availability and reliability of supplies
- Future climate impacts, including changes to temperature and precipitation, must be considered when assessing supply

Climate Change Assessment – Summary





- **Temperature increases in all projections – strong consensus**
  - Many projections show an increase in variability and extremes
  - Potential impacts on water supply and demand – increased water demand

- **Precipitation increases in some projections, decreases in others – modest increase overall but no clear consensus**
  - Many projections also show an increase in variability and extremes
  - Potential impacts on water supply and demand – floods and droughts

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What's Next: Objectives and Measures for Screening Mitigation and Response Actions

Initial Priorities from Task Force

- Projects and actions that deliver real results
- Recommendations that are implementation driven
- Review and make recommendations on how to better utilize/manage existing facilities and supply
- Look at expanding applications for Napa San winter water and explore potential of advanced purification efforts
- Develop a common platform for understanding surface supply water and groundwater interface, how this relates to State Water Project, and use this information for both DCP and regional educational purposes

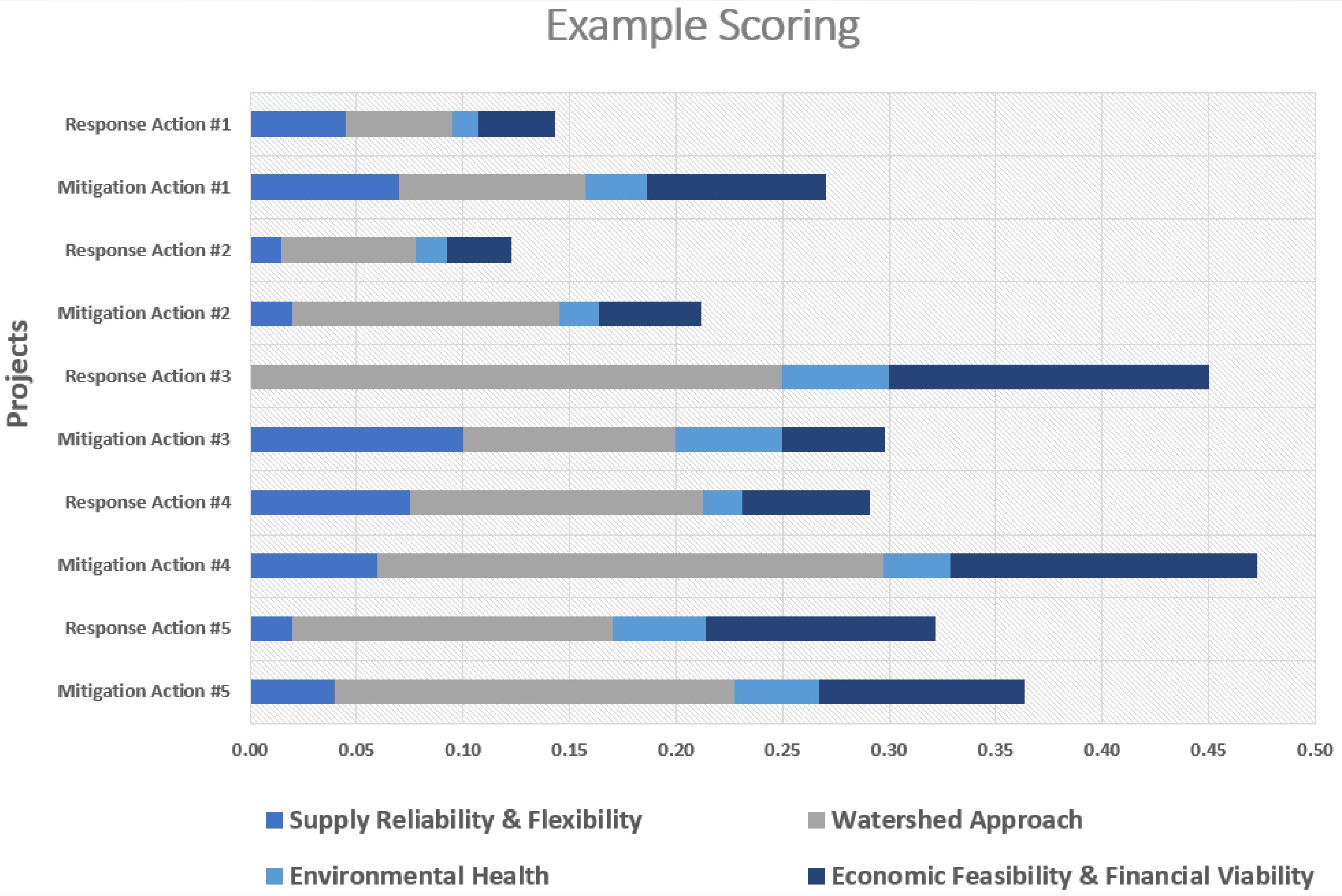
Preliminary DCP Goals and Objectives

Project Goals and Objectives to satisfy local priorities and federal guidelines

Napa Valley DCP Task Force Goals	Napa Valley DCP Objectives
Supply Reliability & Flexibility	• Improve local, regional, and State Water supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project
Watershed Approach	• Interface with Groundwater Sustainability Agencies to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation
Environmental Enhancement	• Maintain and protect public health and safety • Enhance local and regional ecosystems
Economic Feasibility & Financial Viability	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed

Example: Scoring of Mitigation and Response Actions

- Goals and Objectives will be used to score/evaluate potential Mitigation and Response actions
- Process shows how a project performs against Goals and Objectives



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What’s Next: Administrative and Organizational Framework

DCP Task Force Partner Considerations

Who owns the DCP Responsibilities

- Tasked with implementing Mitigation Measures, Response Actions, updating the DCP and communicating with the public
- Who are partners on drought mitigation projects, response actions and management of water beyond established service areas
- Who secures and manages financial assistance for project grants and or/financing

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Information Update: Interface between the DCP and the Napa Valley Groundwater Sustainability Plan

Introduction

- When the Napa Valley DCP scope was developed in Spring 2019, the City of Napa emphasized:
  - Strong, project-oriented outcomes
  - Where possible, identify opportunities to collaborate in order to maximize support for, and secure, project implementation funding

Opportunity for Collaboration

- Subsequent formation of the Napa Valley GSA, and future development of the GSP, present an opportunity for additional regional collaboration
- In reviewing the DRAFT outline of the proposed GSP, several commonalities with DCP tasks were identified

Ongoing Coordination Discussions

- The DCP and GSP consulting teams are discussing common tasks and ways to share information
- Options for possible collaboration are under development and will be sent to Task Force members for consideration later this summer

Wrap Up and Next Steps

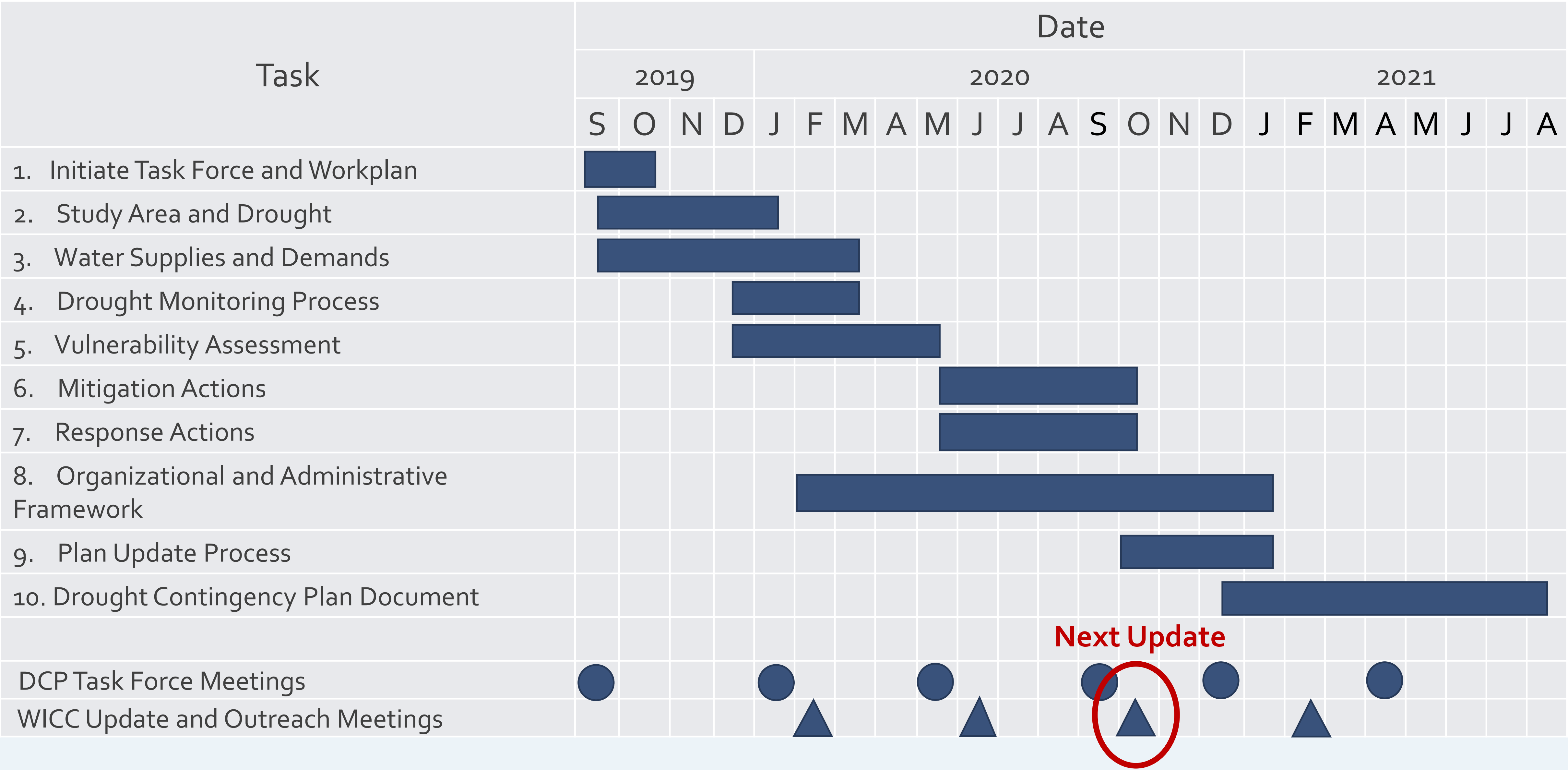
Stakeholder Updates

- Napa Valley DCP website for information and input is:

  www.napawatersheds.org/dcp

- City of Napa will provide the next DCP update tentatively scheduled for:
  - October 22, 2020

DCP Schedule



Questions or Comments

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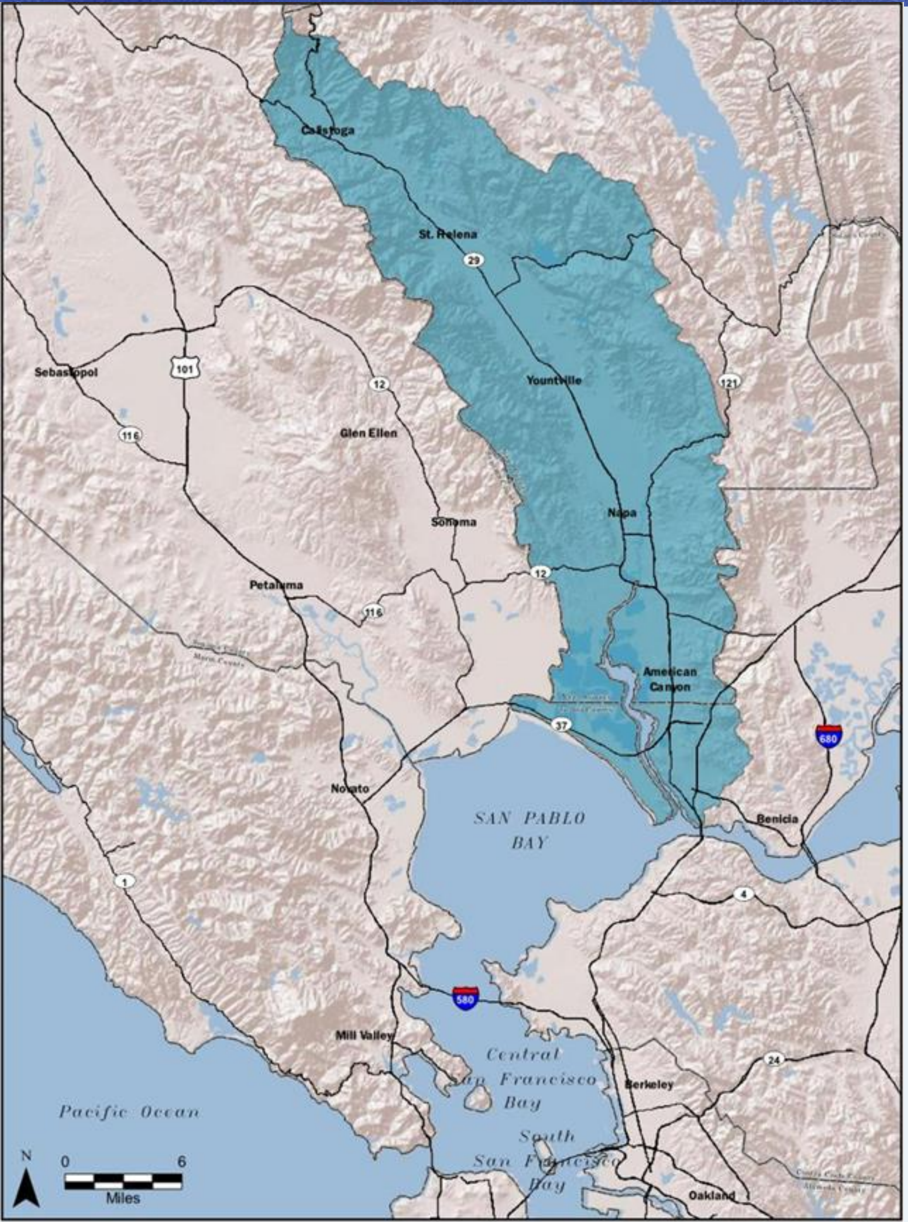


Watershed Information and Conservation Council of Napa County

Napa Valley Drought Contingency Plan Update #3

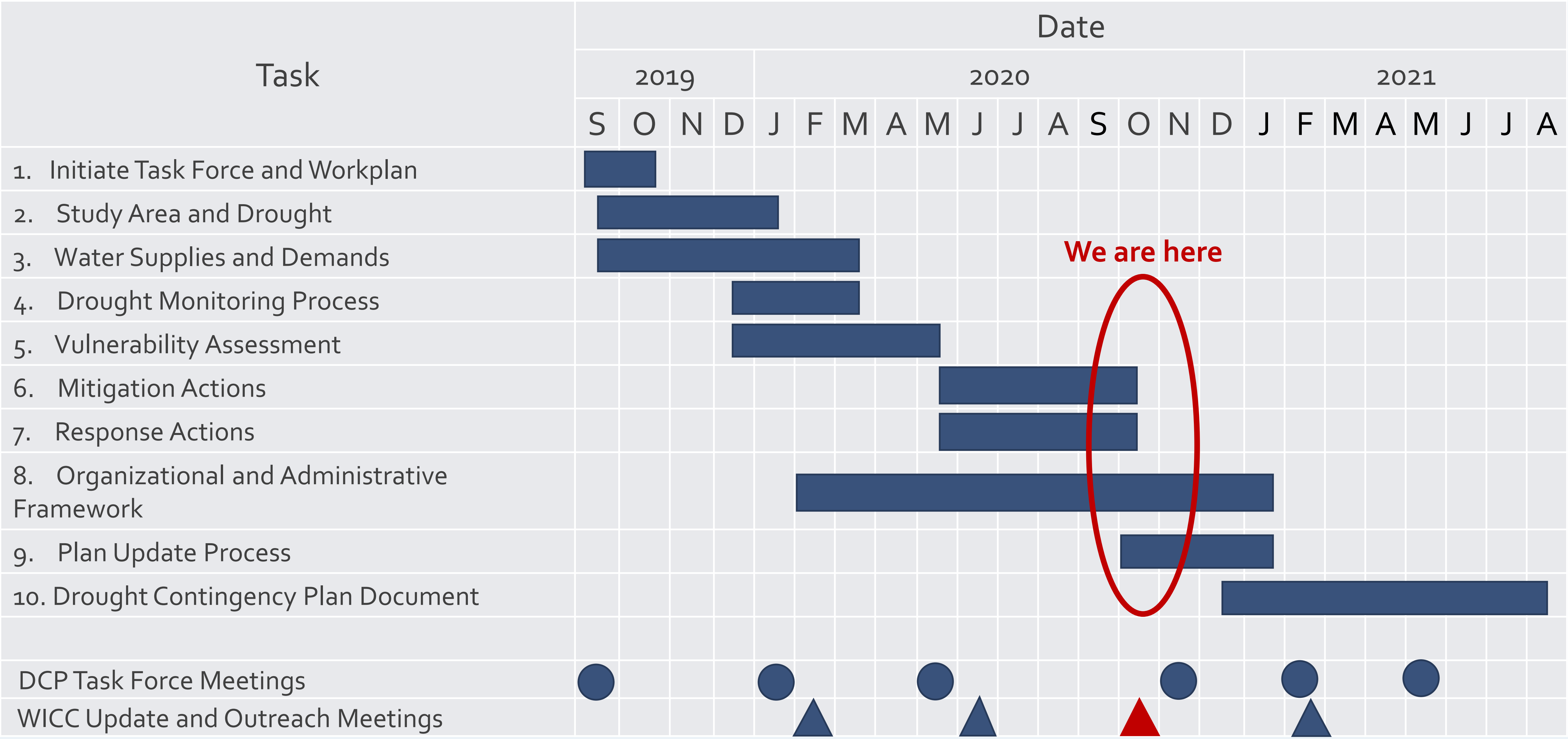
October 2020

Review: What is a Drought Contingency Plan (DCP)?

Drought Contingency Plan

- Drought Contingency Plans address
  - How will we recognize the next drought in early stages
  - How will drought affect us
  - How can we protect ourselves from the next drought
- Drought Resiliency Projects
  - These projects are referred to as "mitigation actions" in the DCP
  - Are implemented to mitigate effects of drought

DCP Schedule



Ongoing Activities:
Mitigation and Response Actions

Review: What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
- Response actions can be quickly implemented and provide expeditious benefits

Priorities from DCP Task Force

- Projects and actions that deliver real results
- Recommendations that are implementation driven
- Review and make recommendations on how to better utilize/manage existing facilities and supply
- Look at expanding applications for Napa San winter water and explore potential of advanced purification efforts
- Develop a common platform for understanding surface supply water and groundwater interface, how this relates to State Water Project, and use this information for both DCP and regional educational purposes

Mitigation and Response Actions – Progress to Date

- Developed and discussed Preliminary Mitigation and Response Actions list
- **Intent: Identify Mitigation and Response Actions that:**
  - Build long term resiliency to drought
  - Mitigate risks posed by drought
  - Decrease regional vulnerabilities
  - Reduce need for response actions
- Mitigation and Response Actions are sorted into five drought mitigation project "categories"

Project/Action "Categories"

Groundwater Management	Conveyance	Storage	Treatment	Operations
• Projects that focus on aquifer storage, aquifer recovery, and groundwater basin recharge	• Projects that look to expand existing distribution systems such as to augment current use of recycled water	• Projects providing storage of existing or potential new water supplies to provide for drought resiliency through storage for future use	• Projects that look to expand and or upgrade existing treatment facilities	• Projects that provide for infrastructure improvements necessary to improve operational efficiency and flexibility

Next Steps for Mitigation and Response Actions

- Task Force has identified drought mitigation measures that are at various stages ranging from concept level to construction/implementation
- Finalize the project list and begin evaluation process to prioritize:
  - Drought Mitigation Projects
  - Drought Response Actions

Ongoing Activities: Administrative and Organizational Framework

Administrative and Organizational Framework

Review:

- Identify who is responsible for future implementation of the DCP

November Task Force Meeting:

- Options will be presented for discussion on how the Framework can support implementation of the DCP

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Information Updates and Next Steps

Update on DCP and GSP Interface

- The DCP will be completed prior to completion of the GSP, initial discussions with the GSP consulting team indicate that DCP information will be integrated into that study as appropriate
- There could also be future implementation partnerships resulting from the GSP

Stakeholder Updates

- Napa Valley DCP website for information and input is:

  www.napawatersheds.org/dcp

- City of Napa will provide the next DCP update tentatively scheduled for:
  - February 2021

Questions or Comments

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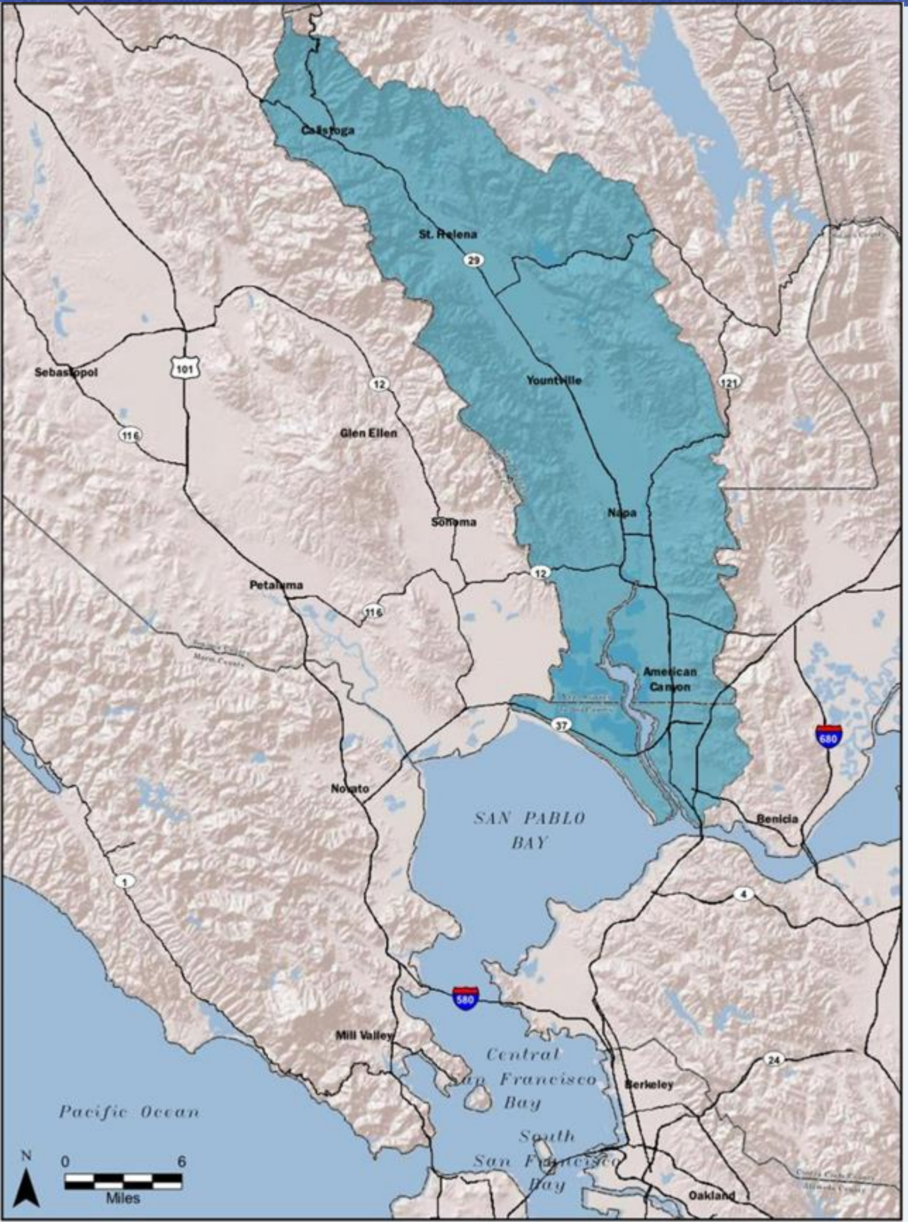

Watershed Information and Conservation Council of Napa County

Napa Valley
Drought Contingency Plan
Update #4

January 28, 2021

Review: What is a Drought Contingency Plan (DCP)?

Drought Contingency Plan

- Drought Contingency Plans address
  - How will we recognize the next drought in early stages
  - How will drought affect us
  - How can we protect ourselves from the next drought
- Drought Resiliency Projects
  - These projects are referred to as "mitigation actions" in the DCP
  - Are implemented to mitigate effects of drought

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DCP Schedule

Wrapping up the DCP

- Complete Mitigation and Response Actions
- Finalize Administrative and Organizational Framework
- Draft DCP document expected Spring 2021

Ongoing Activities:
Mitigation and Response Actions

Review: What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
- Response actions can be quickly implemented and provide expeditious benefits

Purpose of Mitigation and Response Actions Task

- Identify Mitigation and Response Actions that:
  - Build long term resiliency to drought
  - Mitigate risks posed by drought
  - Decrease regional vulnerabilities
  - Reduce need for response actions
- Screen projects to consider best way to equitability allocate:
  - Drought water resources to various types of water user needs
  - Rank projects in terms of regional benefit
  - Identify and propose projects to pursue for grant funding

Mitigation and Response Actions – Project List

- Task Force reviewed/provided input to refine Mitigation and Response Actions
- Added additional projects to help promote regional collaboration/solutions
- Divided projects into two Stages for Evaluation:
  - **Implementation Ready** – well-defined implementable projects
  - **Planning** – concepts and/or implementable studies

Mitigation and Response Actions – Project Evaluation

- 23 Mitigation and Response Actions (projects) were evaluated
- These were broken out into one of two Stages:

Implementation Ready Projects

Well defined and physically implementable projects

Planning Projects

Concept level projects or implementable studies

These are concurrent tracts designed to build long-term resilience to drought and improve supply reliability

Mitigation and Response Actions – Evaluation Approach and Outcome

- Objectives and Weights for each of the DCP Goals were used to evaluate Mitigation and Response Actions
- Scores were assigned using both Quantitative and Qualitative criteria
- **Based on the results of the evaluation, three (3) Mitigation Actions were selected for further development**

Next Steps for Mitigation and Response Actions

- Finalize the project list and evaluation process
- Further develop the three (3) selected mitigation actions

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Ongoing Activities: Administrative and OrganizationalFramework

Administrative and Organizational Framework - Review

Describes the Structure and Identifies who Implements the DCP Tasks

- Includes roles, responsibilities, and procedures necessary to:
  - Conduct drought monitoring
  - Initiate response actions, including emergency response actions
  - Initiate mitigation actions
  - Describe a process and schedule for monitoring, evaluating, and updating the DCP (generally every 5-yrs)

Administrative and Organizational Framework – Progress to Date

- The DCP has identified regional water management challenges and developed strategies to address them
- Implementing this DCP will require preparation and support; both financially and with political support and leadership
- Based on Task Force feedback, team is currently drafting the framework to help support DCP implementation

Wrap up and Next Steps

Stakeholder Updates

- Napa Valley DCP website for information and input is:

  www.napawatersheds.org/dcp

- City of Napa will provide the next DCP update tentatively scheduled for:
  - May 2021

Questions or Comments

Napa Valley Water
Management Agencies

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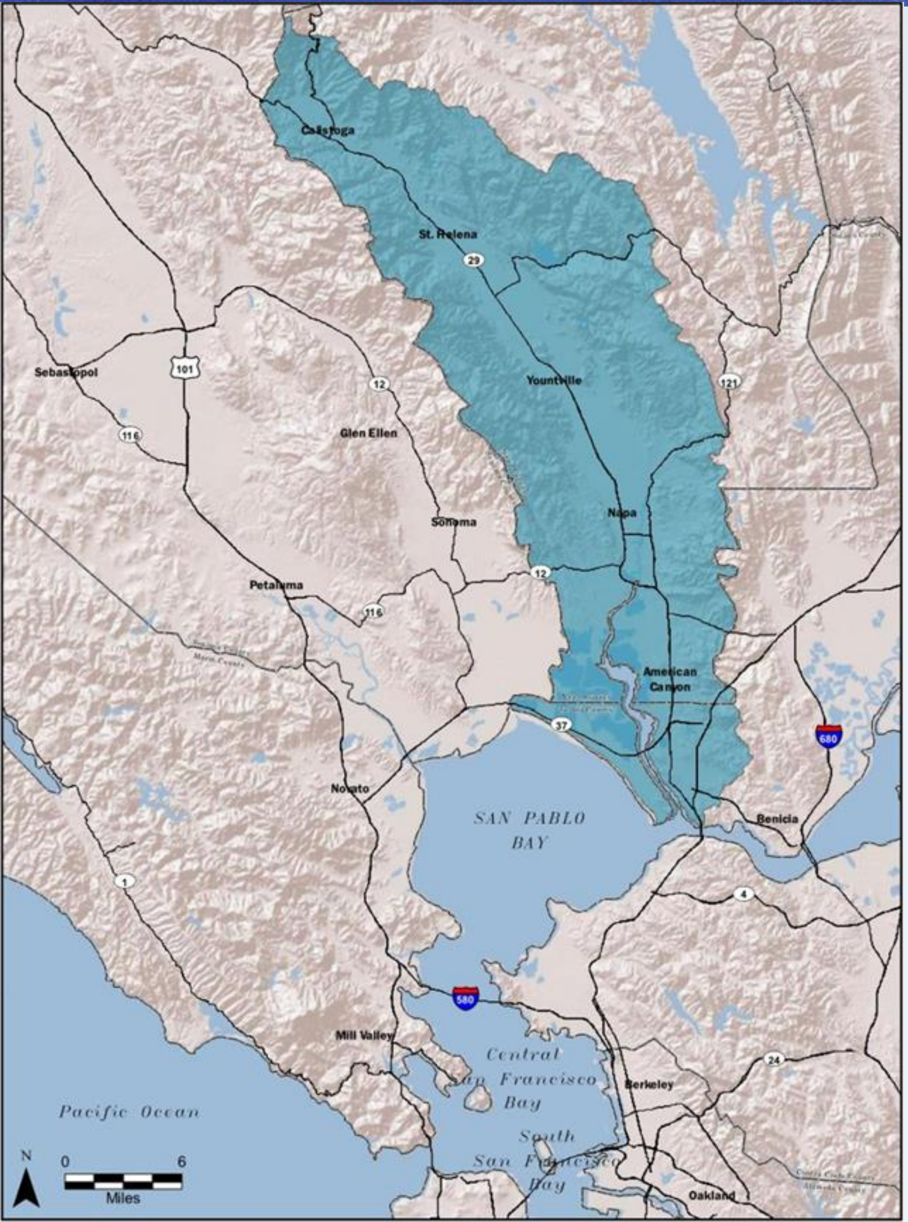

Watershed Information and Conservation Council of Napa County

Napa Valley Drought Contingency Plan Update #5

April 22, 2021

Review: What is a Drought Contingency Plan (DCP)?

Drought Contingency Plan

- Drought Contingency Plans address
  - How will we recognize the next drought in early stages?
  - How will drought affect us?
  - How can we protect ourselves from the next drought?
- Drought Resiliency Projects
  - These projects are referred to as "mitigation actions" in the DCP
  - Are implemented to mitigate effects of drought

DCP Schedule

Wrapping up the DCP

- Finalize Mitigation and Response Actions
- Finalize Administrative and Organizational Framework
- Draft DCP document expected June 2021

Ongoing Activities:
Mitigation and Response Actions

Review: What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
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Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
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Mitigation and Response Actions – Evaluation Approach and Outcome

- Objectives and Weights for each of the DCP Goals were used to evaluate Mitigation and Response Actions
- Scores were assigned using both Quantitative and Qualitative criteria
- **Based on the results of the evaluation, three (3) Mitigation Actions were selected for further development**

Mitigation Actions being Further Refined

- **Sites Reservoir**
  - Reservoir will utilize available surplus flows from Sacramento River
- **Purified Water Assessment**
  - Project is looking to develop purified water alternatives for the region to evaluate the viability of incorporating purified water into the region’s water supply portfolio
- **Integrated Supply and Reservoir Operations**
  - Two phased assessment, Phase 1 is looking for opportunities to optimize use of existing water supplies and help create new and or augment existing ones

Next Steps for Mitigation and Response Actions

- **Sites Reservoir**
  - Decision for involvement would need to happen by July 2023, that's when bank financing kicks in
- **Purified Water Assessment**
  - Work with Napa San and American Canyon to confirm assumptions included in each alternative being assessed
- **Integrated Supply and Reservoir Operations**
  - Continue to refine concepts that Phase 2 (Future Study) will would look to assess

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Ongoing Activities: Administrative and Organizational Framework

Administrative and Organizational Framework - Review

Describes the Structure and Identifies who Implements the DCP Tasks

- Includes roles, responsibilities, and procedures necessary to:
  - Conduct drought monitoring
  - Initiate response actions, including emergency response actions
  - Initiate mitigation actions
  - Describe a process and schedule for monitoring, evaluating, and updating the DCP (generally every 5 years)

Administrative and Organizational Framework – Questionnaire

- DCP Task Force members completed an Administrative and Organizational Framework Questionnaire
- Responses provided critical direction for future work
  - Focused on what's needed for DCP implementation
  - Recognized planning priorities may differ
  - Identified priorities for implementing Studies and Projects
  - Described organizational needs for future work together

Next Steps for Administrative and Organizational Framework

- Implementing this DCP will require preparation and support; both financially and with political support and leadership
- Based on Task Force feedback, team is updating and refining the framework to help support DCP implementation

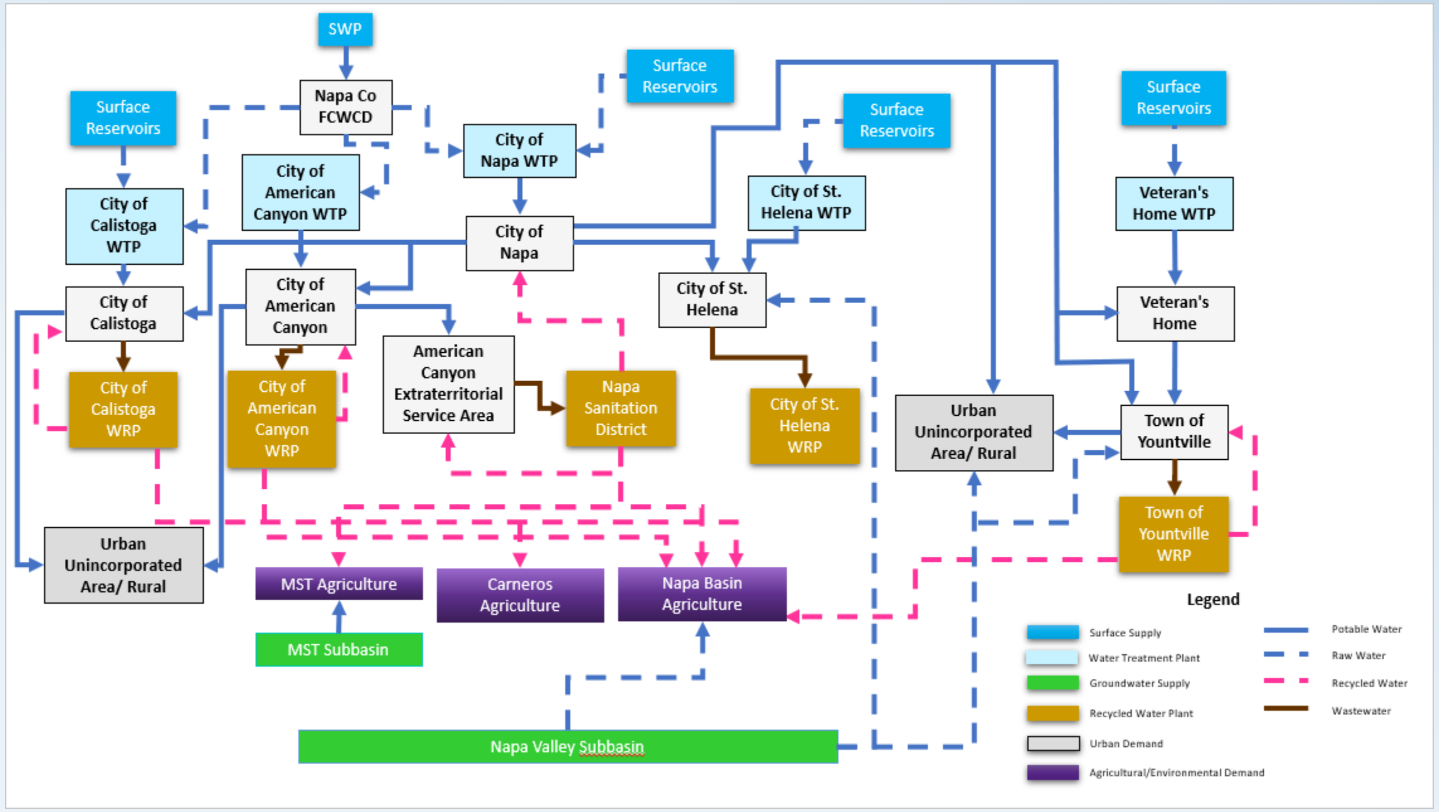
Wrap up and Next Steps

Stakeholder Updates

- Napa Valley DCP website for information and input is:

  www.napawatersheds.org/dcp

- Draft Plan to be reviewed starting in June



Questions or Comments

Documentation from meeting given to the Napa Valley Groundwater Sustainability Plan Advisory Committee

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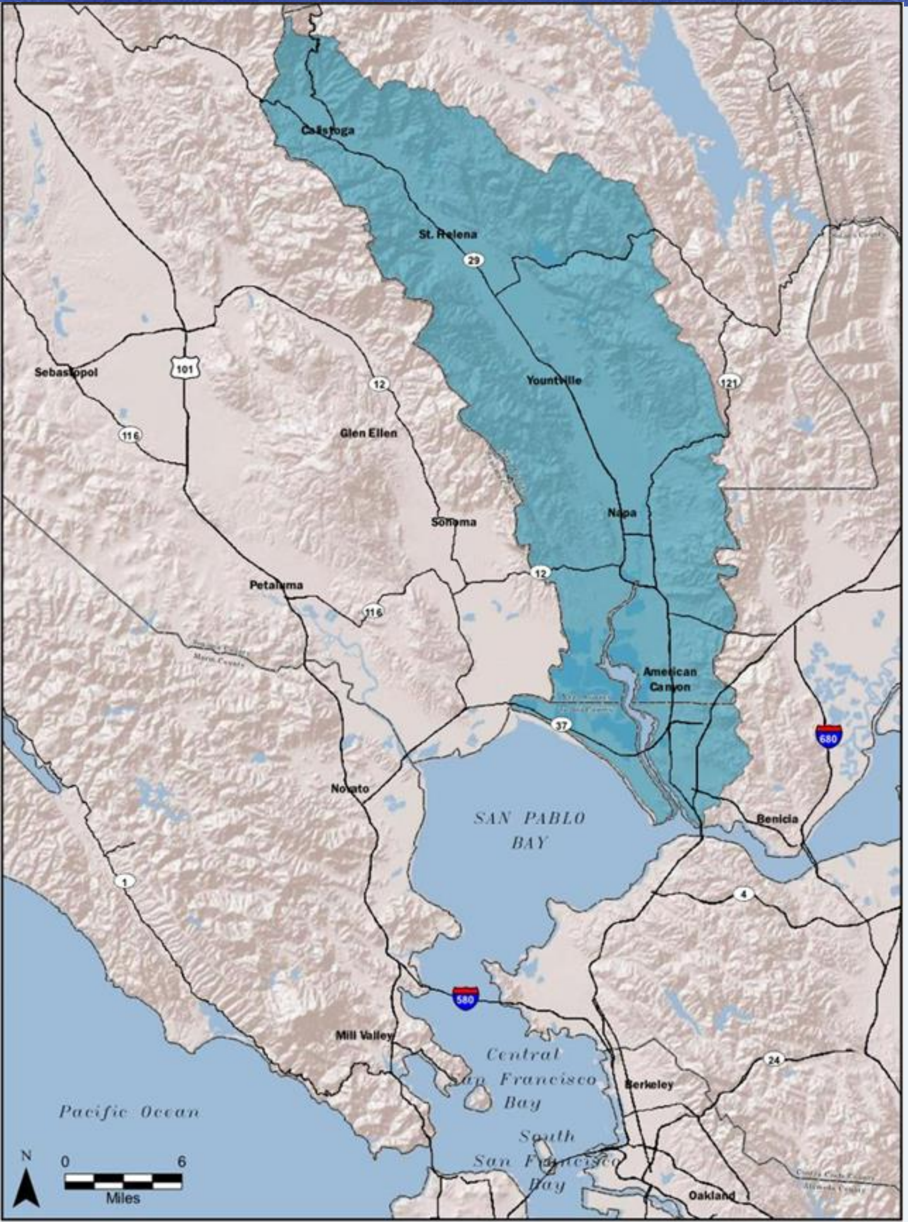

Napa Valley Groundwater Sustainability Plan Advisory Committee

Napa Valley Drought Contingency Plan

February 11, 2021

Meeting Agenda

- What is a Drought Contingency Plan?
- Progress to Date
  - Water Supply and Demand Analysis
  - Vulnerability Assessment
  - Mitigation and Response Actions
  - Administrative and Organizational Framework
- Interface between the DCP and GSP
- Next Steps for the DCP

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What is a Drought Contingency Plan?

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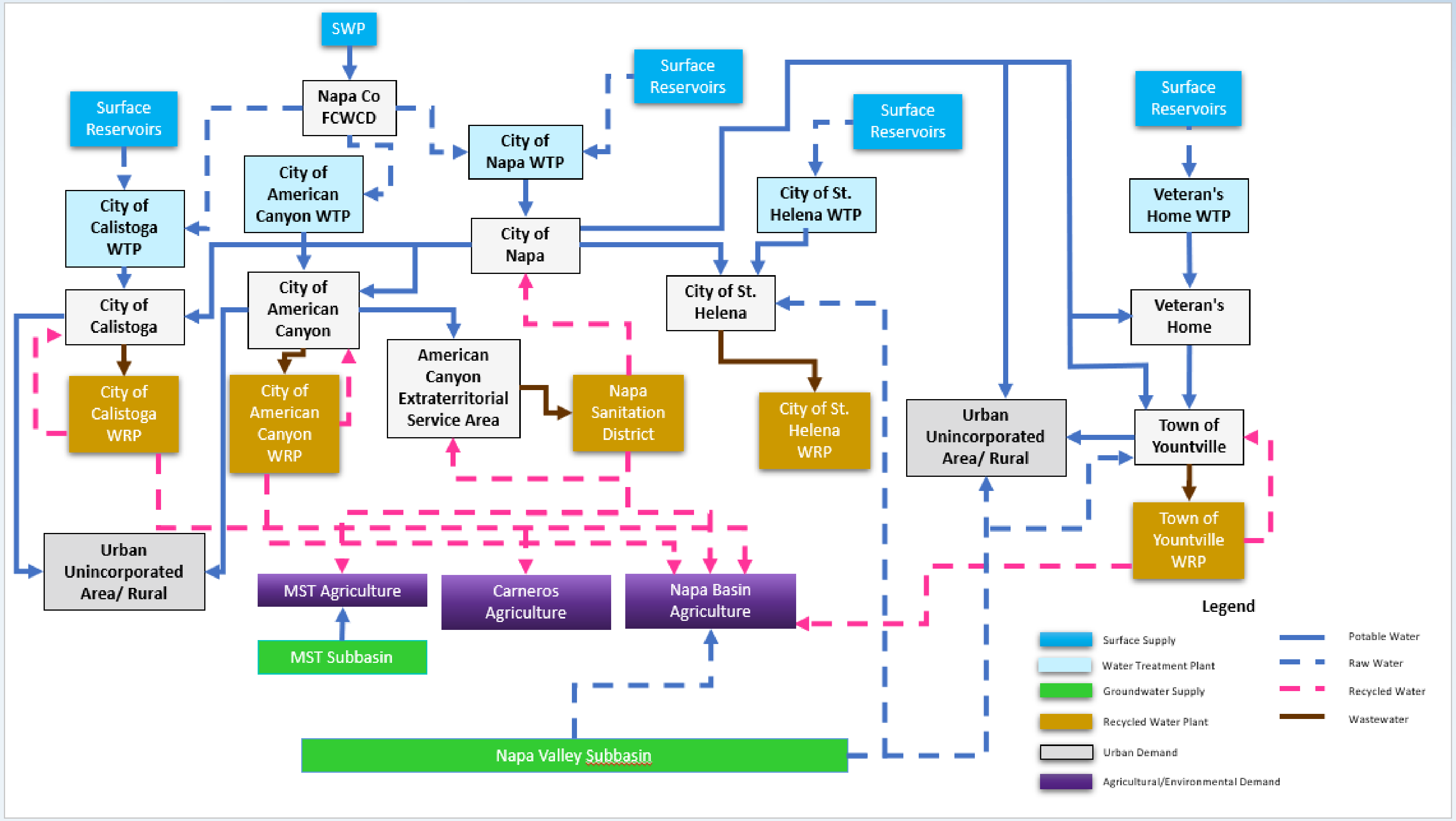
Progress to Date and Ongoing Activities

The Task Force Partner Agencies are Physically Linked

- Each of the water supply agencies has shared water supplies or linkages
- Understanding the linkages is critical to addressing drought responses



Water Supply and Demand Assessment

- Water supply and demand assessment identified a heavy reliance on limited number of supply sources
- **As a region, there is enough water supply across all year types**
  - ***However, some municipalities face supply deficits during drought conditions***

Vulnerability Assessment

- Evaluates specific threats to critical water resources
  - Forms the basis for development of drought response and mitigation actions (i.e., projects)
- **In the context of this DCP:**
  - ***Drought Vulnerability is the extent to which the Partner Agencies, and the region, are exposed or susceptible to risk***

How Can We Assess Vulnerability?

- Risk is a combination of:
  - Likelihood of occurrence
  - Consequences of occurrence
- **Risk = Consequence x Likelihood**
  - Consequence = significance of the supply source (both regional and local)
  - Likelihood = uncertainty factors that contribute to loss of supply

Climate Change is also Considered

High level assessment of climate change in the Napa Valley:

- Climate Change is projected to make planning for water supply and demand imbalances even more challenging
- While existing water supply data does account for climate variability, climate change has the potential to impact the availability and reliability of supplies
- Future climate impacts, including changes to temperature and precipitation, must be considered when assessing supply
- DCP and GSP are consistent, however GSP includes more detailed analysis

Summary of Vulnerability Assessment

- There are different risks for different agencies, depending on the supply
- Each agency's level of exposure is dependent on their level of reliance on any one given supply source
- The likelihood of supply reduction is based on uncertainty factors and regional significance of each supply
- Mitigation and response actions (i.e., projects) should focus on reducing consequence and/or reducing likelihood

What are Drought Mitigation & Response Actions?

Drought Mitigation Actions

- Programs and strategies implemented during non-drought period
- Address water supply vulnerabilities specific to this region
- Reduce the need for drought response activities during drought

Drought Response Actions

- Near-term actions, triggered during specific stages of drought, to manage limited supply and decrease severity of immediate impacts
- Response actions can be quickly implemented and provide expeditious benefits

Mitigation and Response Actions – Progress to Date

- Developed and discussed Mitigation and Response Actions list
- DCP metrics were used to evaluate Mitigation and Response Actions
- Further evaluating and developing 3 mitigation actions

Administrative and Organizational Framework

Describes the Structure and Identifies who Implements the DCP Tasks

- Includes roles, responsibilities, and procedures necessary to:
  - Conduct drought monitoring
  - Initiate response actions, including emergency response actions
  - Initiate mitigation actions
  - Describe a process and schedule for monitoring, evaluating, and updating the DCP (generally every 5 years)
- Based on Task Force feedback, currently drafting the framework to help support DCP implementation

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Interface between the DCP and GSP

Introduction

- DCP scope was developed in Spring 2019 and emphasized:
  - Strong, project-oriented outcomes
  - Collaboration to maximize support for project implementation funding
- Subsequent formation of the Napa Valley GSA, and future development of the GSP, presented an opportunity for regional collaboration
- Several commonalities between DCP and GSP tasks interface

Comparison of DCP and GSP Tasks

Overview of DCP and GSP Task Linkages	
DCP	**GSP**
Task 1. Initial Drought Contingency Plan Steps	Task 9. Napa Valley Subbasin Sustainability Goal
Task 2. Background, Study Area, and Participating Agencies	Task 2. Plan Area
Task 3. Water Supplies and Demands	Task 6. Groundwater and Surface Water Conditions Task 7. Historical, Current and Projected Water Supplies
Task 4. Drought Monitoring Process	
Task 5. Vulnerability Assessment	Task 8. Water Budget
Task 6. Mitigation Actions	Task 11. Sustainable Groundwater Management: Projects and Management Actions Task 12. Plan Implementation
Task 7. Response Actions	
Task 8. Organizational and Implementation Framework and Stakeholder Outreach	11.2. Education and Collaboration Communication and Outreach
Task 9. Update Process	12.5. Periodic Evaluation by GSA
Task 10. Drought Contingency Plan Document	Task 12. Plan Implementation • 12.1. Summary • 12.2. Summary of Recommendations
Task 11. Project Management	.

Importance of Collaboration between Studies

- Napa Valley has limited new water supply options, both studies are likely to identify a similar set of issues and potential solutions
- DCP and GSP are complementary:
  - Demonstrate a united effort on leveraging local, state, and federal funds to benefit regional water management
  - Provide equitable benefit and costs
  - Create broad stakeholder support for future project implementation

Continued Interface between the DCP and GSP

- The DCP will be completed prior to completion of the GSP
- Consulting teams will integrate information as appropriate
- Future implementation partnerships are anticipated between the DCP and GSA

Next Steps for the DCP

Next Steps for DCP

- DRAFT DCP due Spring 2021
- Napa Valley DCP website for information and input is up and running

  www.napawatersheds.org/dcp

- Questions or Comments?

Appendix B: NVDCP Water Supply and Demand Assessments

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Brown AND Caldwell

Napa Valley Drought Contingency Plan

City of American Canyon

Summary of Water Supply and Demand Assessment

CITY OF AMERICAN CANYON

Overview

The data included in the following slides was pulled from existing planning documents and/or conversations with City staff.

- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demands were pulled from the City of American Canyon 2015 UWMP.

Water Demands (AFY)					
Demand Type	2020	2025	2030	2035	2040
Potable	3,349	3,622	3,898	4,175	4,466
Non-Potable	56	--	--	--	--
Recycled Water	1,007	1,146	1,351	1,862	1,862

Population numbers were pulled from the City of American Canyon 2015 UWMP.

City of American Canyon Population					
Year	2020	2025	2030	2035	2040
City of American Canyon	22,462	24,609	26,756	29,903	31,210

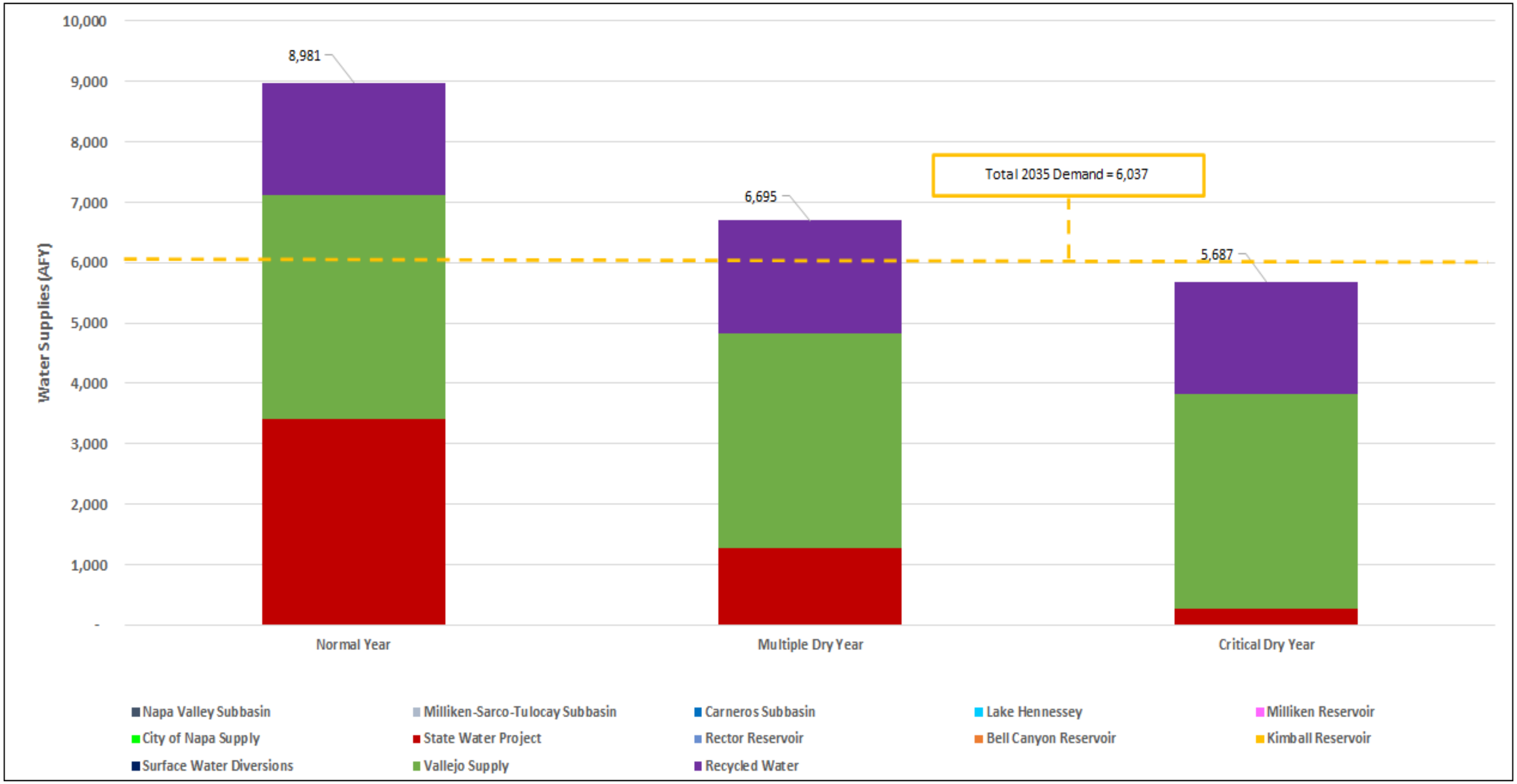
Available Water Supply (AFY)

Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
State Water Project	Normal Year	3,413	3,413	3,413	3,413	3,413	During Normal Years, State Water Project supplies are 62% of Table A (3,224 AF), with some Article 21 water (189 AF) assumed. The State Water Project supply is assumed to drop to 22% and 5%, respectively, when looking at the Multiple Dry Year and Critical Dry Year scenarios. Some Article 21 water is assumed to be available during the Multiple Dry Year scenario (124 AF), but none is assumed to be available during the Critical Dry Year scenario.
	Multiple Dry Year	1,268	1,268	1,268	1,268	1,268	
	Critical Dry Year	260	260	260	260	260	
Vallejo	Normal Year	3,413	3,413	3,413	3,413	3,413	Total includes Vallejo Permit Water, Vallejo Treated Water, and Vallejo Emergency Water. Vallejo Permit Water is assumed to remain the same across all three scenarios (500 AFY). Vallejo Treated Water is assumed to drop by 20% during drought scenarios (2,640 AFY vs 2,112 AFY). Vallejo Emergency Water (500 AFY) is assumed to be available only during drought periods (i.e., Multiple Dry Year and Critical Dry Year).
	Multiple Dry Year	3,112	3,112	3,112	3,112	3,112	
	Critical Dry Year	3,112	3,112	3,112	3,112	3,112	
Napa San Recycled Water	Normal Year	391	491	591	591	591	Totals were retrieved from City of American Canyon 2015 UWMP.
	Multiple Dry Year	391	491	591	591	591	
	Critical Dry Year	391	491	591	591	591	
American Canyon Recycled Water	Normal Year	616	655	760	1,271	1,271	Totals were retrieved from City of American Canyon 2015 UWMP.
	Multiple Dry Year	616	655	760	1,271	1,271	
	Critical Dry Year	616	655	760	1,271	1,271	
Total Water Supply	Normal Year	7,560	8,265	8,470	8,981	8,981	--
	Multiple Dry Year	5,387	5,979	6,184	6,695	6,695	
	Critical Dry Year	4,379	4,971	5,176	5,687	5,687	

Supply and Demand Comparison – 2020 Existing Condition

Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year and Multiple Dry Year scenario but there is a supply deficit during the Critical Dry Year scenario (33 AF).

Supply and Demand Comparison – 2035 Future Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year and Multiple Dry Year scenario but there is a supply deficit during the Critical Dry Year scenario (350 AF).

Napa Valley Drought Contingency Plan

City of Calistoga

Summary of Water Supply and Demand Assessment

Overview

The data included in the following slides was pulled from existing planning documents and/or conversations with City staff.

- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demand projections were based on an assumed GPCD of 95 and the population projections presented below. This GPDC was based on input from City staff.

Water Demands (AFY)					
Demand Type	2020	2025	2030	2035	2040
Potable	745	756	767	778	790
Non-Potable	--	--	--	--	--
Recycled Water	300	325	350	350	350

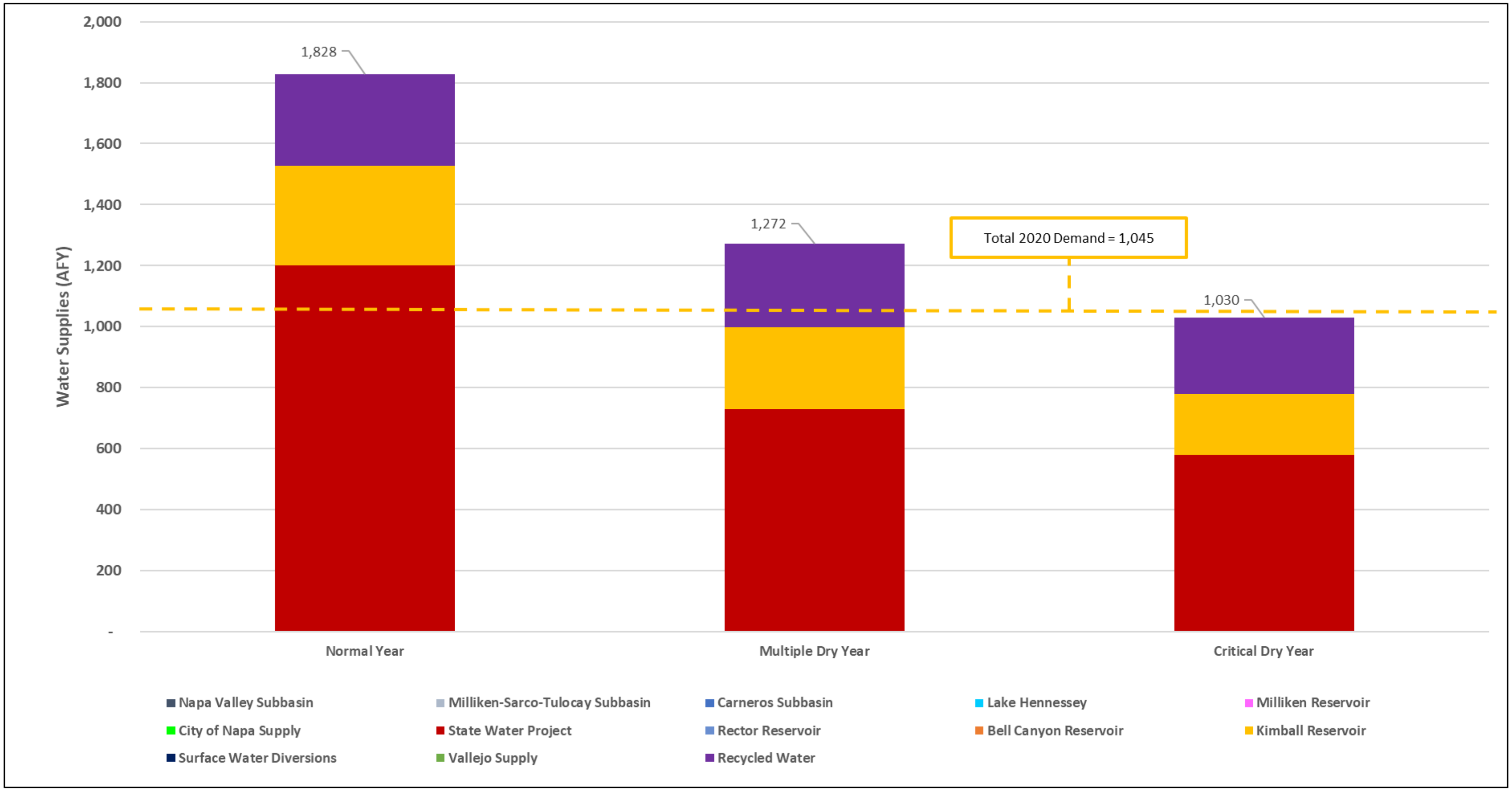
Population numbers are based on input provided by City staff.

City of Calistoga Population					
Year	2020	2025	2030	2035	2040
City of Calistoga	7,000	7,104	7,209	7,315	7,424

Available Water Supply (AFY)

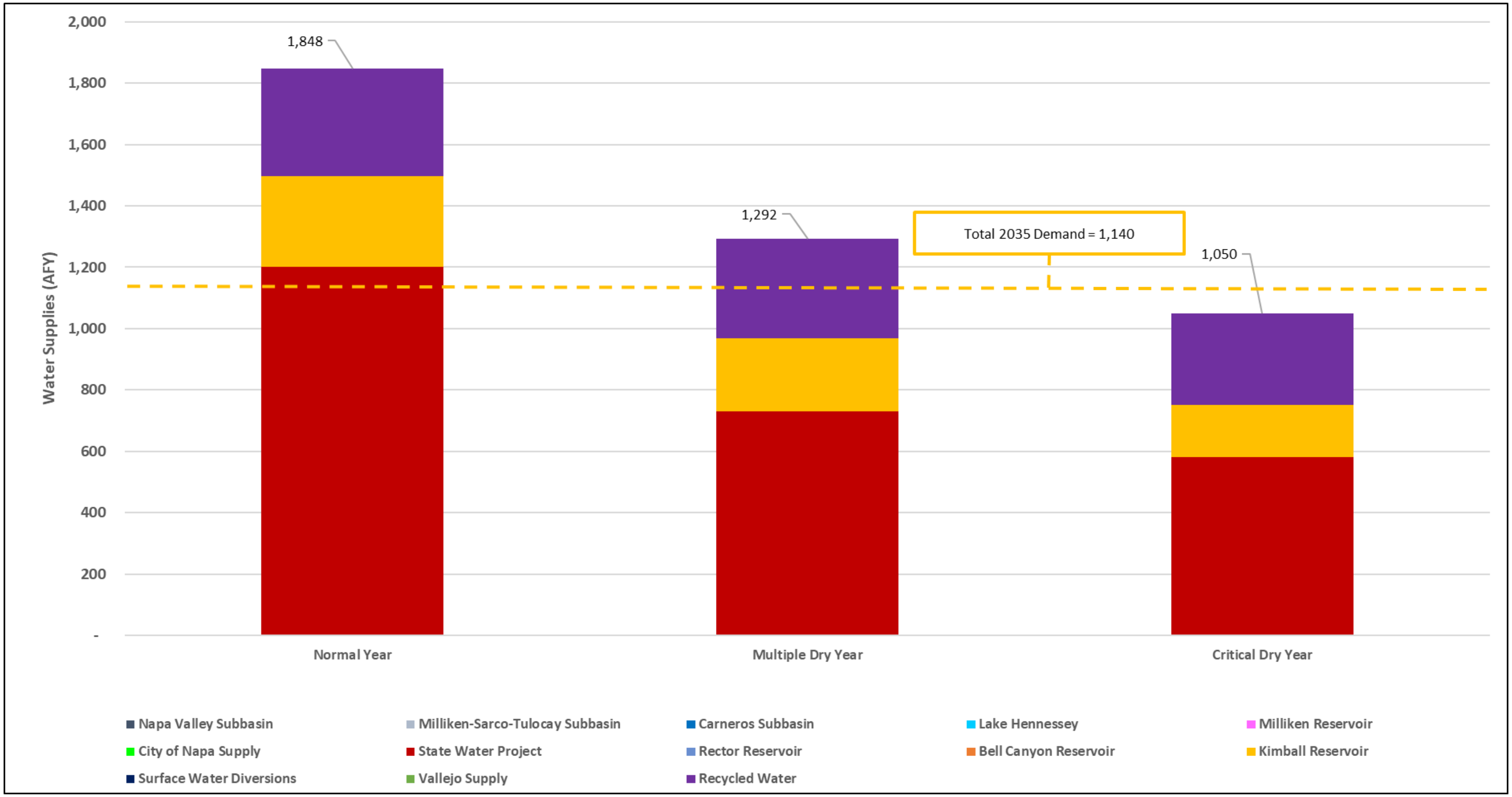
Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
State Water Project	Normal Year	1,200	1,200	1,200	1,200	--	Includes original 500 AF Table A agreement, 500 AF water transfer with American Canyon, and 925 AF water transfer with Kern County. Assumed that a firm yield of 62% delivery can be expected during normal years. This percentage was assumed to drop to 38% and 30%, respectively, during the Multiple Dry and Critical Dry Year Year scenarios. Note that this does not include carryover or Article 21 water which is additional water typically available, even in dry years.
	Multiple Dry Year	730	730	730	730	--	
	Critical Dry Year	580	580	580	580	--	
Kimball Reservoir	Normal Year	328	318	308	298	--	Based on City staff input, the reservoir capacity, and 2 AF/year loss due to sediment.
	Multiple Dry Year	267	257	247	237	--	
	Critical Dry Year	200	190	180	170	--	
Recycled Water	Normal Year	300	325	350	350	--	Based on totals included in the December 2016 Municipal Service Review for the City of Calistoga and input from City staff.
	Multiple Dry Year	275	300	325	325	--	
	Critical Dry Year	250	275	300	300	--	
Total Water Supply	Normal Year	1,828	1,843	1,858	1,848	--	--
	Multiple Dry Year	1,272	1,287	1,302	1,292	--	
	Critical Dry Year	1,030	1,045	1,060	1,050	--	

Supply and Demand Comparison – 2020 Existing Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year and Multiple Dry Year scenario but there is a supply deficit during the Critical Dry Year scenario (15 AF).

Supply and Demand Comparison – 2035 Future Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year and Multiple Dry Year scenario but there is a supply deficit during the Critical Dry Year scenario (90 AF).

Brown AND Caldwell

Napa Valley Drought Contingency Plan

City of Napa

Summary of Water Supply and Demand Assessment

CITY OF NAPA

Overview

The data included in the following slides was pulled from existing planning documents and/or conversations with City staff.

- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demands were pulled from the City of Napa 2015 UWMP and input from City staff.

Water Demands (AFY)					
Demand Type	2020	2025	2030	2035	2040
Potable	14,189	14,716	15,056	15,441	--
Non-Potable	--	--	--	--	--
Recycled Water	650	855	1,095	1,095	--

Potable water demands includes the 600 AFY in contractual retail sales to City of St. Helena.

Population numbers were pulled from the City of Napa 2015 UWMP and input from City staff.

City of Napa Population					
Year	2020	2025	2030	2035	2040
City of Napa	81,714	86,118	88,418	91,018	--

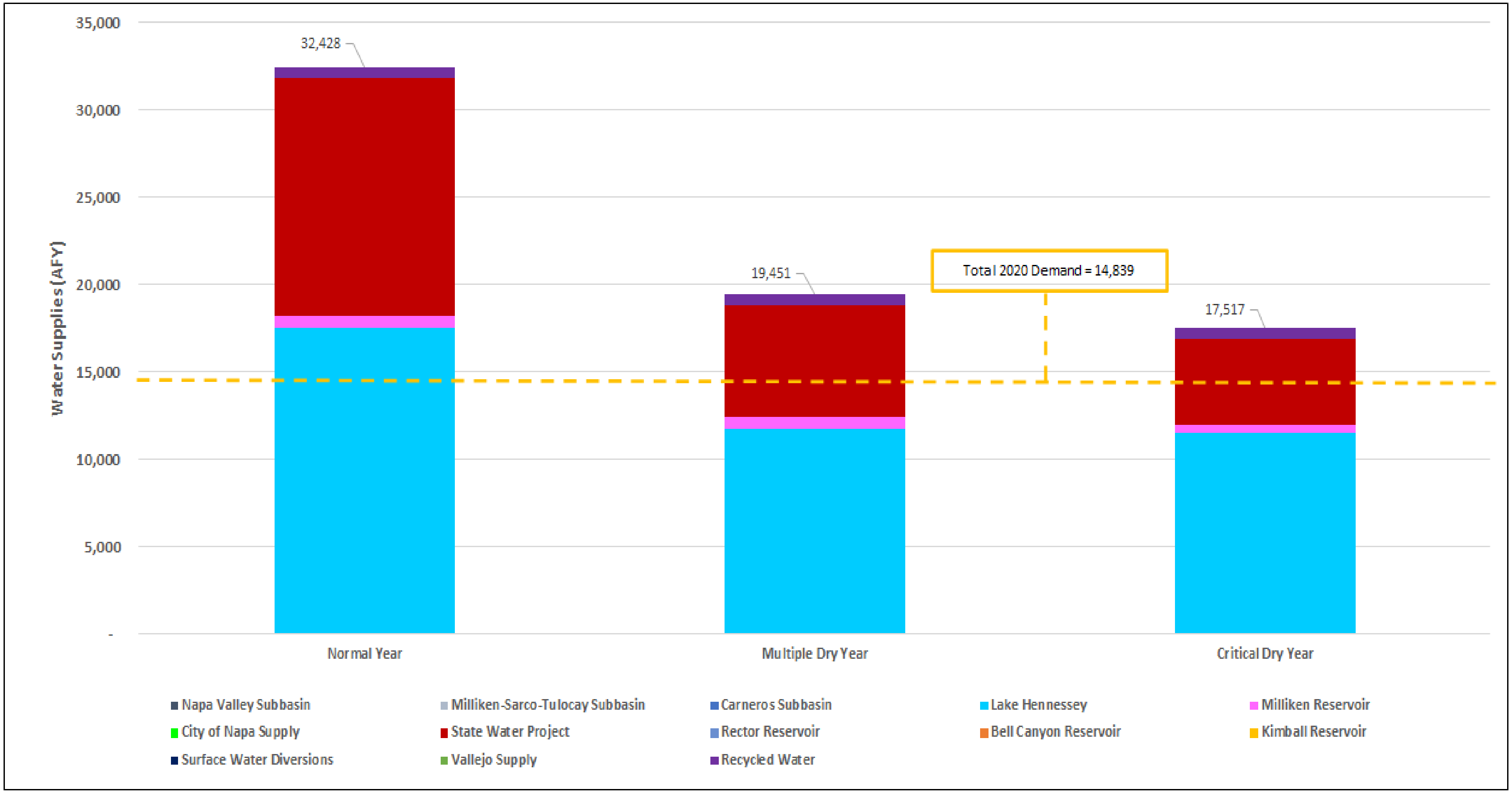
Values shown only account for population within the City limits.

Available Water Supply (AFY)

Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
State Water Project	Normal Year	13,578	13,578	13,578	13,578	--	State Water Project supplies are 62% of Table A, with no Carryover, Article 21, or North of Delta allocation assumed. This percentage drops to 29% and 5%, respectively, when looking at the Multiple Dry Year and Critical Dry Year scenarios. For the Critical Dry Year scenario, it is assumed that the City would receive an additional 3,772 AF from their Advanced Table A allocation.
	Multiple Dry Year	6,351	6,351	6,351	6,351	--	
	Critical Dry Year	4,867	4,867	4,867	4,867	--	
Lake Hennessey	Normal Year	17,500	17,500	17,500	17,500	--	Totals are based on reservoir yield and depletion tables from the 2015 City of Napa UWMP and City staff input.
	Multiple Dry Year	11,717	11,717	11,717	11,717	--	
	Critical Dry Year	11,500	11,500	11,500	11,500	--	
Milliken Reservoir	Normal Year	700	700	700	700	--	Totals are based on reservoir yield and depletion tables from the 2015 City of Napa UWMP and City staff input.
	Multiple Dry Year	733	733	733	733	--	
	Critical Dry Year	500	500	500	500	--	
Recycled Water	Normal Year	650	855	1,095	1,095	--	Recycled water is provided by Napa San. Totals were retrieved from City of Napa 2015 UWMP and City staff input.
	Multiple Dry Year	650	855	1,095	1,095	--	
	Critical Dry Year	650	855	1,095	1,095	--	
Total Water Supply	Normal Year	32,428	32,633	32,873	32,873	--	--
	Multiple Dry Year	24,651	24,856	25,096	25,096	--	
	Critical Dry Year	17,517	17,722	17,962	17,962	--	

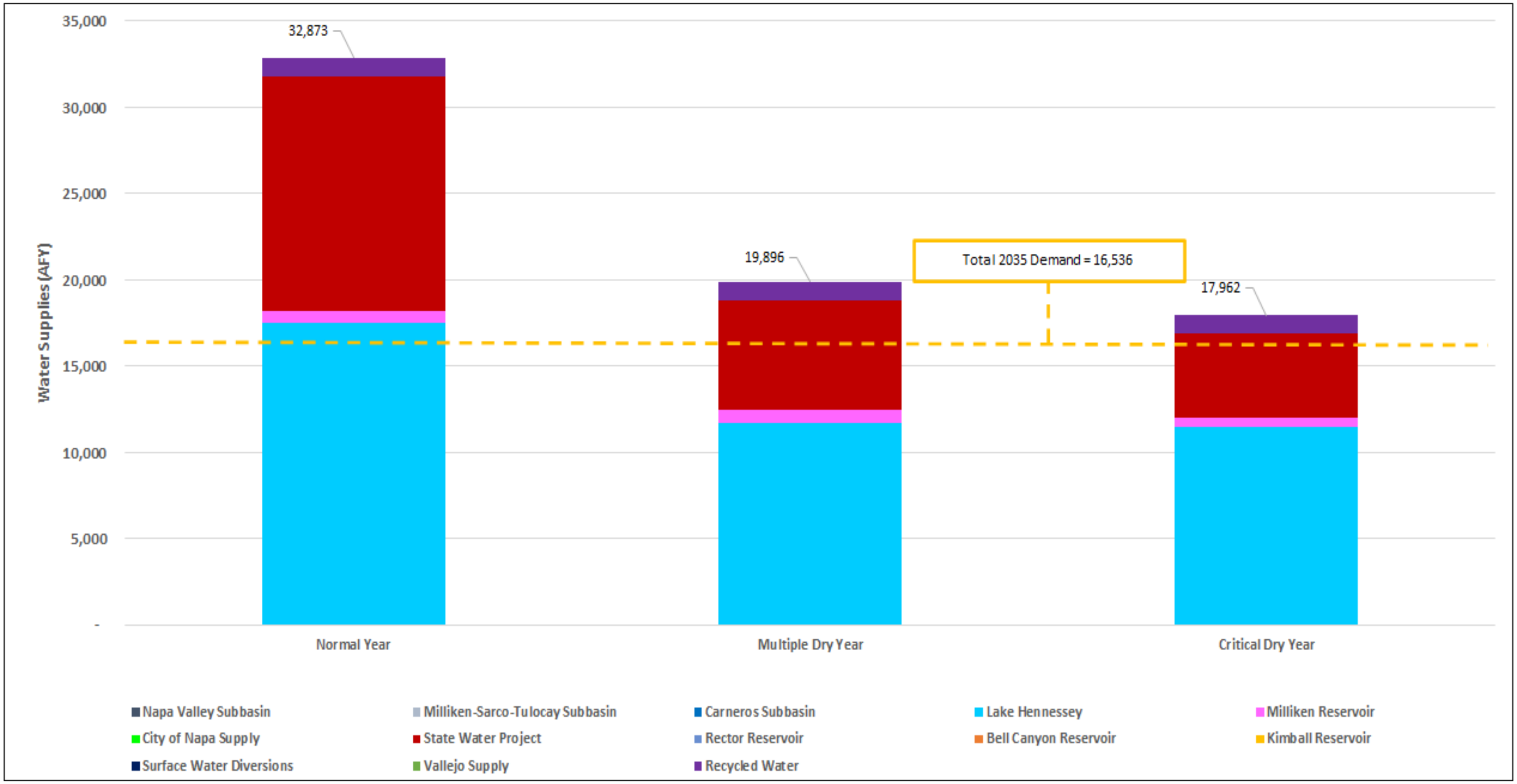
Supply and Demand

Supply and Demand Comparison – 2020 Existing Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand across all year types.

Supply and Demand Comparison – 2035 Future Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand across all year types.

Brown AND Caldwell

Napa Valley Drought Contingency Plan

City of St. Helena

Summary of Water Supply and Demand Assessment

Overview

The data included in the following slides was pulled from existing planning documents and/or conversations with City staff.

- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demand projections were based on an assumed GPCD of 237 and the population projections presented below. This GPDC was derived by reviewing recent water use trends and discussions with City staff.

Water Demands (AFY)					
Demand Type	2020	2025	2030	2035	2040
Potable	1,653	1,716	1,788	1,843	1,911
Non-Potable	--	--	--	--	--
Recycled Water	--	--	--	--	--

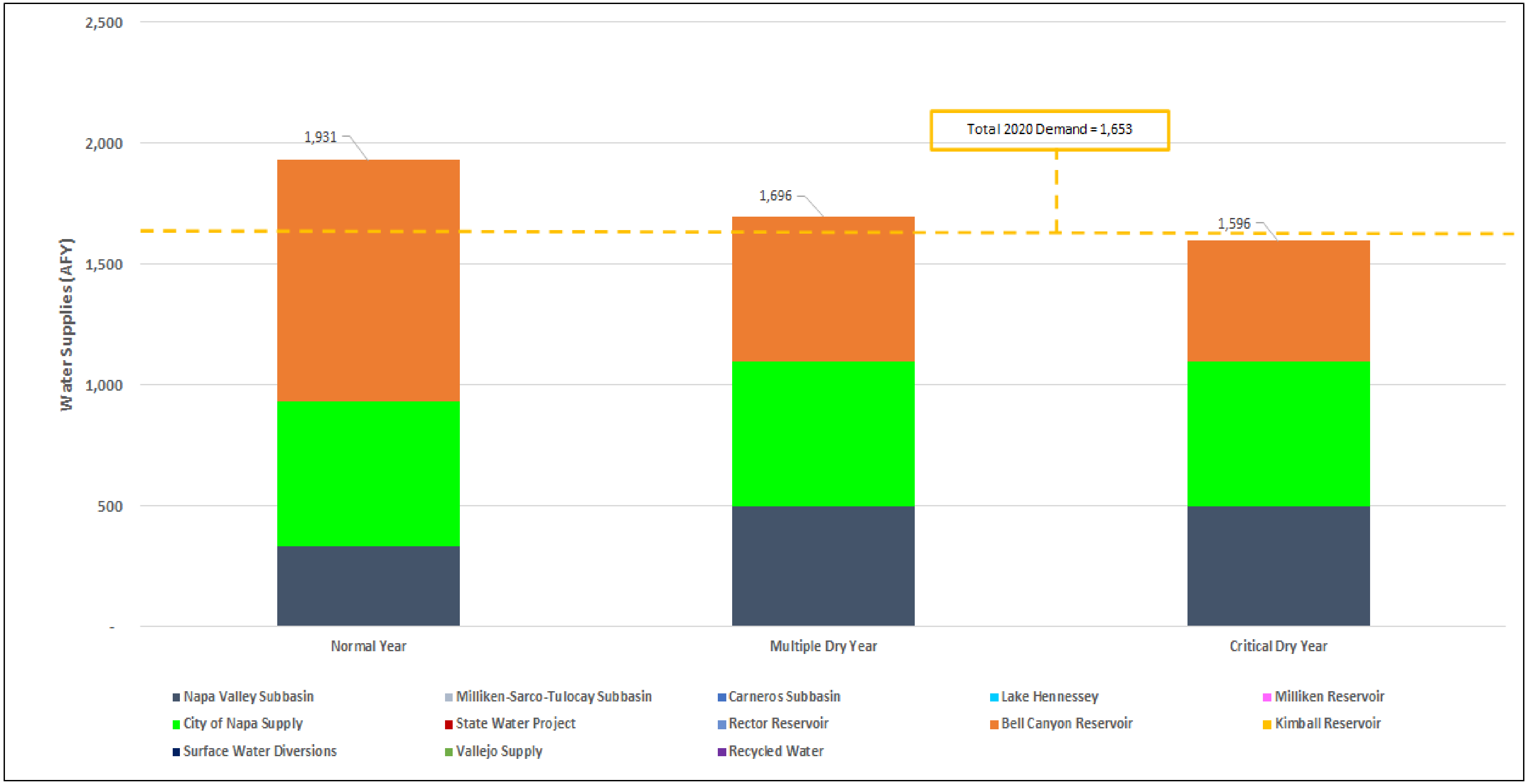
Population numbers are based on input provided by City staff and projections developed as part of the LAFCO MSR Administrative Draft dated February 2020.

City of St. Helena Population					
Year	2020	2025	2030	2035	2040
City of St. Helena	6,222	6,458	6728	6,936	7,192

Available Water Supply (AFY)

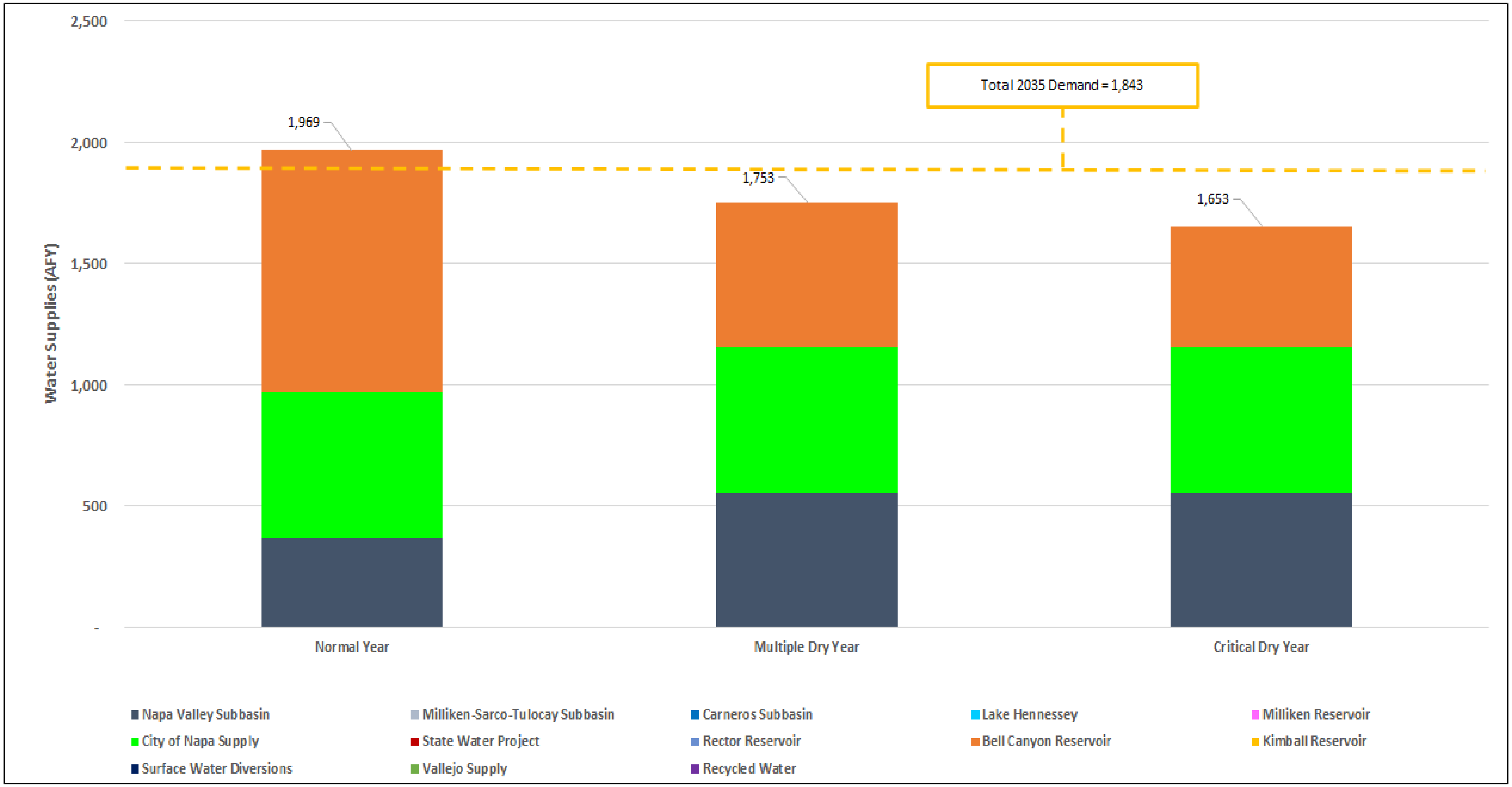
Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
Napa Valley Subbasin	Normal Year	331	343	358	369	--	Assumed that groundwater pumping from Stonebridge Well #1 and #2 would meet but not exceed 20% of the City's demands during Normal Years. It was assumed that pumping from the wells could be increased to meet but not exceed 30% of the City's demands during drought years (i.e., Multiple Dry Year and Critical Dry Year).
	Multiple Dry Year	496	515	536	553	--	
	Critical Dry Year	496	515	536	553	--	
Bell Canyon Reservoir	Normal Year	1,000	1,000	1,000	1,000	--	Values shown for Bell Canyon Reservoir are based on the sustainable yield shown in the Water Supply Plan that factor historical rainfall, rainfall to runoff relationship, and the bypass flow requirements.
	Multiple Dry Year	600	600	600	600	--	
	Critical Dry Year	500	500	500	500	--	
City of Napa Supply	Normal Year	600	600	600	600	--	Based on existing water supply agreement with the City of Napa. The City is required to make available 600 AF each year. If the City of Napa has additional water
	Multiple Dry Year	600	600	600	600	--	
	Critical Dry Year	600	600	600	600	--	
Total Water Supply	Normal Year	1,931	1,943	1,958	1,969	--	--
	Multiple Dry Year	1,696	1,715	1,736	1,753	--	
	Critical Dry Year	1,596	1,615	1,636	1,653	--	

Supply and Demand Comparison – 2020 Existing Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year and Multiple Dry Year scenario but there is a supply deficit during the Critical Dry Year scenario (57 AF).

Supply and Demand Comparison – 2035 Future Condition

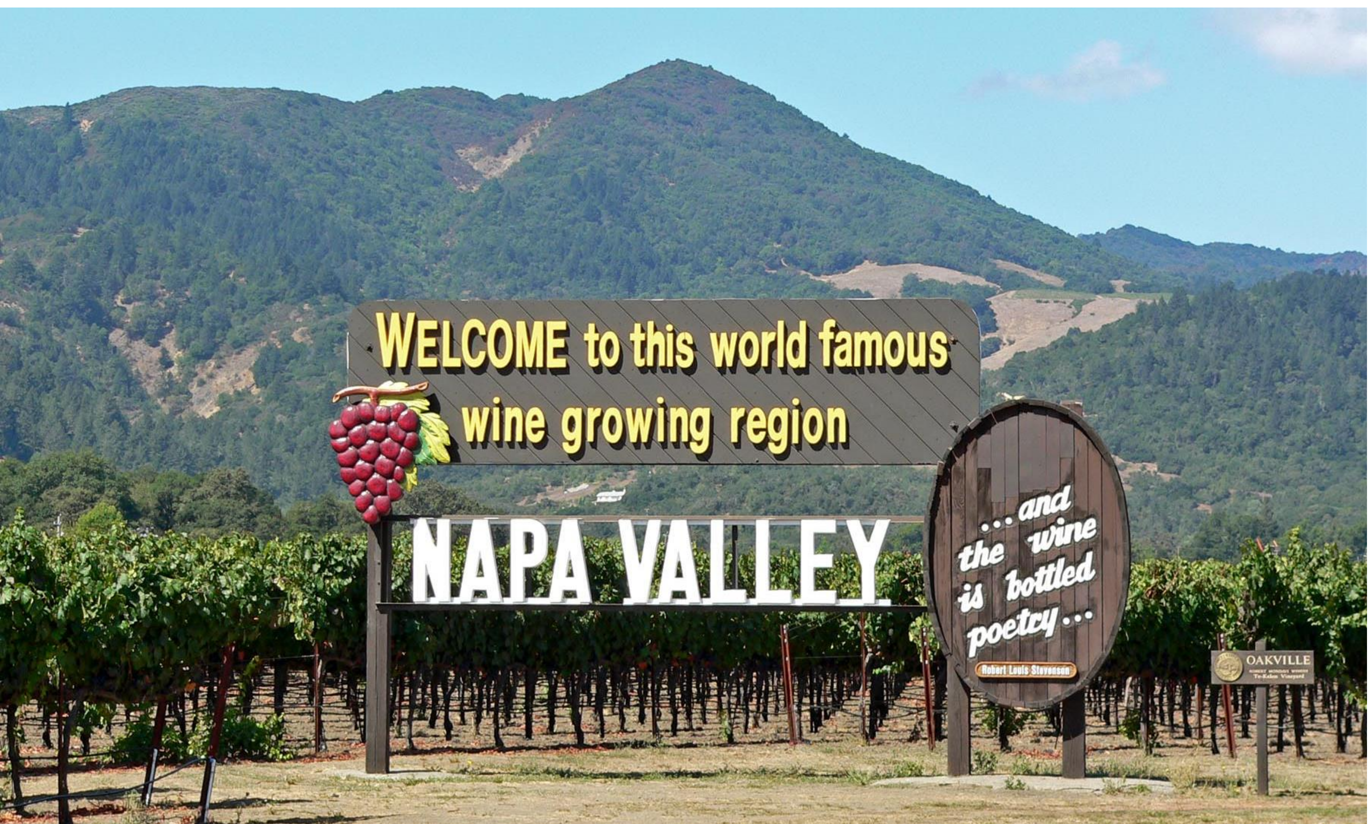


Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year scenario but there is a supply deficit during the Multiple Dry Year (90 AF) and Critical Dry Year scenario (190 AF).

Napa Valley Drought Contingency Plan

Napa County

Summary of Water Supply and Demand Assessment



Overview

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- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demands were assumed to remain relatively constant into the future based on recent water use data. The listed values are based on average water use in the Napa Valley Subbasin between 2013 and 2018. Carneros and MST demands were estimated to be 2,500 and 3,300, respectively, based on available projections from the 2050 Napa Study and discussions with County staff.

Agriculture and Unincorporated Water Demands by Region in the Valley (AFY)					
Year	2020	2025	2030	2035	2040
Napa Valley Subbasin Region	20,394	20,394	20,394	20,394	20,394
MST Region	3,300	3,300	3,300	3,300	3,300
Carneros Region	2,500	2,500	2,500	2,500	2,500

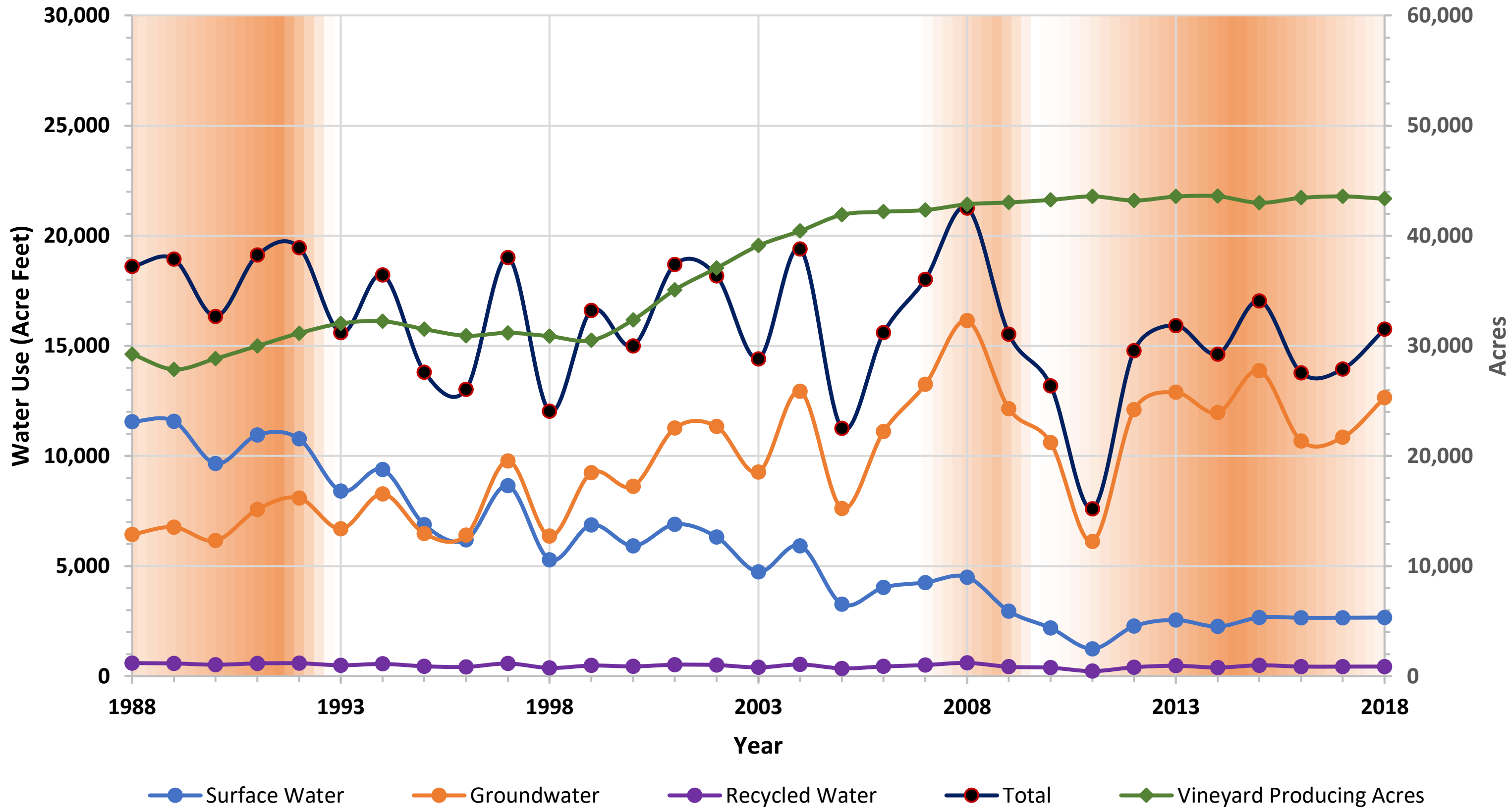
Source: Based on data from the Napa Valley Subbasin Analysis Report prepared by Luhdorff & Scalmanini, the Napa 2050 Study, and discussions with County staff..

Population numbers were interpolated based on available ABAG data. Values shown in the table below only look at unincorporated population, population for other cities and towns in the Napa Valley are provided and being reviewed by each respective partner agency.

Napa Valley Unincorporated Population					
Year	2020	2025	2030	2035	2040
Unincorporated Area	27,600	28,476	29,300	30,020	30,791

Source: Based on data from the Napa County Flood Control and Water Conservation District Municipal Service Review from June 2016.

Historical Agriculture Water Use



Note: Orange shading in the figure denotes periods of drought in the State.
Source: Water use data was pulled from the Napa Valley Subbasin Analysis Report prepared by Luhdorff & Scalmanini. The vineyard producing acres were pulled from the Napa County Agricultural Commissioner's Office Annual Crop Reports.

Available Water Supply for Agriculture and Unincorporated Water Demands (AFY)

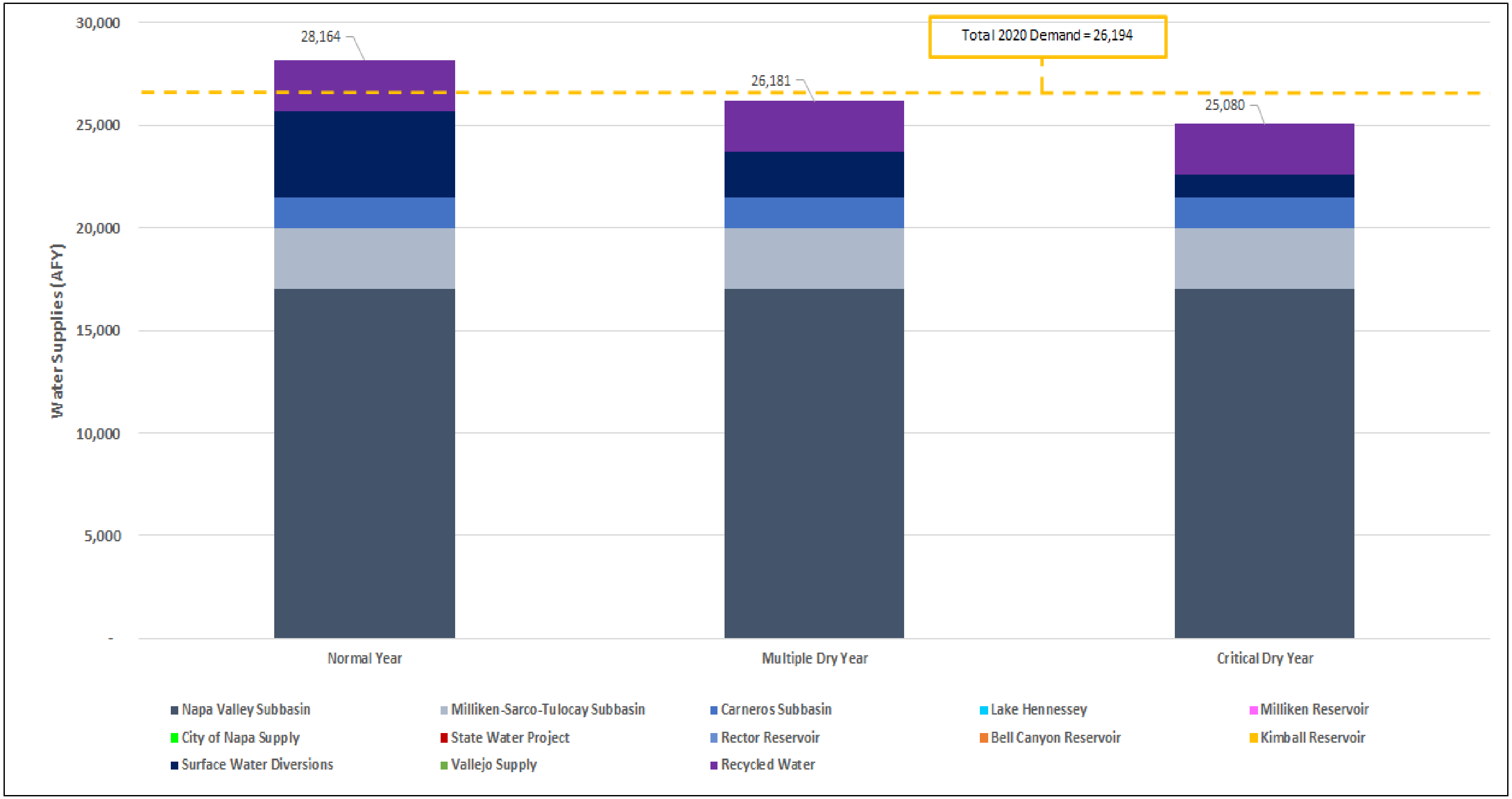
Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
Napa Valley Subbasin	Normal Year	17,000	17,000	17,000	17,000	17,000	Sustainable Yield is between 17,000 and 20,000 AFY according to the 2018 Groundwater Sustainability Annual Report dated March 2019. Assumed no changes in water availability across different year types.
	Multiple Dry Year	17,000	17,000	17,000	17,000	17,000	
	Critical Dry Year	17,000	17,000	17,000	17,000	17,000	
Milliken-Sarco-Tulocay Subbasin	Normal Year	3,000	3,000	3,000	3,000	3,000	Napa 2050 Study estimates up to 3,931 AFY could potentially be available. This estimate was adjusted to 3,000 based on discussions with County staff. Assumed no changes in water availability across different year types.
	Multiple Dry Year	3,000	3,000	3,000	3,000	3,000	
	Critical Dry Year	3,000	3,000	3,000	3,000	3,000	
Carneros Subbasin	Normal Year	1,500	1,500	1,500	1,500	1,500	Napa 2050 Study estimates up to 3,424 AFY could potentially be available. This estimate was adjusted to 1,500 based on discussions with County staff. Assumed no changes in water availability across different year types.
	Multiple Dry Year	1,500	1,500	1,500	1,500	1,500	
	Critical Dry Year	1,500	1,500	1,500	1,500	1,500	
Napa River Diversions	Normal Year	4,186	4,186	4,186	4,186	4,186	Total active surface water diversions were assumed to be 5,508 AFY. It was assumed that only 76% of that total would be available during Normal Years. This percentage drops to 40% and 20%, respectively, when looking at the Multiple Dry Year and Critical Dry Year scenarios.
	Multiple Dry Year	2,203	2,203	2,203	2,203	2,203	
	Critical Dry Year	1,102	1,102	1,102	1,102	1,102	
Recycled Water	Normal Year	2,478	2,478	2,478	2,478	2,478	Based on allocations from Napa San for Vineyards and LCWD water. Assumed no changes in water availability across different year types.
	Multiple Dry Year	2,478	2,478	2,478	2,478	2,478	
	Critical Dry Year	2,478	2,478	2,478	2,478	2,478	
Total Water Supply	Normal Year	28,164	28,164	28,164	28,164	28,164	--
	Multiple Dry Year	26,181	26,181	26,181	26,181	26,181	
	Critical Dry Year	25,080	25,080	25,080	25,080	25,080	

Notes on Napa River Diversion Values

Napa River Diversions

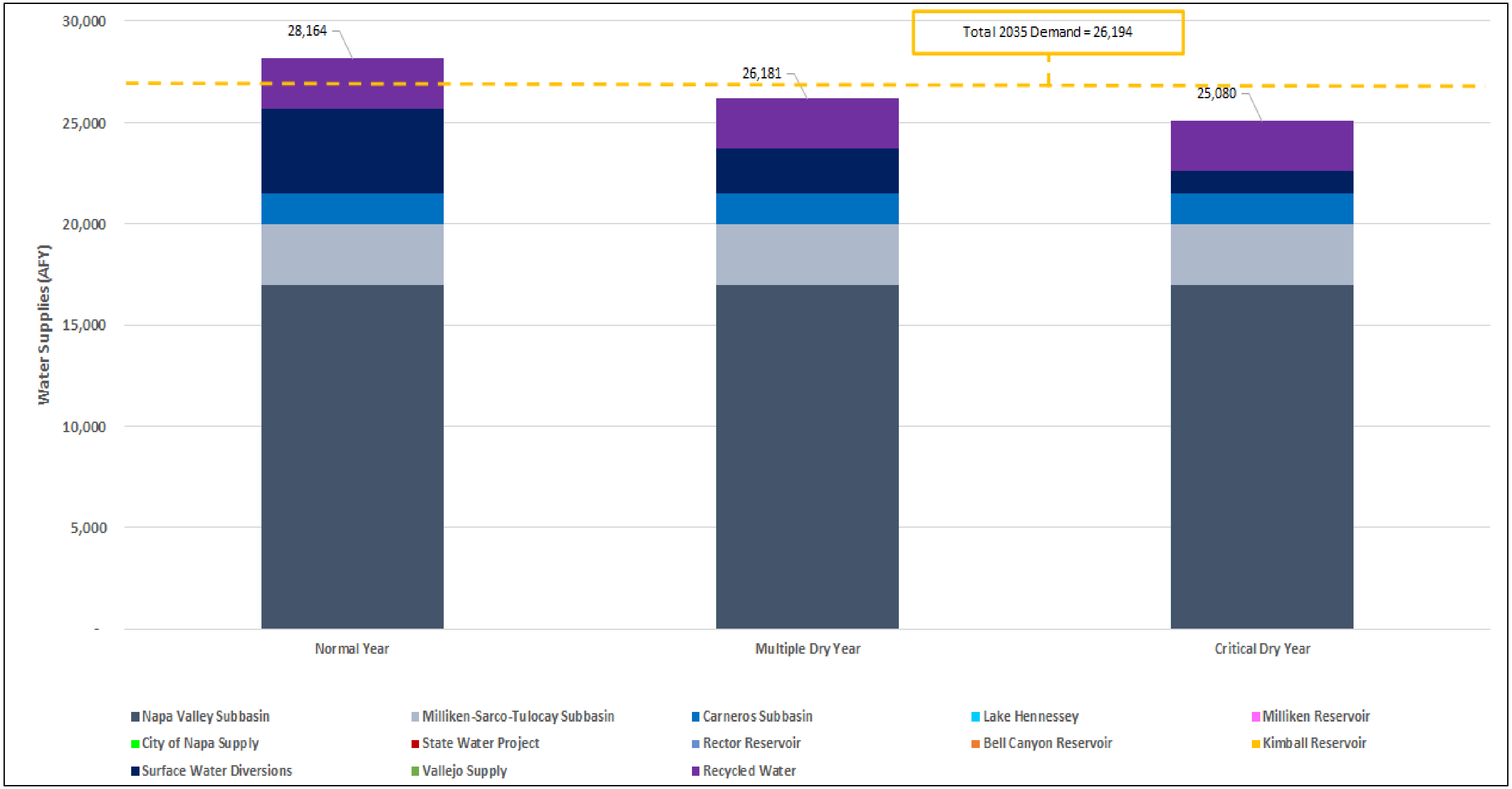
- The State Water Resources Control Board (SWRCB) is responsible for maintaining surface water rights in the State of California, including the Napa River and its tributaries.
- The SWRCB database establishes maximum values that a water right holder can divert, it is not possible to know the actual quantity of surface water diverted annually. However, the maximum agricultural diversion allowed can be estimated by summing all water right applications, licenses, permits and statement of diversions or use for both direct diversion and storage.
- This database does not include riparian diversions from the Napa River or its tributaries. It is acknowledged that riparian stream diversions do take place, however these quantities are very difficult to quantify, and will not make a significant difference to this planning study.
- The Napa River is considered fully appropriated during the irrigation season. Therefore, no increase in water supply from the Napa River is anticipated.

Supply and Demand Comparison – 2020 Existing Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year scenario but there is a supply deficit during the Multiple Dry Year (13 AF) scenario and Critical Dry Year (1,114 AF).

Supply and Demand Comparison – 2035 Future Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand in the Normal Year scenario but there is a supply deficit during the Multiple Dry Year (13 AF) scenario and Critical Dry Year (1,114 AF).

Napa Valley Drought Contingency Plan

Town of Yountville

Summary of Water Supply and Demand Assessment

Overview

The data included in the following slides was pulled from existing planning documents and/or conversations with Town staff.

- When looking at water supply, take note of the supply totals for the three different year types:

  Normal Year: The amount of water that most closely represents the average water supply available to your agency.

  Multiple Dry Year: This is meant to represent the lowest average water supply available to your agency for a consecutive multiple year period, in this analysis we've assumed "multiple dry years" to mean three dry years.

  Critical Dry Year: This is meant to represent the lowest water supply available to your agency.

Water Demand and Population Projections

Water demand projections were based on input provided by Town of Yountville staff.

Water Demands (AFY)					
Demand Type	2020	2025	2030	2035	2040
Potable	500	500	500	500	--
Non-Potable	--	--	--	--	--
Recycled Water	350	350	350	350	--

The amount of recycled water varies from year to year, values shown here are an approximate average.

Population numbers are based on input provided by Town of Yountville staff and projections developed as part of the LAFCO MSR Administrative Draft dated February 2020.

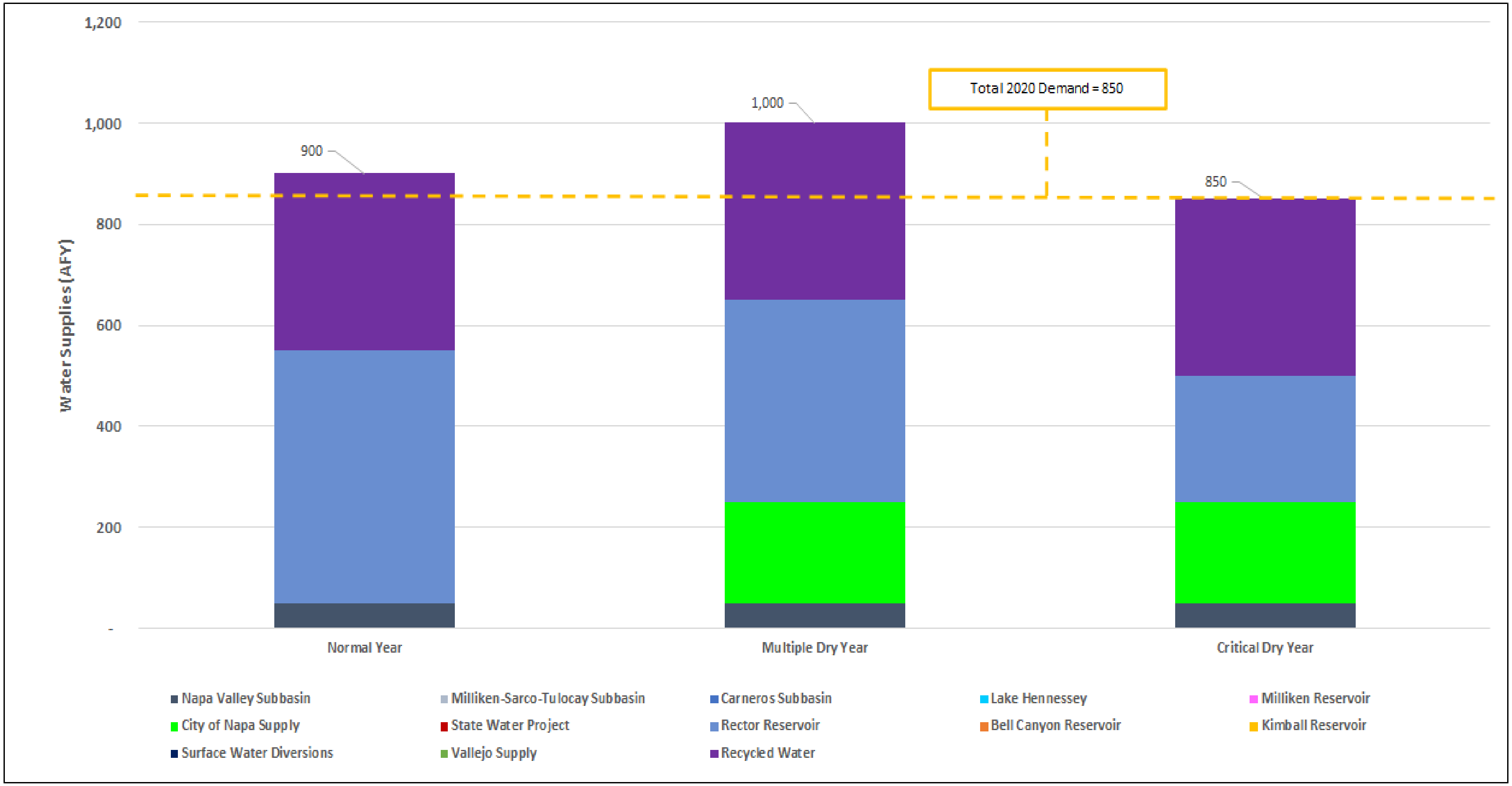
Town of Yountville Population					
Year	2020	2025	2030	2035	2040
Town of Yountville	2,907	2,860	2,813	2,768	2,724

Available Water Supply (AFY)

Supply Source	Year Type	2020	2025	2030	2035	2040	Notes
Napa Valley Subbasin	Normal Year	50	50	50	50	--	The Town owns one groundwater well for use in an emergency or drought situation. Existing planning studies suggest that the well can produce up to 300 AF per year, however, Town of Yountville staff indicated that actual production capacity was closer to 50 AF per year.
	Multiple Dry Year	50	50	50	50	--	
	Critical Dry Year	50	50	50	50	--	
Rector Reservoir	Normal Year	500	500	500	500	--	Long term purchase agreement for 500 AFY with the California Department of Veterans Affairs. Amount of water available was assumed to drop to 400 AFY and 250 AFY for the multiple dry year and critical dry year scenarios, respectively. These amounts were based on input provided by Town of Yountville staff.
	Multiple Dry Year	400	400	400	400	--	
	Critical Dry Year	250	250	250	250	--	
City of Napa Supply	Normal Year	--	--	--	--	--	The Town of Yountville has an agreement in place to purchase up to 200 AFY of emergency supply from the City of Napa. This supply can come from the State Water Project, Lake Hennessey, and/or Milliken Reservoir.
	Multiple Dry Year	200	200	200	200	--	
	Critical Dry Year	200	200	200	200	--	
Recycled Water	Normal Year	350	350	350	350	--	Totals were based on input provided by Town of Yountville staff.
	Multiple Dry Year	350	350	350	350	--	
	Critical Dry Year	350	350	350	350	--	
Total Water Supply	Normal Year	900	900	900	900	--	--
	Multiple Dry Year	1,000	1,000	1,000	1,000	--	
	Critical Dry Year	850	850	850	850	--	

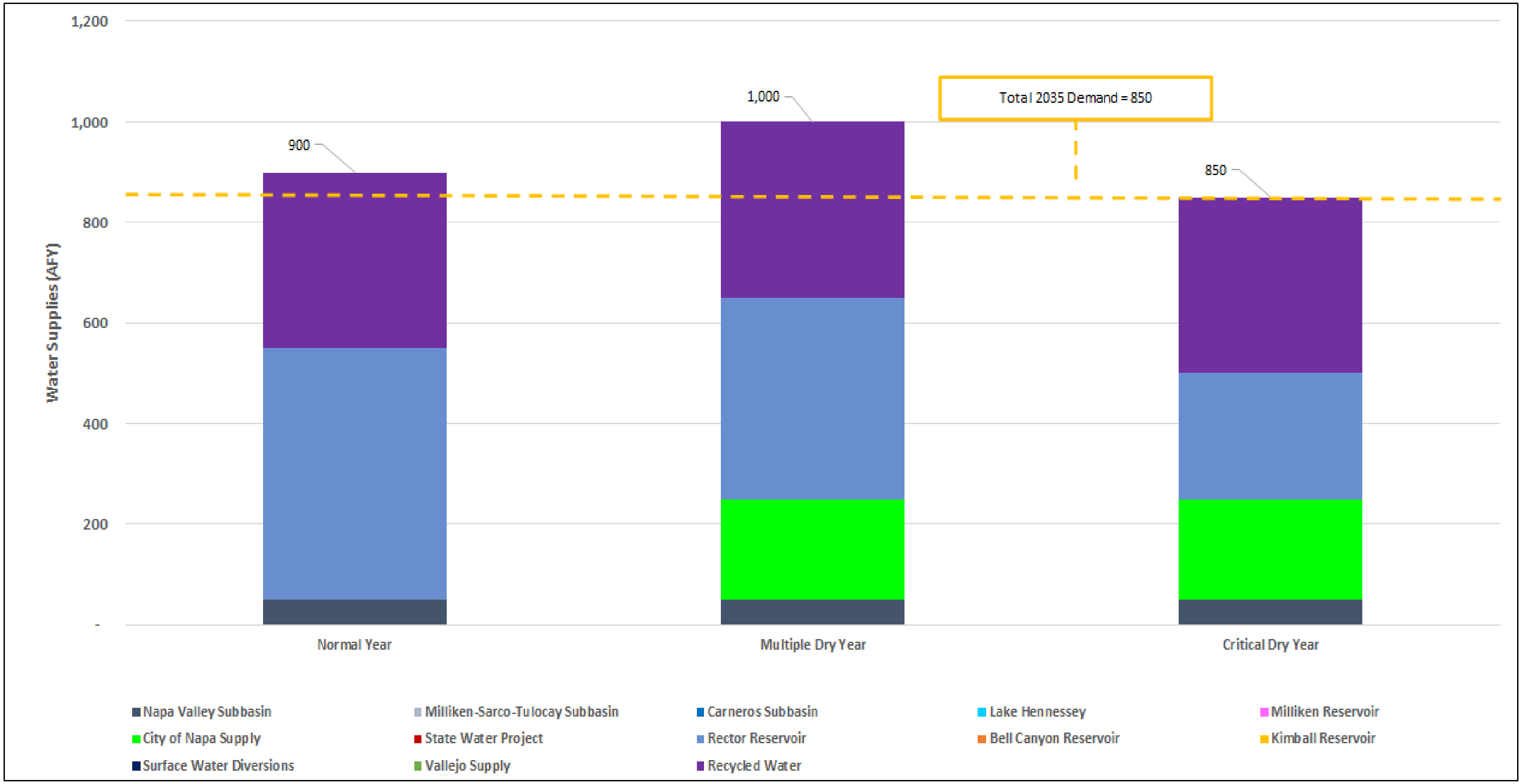
Supply and Demand

Supply and Demand Comparison – 2020 Existing Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand across all year types.

Supply and Demand Comparison – 2035 Future Condition



Based on the available water demand and supply data, there appears to be sufficient water supply to meet demand across all year types.

Appendix C: Evaluation and Prioritization Methodology for Mitigation and Response Actions

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Appendix C – Evaluation and Prioritization Methodology for Mitigation and Response Actions

This appendix details the methodology that was utilized to evaluate and prioritize the mitigation and response actions that the DCP Task Force and DCP Consultant team identified as part of the NVDCP. Included in the discussion are key differences in the approach used to evaluate projects included in the **Implementation Ready** stage (i.e., projects that are thought to be relatively well-defined and physically implementable) and the **Planning** stage (i.e., concept level projects and or implementable studies).

C.1 Evaluation and Prioritization

The goals, objectives, and weighting shown in Table C-1 were used to conduct the analysis and help identify which drought measures may be best suited to help build long-term resiliency to drought and mitigate the risks posed by drought in the region. As shown in Table C-1, weighting factors that were developed for the NVDCP goals were further disaggregated and evenly distributed amongst the objectives identified for each respective goal.

Table C-1. DCP Goals and Objectives

Napa Valley DCP Task Force Goals	Weighting Factor	Napa Valley DCP Objectives	Weighting Factor (by Objective)
Supply Reliability and Flexibility	35%	• Improve local, regional, and State Water Project supply reliability • Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.) • Reduce dependence on the State Water Project in dry years	11.67% 11.67% 11.67%
Watershed Approach	20%	• Interface with Napa County Groundwater Sustainability Agency to help support ongoing groundwater basin management • Alignment with the State's Water Resilience Portfolio principles • Enhance water use efficiency and conservation in the Napa Valley • Enhance climate change adaptation and mitigation	5% 5% 5% 5%
Environmental Enhancement	15%	• Maintain and protect public health and safety • Enhance local and regional ecosystems	7.5% 7.5%
Economic Feasibility and Financial Viability	30%	• Cost effectiveness ($/AF) • Ease of implementation/readiness to proceed	15% 15%

C.1.1 Developing Scoring Criteria

In order to develop a relative evaluation of the mitigation measures identified for the NVDCP with respect to the ability of each to satisfy the DCP Goals, a set of scoring metrices for the NVDCP objectives were developed. The objectives listed in Table C-1 were broken out into both quantitative and qualitative criteria. The metrics used for each criterion are shown in Tables C-2 and C-3, for projects in the Implementation Ready stage, and in Tables C-4 and C-5, for the Planning stage projects. These metrics were used to conduct the evaluation and comparison of the projects.

Table C-2. Quantitative Criteria – Implementation Ready Projects

Objective	Units	Maximum Quantity	Minimum Quantity
Improve local, regional, and State Water supply reliability	AFY	10,000	1
Cost effectiveness – Capital	($/AFY)	116,000	0
Cost effectiveness – O&M	($/AFY)	1,200	0

Table C-3. Qualitative Criteria – Implementation Ready Projects

Objective	Range of Scoring		Scoring Matrix		
	Minimum	Maximum	1	2	3
Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.)	1	3	No	Some indirect improvement in reliance against non-drought disasters	Direct improvement in reliance against non-drought disasters
Reduce dependence on the State Water Project in dry years	1	2	No	Yes	--
Interface with Napa County Groundwater Sustainability Agency to help support ongoing groundwater basin management	1	3	Little to no interface with GSA	Some interface with GSA with indirect benefits that support the ongoing groundwater basin management	Coordinated effort with GSA that directly support ongoing groundwater basin management
Alignment with the State's Water Resilience Portfolio principles	1	3	No	Partial Alignment with Portfolio's Principles	Full Alignment with Portfolio's Principles
Enhance water use efficiency and conservation in the Napa Valley	1	3	None	Use Efficiency (requires user participation)	Asset Efficiency (no action needed; implementation leads to uptick in efficiency)
Enhance climate change adaptation and mitigation	1	3	Benefits small area and single agency	Benefits multiple agencies and adds to resiliency	Benefits multiple agencies and reduces highly vulnerable supplies
Maintain and protect public health and safety	1	3	Makes water more accessible	Makes water more accessible, helps improve water quality, or helps reduce flooding potential	Makes water more accessible, helps improves water quality, and reduces flooding potential
Enhance local and regional ecosystems	1	3	Further taxes water supply from the environment	Leverages already used regional water supply	Increases effective regional water supply
Ease of implementation/readiness to proceed	1	3	Complex project with significant stakeholder considerations	Moderate project complexity with some stakeholder considerations	Relatively simple project with broad stakeholder support

The scoring metrics for Planning projects was generally the same as those developed for the Implementation Ready projects (Table C-2 and C-3) with only two differences: 1) the “Improve local, Regional, and State Water supply reliability” objective was shifted from quantitative objective to a qualitative one and 2) the “Cost Effectiveness” objective was assessed on a “0 to 100” scale rather than using actual capital costs as there was insufficient information to accurately quantify costs for projects/concepts in this stage. Tables C-4 and C-5 present the scoring criteria for the projects grouped in the Planning stage.

Table C-4. Quantitative Criteria – Planning Projects			
Objective	Units	Maximum Quantity	Minimum Quantity
Cost effectiveness – Capital	--	100	0

Table C-5. Qualitative Criteria – Planning Projects						
	Range of Scoring		Scoring Matrix			
Objective	Minimum	Maximum	1	2	3	4
Improve local, regional, and State Water supply reliability	1	3	Low	Medium	High	--
Improve reliance for non-drought disasters (i.e., fires, earthquakes, etc.)	1	3	No	Some indirect improvement in reliance against non-drought disasters	Direct improvement in reliance against non-drought disasters	--
Reduce dependence on the State Water Project in dry years	1	2	No	Yes	--	--
Interface with Napa County Groundwater Sustainability Agency to help support ongoing groundwater basin management	1	3	Little to no interface with GSA	Some interface with GSA with indirect benefits that support the ongoing groundwater basin management	Coordinated effort with GSA that directly support ongoing groundwater basin management	--
Alignment with the States Water Resilience Portfolio principles	1	3	No	Partial Alignment with Portfolios Principles	Full Alignment with Portfolios Principles	--
Enhance water use efficiency and conservation in the Napa Valley	1	3	None	Use Efficiency (requires user participation)	Asset Efficiency (no action needed; implementation leads to uptick in efficiency)	--
Enhance climate change adaptation and mitigation	1	3	Benefits small area and single agency	Benefits multiple agencies and adds to resiliency	Benefits multiple agencies and reduces highly vulnerable supplies	--
Maintain and protect public health and safety	1	3	Makes water more accessible	Makes water more accessible, helps improve water quality, or helps reduce flooding potential	Makes water more accessible, helps improves water quality, and reduces flooding potential	--
Enhance local and regional ecosystems	1	3	Further taxes water supply from the environment	Leverages already used regional water supply	Increases effective regional water supply	--
Ease of implementation/readiness to proceed	1	4	Conceptual only	Concept examples available with potentially significant stakeholder considerations	Requires funding, design/planning, but has broad stakeholder support	Only requires funding with broad stakeholder support

C.1.2 Assigning Raw Scores

The quantitative and qualitative criteria in the previous section was used to assign scores based on each projects ability to satisfy project objectives. Tables C-6 and C-7 present the raw quantitative scores for both the Implementation Ready and Planning projects, respectively, while Tables C-8 and C-9 present the qualitative scores both the Implementation Ready and Planning projects, respectively. Scores were based on best available project information.

Table C-6. Raw Quantitative Scores for Implementation Ready Projects

No.	Drought Mitigation Measure	Improve Local, Regional, and State Water Supply Reliability[a]	Cost Effectiveness: Capital[b]	Cost Effectiveness: O&M[b]
	Units:	AFY	$/AFY	$/AFY
Conveyance – Expansion of existing distribution systems to augment current use of recycled water.				
4	Phase 1 Recycled Water Distribution System Expansion	102	30,392	294
5	Phase 2 Recycled Water Distribution System Expansion	25	116,000	1,200
6	Milliken-Sarco-Tulocay Northern Loop	350	21,714	143
7	Milliken-Sarco-Tulocay Eastern Extension	150	27,333	333
Storage – Development of storage facilities used to store winter effluent for summer use and or optimize daily recycled water supply.				
8	Additional Soscol WRF Covered Storage	240	12,083	167
9	Napa State Hospital Storage Tank	429	17,249	163
10	Napa SD Seasonal Storage	1,100	27,636	209
11	Lake Curry Purchase (Vallejo Lakes System)	N/A	N/A	N/A
12	Sites Reservoir allocation Purchase	N/A	N/A	N/A
Treatment – Expansion and or upgrades of existing treatment facilities.				
13	WRF Phase 2 Treatment Plant Upgrades	168	35,714	60
14	Soscol WRF Phase 2 Treatment Plant Upgrades	571	3,853	473
Operations – Infrastructure improvements that improve operational efficiency and flexibility.				
17	Dwyer Road Pump Station Project	N/A	N/A	N/A
18	Dunaweal Pump Station Replacement Project	N/A	N/A	N/A
19	Putah South Canal Intertie	10,000	600	N/A
21	Regional Water Conservation Program	1[c]	N/A	0

a. Value based on the projected project yield.
b. Value was tabulated by dividing the associated cost by the projected project yield.
c. Number assigned for relative scoring purposes.
NA – Not available

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Table C-7. Raw Quantitative Scores for Planning Projects		
No.	Drought Mitigation Measure	Cost Effectiveness[a]
	Units:	--
Groundwater Management – Aquifer storage, aquifer recovery, and groundwater basin recharge.		
1	Aquifer Storage and Recovery	50
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	35
3	Integrated Water Supply Wells	65
Treatment – Expansion and or upgrades of existing treatment facilities.		
15	Purified Water Feasibility Study	100
16	Mitigation Strategies for Boron Reduction	70
Operations – Infrastructure improvements that improve operational efficiency and flexibility.		
20	North Bay Aqueduct Expansion	1
22	Integrated Supply and Operations Study	100

a. *Value was assigned a score between 0 and 100, the higher the score the more cost effective it was deemed to be.*

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Table C-8. Raw Qualitative Scores for Implementation Ready Projects										
No.	Drought Mitigation Measure	Improve Reliance for Non-drought Disasters (i.e., fires, earthquakes, etc.)	Reduce Dependence on the State Water Project in Dry Years	Interface with Napa County Groundwater Sustainability Agency	Alignment with the State's Water Resilience Portfolio principles	Enhance Water Use Efficiency and Conservation in the Napa Valley	Enhance Climate Change Adaptation and Mitigation	Maintain and Protect Public Health and Safety	Enhance Local and Regional Ecosystems	Ease of implementation/ readiness to proceed
	Range:	1-3	1-2	1-3	1-3	1-3	1-3	1-3	1-3	1-3
Conveyance – Expansion of existing distribution systems to augment current use of recycled water.										
4	Phase 1 Recycled Water Distribution System Expansion	2	2	1	2	3	2	2	3	2
5	Phase 2 Recycled Water Distribution System Expansion	2	2	1	2	3	2	2	3	2
6	Milliken-Sarco-Tulocay Northern Loop	2	2	1	2	3	2	2	3	2
7	Milliken-Sarco-Tulocay Eastern Extension	2	2	1	2	3	2	2	3	2
Storage – Development of storage facilities used to store winter effluent for summer use and or optimize daily recycled water supply.										
8	Additional Soscol WRF Covered Storage	1	2	1	2	3	2	2	2	3
9	Napa State Hospital Storage Tank	1	2	1	2	3	2	2	2	3
10	Napa SD Seasonal Storage	2	2	2	2	3	2	2	2	3
11	Lake Curry Purchase (Vallejo Lakes System)	2	2	2	2	1	3	1	1	1
12	Sites Reservoir allocation Purchase	3	3	2	2	1	3	2	2	1
Treatment – Expansion and or upgrades of existing treatment facilities.										
13	WRF Phase 2 Treatment Plant Upgrades	2	2	1	2	3	2	2	3	3
14	Soscol WRF Phase 2 Treatment Plant Upgrades	2	2	1	2	3	2	2	3	3
Operations – Infrastructure improvements that improve operational efficiency and flexibility.										
17	Dwyer Road Pump Station Project	3	2	2	2	3	3	2	3	3
18	Dunaweal Pump Station Replacement Project	3	2	2	2	2	3	3	2	3
19	Putah South Canal Intertie	3	2	1	2	1	3	1	2	2
21	Regional Water Conservation Program	2	2	1	2	2	3	2	3	3

Table C-9. Raw Qualitative Scores for Planning Projects

No.	Drought Mitigation Measure	Improve Local, Regional, and State Water Supply Reliability	Improve Reliance for Non-drought Disasters (i.e., fires, earthquakes, etc.)	Reduce Dependence on the State Water Project	Interface with Napa County Groundwater Sustainability Agency	Alignment with the State's Water Resilience Portfolio Principles	Enhance Water Use Efficiency and Conservation in the Napa Valley	Enhance Climate Change Adaptation and Mitigation	Maintain and Protect Public Health and Safety	Enhance Local and Regional Ecosystems	Ease of Implementation/ Readiness to Proceed
	Range:		1-3	1-2	1-3	1-3	1-3	1-3	1-3	1-3	1-3
Groundwater Management – Aquifer storage, aquifer recovery, and groundwater basin recharge.											
1	Aquifer Storage and Recovery	3	2	2	3	2	2	2	2	2	2
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	3	2	2	3	3	2	2	2	3	2
3	Integrated Water Supply Wells	3	2	2	3	2	2	2	2	1	3
Treatment – Expansion and or upgrades of existing treatment facilities.											
15	Purified Water Feasibility Study	3	2	2	2	3	2	3	3	3	4
16	Mitigation Strategies for Boron Reduction	2	1	2	2	2	2	1	1	3	1
Operations – Infrastructure improvements that improve operational efficiency and flexibility.											
20	North Bay Aqueduct Expansion	2	2	1	1	2	3	2	2	1	2
22	Integrated Supply and Operations Study	2	2	2	2	2	3	3	3	2	4

C.1.3 Normalizing Raw Scores

The assigned raw quantitative and qualitative scores were normalized as follows:

- **Quantitative Criteria:** Raw scores were converted to a percentage of the maximum specified value amongst the projects being evaluated.
- **Qualitative Criteria:** Raw scores were converted to percentiles that reflect the percentage of projects that are considered "less preferred".

Tables C-10 and C-11 present the normalized quantitative scores for both the Implementation Ready and Planning projects, respectively, while Tables C-12 and C-13 present the qualitative scores both the Implementation Ready and Planning projects, respectively.

Table C-10. Normalized Quantitative Scores for Implementation Ready Projects

No.	Drought Mitigation Measure	Improve Local, Regional, and State Water Supply Reliability[a]	Cost Effectiveness: Capital	Cost Effectiveness: O&M
	Units:	AFY	$/AFY	$/AFY
	Max Value:	10,000	116,000	1,200
	Minimum Value:	1	0	0
Conveyance – Expansion of existing distribution systems to augment current use of recycled water.				
4	Phase 1 Recycled Water Distribution System Expansion	0.010	0.738	0.755
5	Phase 2 Recycled Water Distribution System Expansion	0.003	0	0
6	Milliken-Sarco-Tulocay Northern Loop	0.035	0.813	0.881
7	Milliken-Sarco-Tulocay Eastern Extension	0.015	0.764	0.722
Storage – Development of storage facilities used to store winter effluent for summer use and or optimize daily recycled water supply.				
8	Integrated Soscol WRF Covered Storage	0.024	0.896	0.861
9	Napa State Hospital Storage Tank	0.043	0.851	0.864
10	Napa SD Seasonal Storage	0.110	0.762	0.826
11	Lake Curry Purchase (Vallejo Lakes System)	N/A	N/A	N/A
12	Sites Reservoir allocation Purchase	N/A	N/A	N/A
Treatment – Expansion and or upgrades of existing treatment facilities.				
13	WRF Phase 2 Treatment Plant Upgrades	0.017	0.692	0.950
14	Soscol WRF Phase 2 Treatment Plant Upgrades	0.057	0.967	0.606
Operations – Infrastructure improvements that improve operational efficiency and flexibility.				
17	Dwyer Road Pump Station Project	N/A	N/A	N/A
18	Dunaweal Pump Station Replacement Project	N/A	N/A	N/A
19	Putah South Canal Intertie	1.0	0.995	N/A
21	Regional Water Conservation Program	0.0	N/A	1

Table C-11. Normalized Quantitative Scores for Planning Projects		
No.	Drought Mitigation Measure	Cost Effectiveness
	Units:	--
Groundwater Management – Aquifer storage, aquifer recovery, and groundwater basin recharge.		
1	Aquifer Storage and Recovery	0.50
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	0.35
3	Additional Water Supply Wells	0.65
Treatment – Expansion and or upgrades of existing treatment facilities.		
15	Purified Water Feasibility Study	1.0
16	Mitigation Strategies for Boron Reduction	0.70
Operations – Infrastructure improvements that improve operational efficiency and flexibility.		
20	North Bay Aqueduct Expansion	0.01
22	Integrated Supply and Operations Study	1.0

Table C-12. Normalized Qualitative Scores for Implementation Ready Projects										
No.	Drought Mitigation Measure	Improve Reliance for Non-drought Disasters (i.e., fires, earthquakes, etc.)	Reduce Dependence on the State Water Project in Dry Years	Interface with Napa County Groundwater Sustainability Agency	Alignment with the State's Water Resilience Portfolio principles	Enhance Water Use Efficiency and Conservation in the Napa Valley	Enhance Climate Change Adaptation and Mitigation	Maintain and Protect Public Health and Safety	Enhance Local and Regional Ecosystems	Ease of implementation/ Readiness to Proceed
Conveyance – Expansion of existing distribution systems to augment current use of recycled water.										
4	Phase 1 Recycled Water Distribution System Expansion	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.14
5	Phase 2 Recycled Water Distribution System Expansion	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.14
6	Milliken-Sarco-Tulocay Northern Loop	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.14
7	Milliken-Sarco-Tulocay Eastern Extension	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.14
Storage – Development of storage facilities used to store winter effluent for summer use and or optimize daily recycled water supply.										
8	Additional Soscol WRF Covered Storage	0.00	0.00	0.00	0.00	0.36	0.00	0.14	0.07	0.50
9	Napa State Hospital Storage Tank	0.00	0.00	0.00	0.00	0.36	0.00	0.14	0.07	0.50
10	Napa SD Seasonal Storage	0.14	0.00	0.71	0.00	0.36	0.00	0.14	0.07	0.50
11	Lake Curry Purchase (Vallejo Lakes System)	0.14	0.00	0.71	0.00	0.00	0.64	0.00	0.00	0.00
12	Sites Reservoir allocation Purchase	0.79	1.00	0.71	0.00	0.00	0.64	0.14	0.07	0.00
Treatment – Expansion and or upgrades of existing treatment facilities.										
13	WRF Phase 2 Treatment Plant Upgrades	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.50
14	Soscol WRF Phase 2 Treatment Plant Upgrades	0.14	0.00	0.00	0.00	0.36	0.00	0.14	0.50	0.50
Operations – Infrastructure improvements that improve operational efficiency and flexibility.										
17	Dwyer Road Pump Station Project	0.79	0.00	0.71	0.00	0.36	0.64	0.14	0.50	0.50
18	Dunaweal Pump Station Replacement Project	0.79	0.00	0.71	0.00	0.21	0.64	1.00	0.07	0.50
19	Putah South Canal Intertie	0.79	0.00	0.00	0.00	0.00	0.64	0.00	0.07	0.14
21	Regional Water Conservation Program	0.14	0.00	0.00	0.00	0.21	0.64	0.14	0.50	0.50

Table C-13. Normalized Qualitative Scores for Planning Projects

No.	Drought Mitigation Measure	Improve Local, Regional, and State Water Supply Reliability	Improve Reliance for Non-drought Disasters (i.e., fires, earthquakes, etc.)	Reduce Dependence on the State Water Project	Interface with Napa County Groundwater Sustainability Agency	Alignment with the State's Water Resilience Portfolio principles	Enhance Water Use Efficiency and Conservation in the Napa Valley	Enhance Climate Change Adaptation and Mitigation	Maintain and Protect Public Health and Safety	Enhance Local and Regional Ecosystems	Ease of Implementation/ Readiness to Proceed
Groundwater Management – Aquifer storage, aquifer recovery, and groundwater basin recharge.											
1	Aquifer Storage and Recovery	0.50	0.17	0.17	0.67	0.00	0.00	0.17	0.17	0.33	0.17
2	Indirect Potable Reuse (IPR) via Groundwater Recharge (GWR) or Surface Water Augmentation (SWA)	0.50	0.17	0.17	0.67	0.83	0.00	0.17	0.17	0.67	0.17
3	Integrated Water Supply Wells	0.50	0.17	0.17	0.67	0.00	0.00	0.17	0.17	0.00	0.67
Treatment – Expansion and or upgrades of existing treatment facilities.											
15	Purified Water Feasibility Study	0.50	0.17	0.17	0.17	0.83	0.00	0.83	0.83	0.67	0.83
16	Mitigation Strategies for Boron Reduction	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.67	0.00
Operations – Infrastructure improvements that improve operational efficiency and flexibility.											
20	North Bay Aqueduct Expansion	0.00	0.17	0.00	0.00	0.00	0.83	0.17	0.17	0.00	0.17
22	Integrated Supply and Operations Study	0.00	0.17	0.17	0.17	0.00	0.83	0.83	0.83	0.33	0.83

C.1.4 Applying Weighting Factors and Evaluation Results

The weighting factors from Table C-1 were applied to the normalized scores on an objective level to develop a composite score for each of the assessed projects. Results of the project evaluation and prioritization are summarized for Implementation Ready (Figure C-1 and C-2) and Planning Projects (Figure C-3 and C-4) below. The rankings shown in the figures should not be interpreted to be the order in which projects should occur. To develop drought resiliency for the region a portfolio of many measures must be implemented both in the near-term and in the long-term. The NVDCP is intended to be a living document that is updated regularly to ensure implementation status and project details are up to date. Those measures in concept or development need to continue to be studied and evaluated so their overall scores can be updated in the future once more information is known. This will provide the region with a dynamic DCP that can address continually evolving conditions.

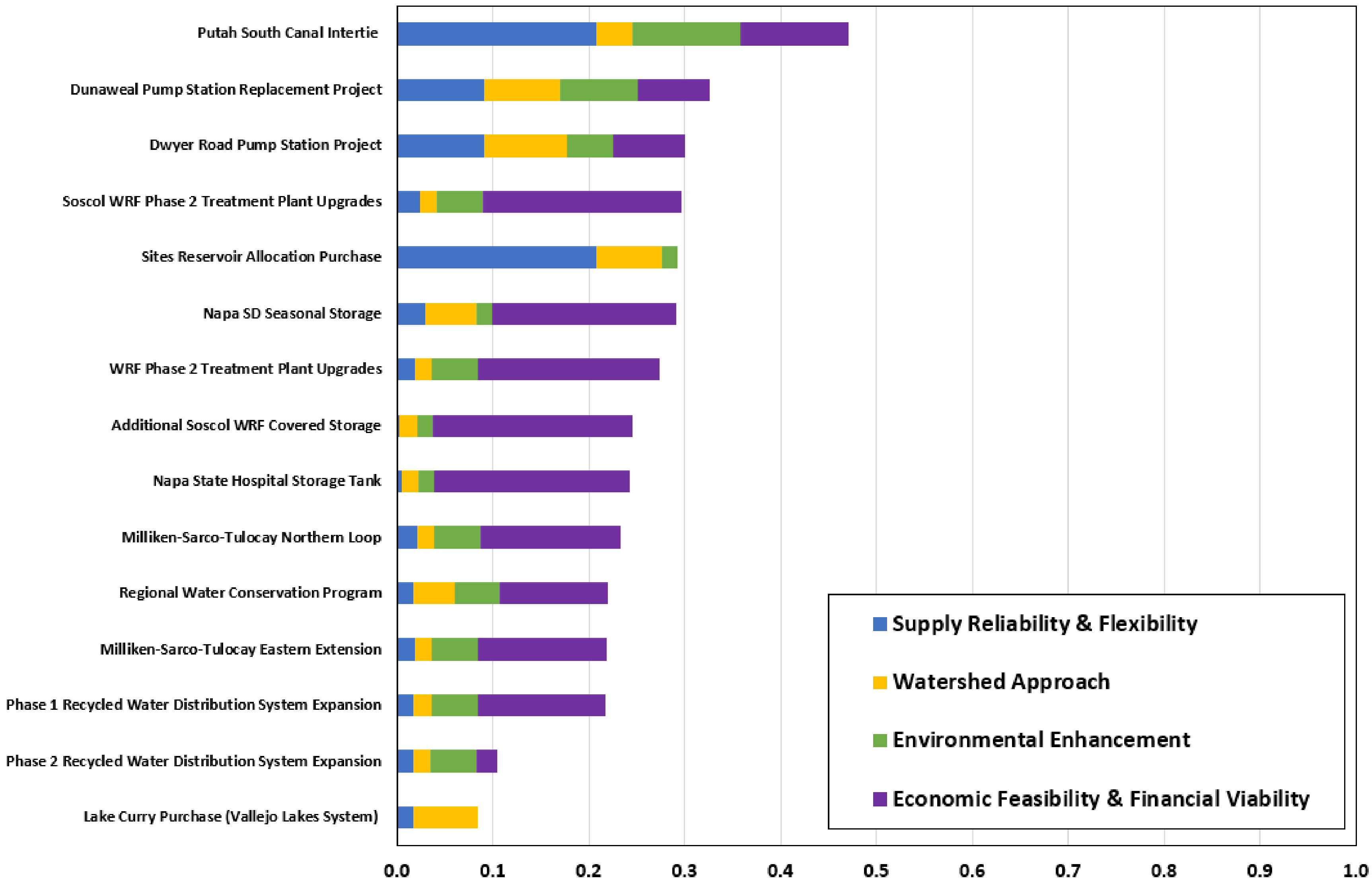

Figure C-1. Implementation Ready Projects Evaluation Results – Goal Level

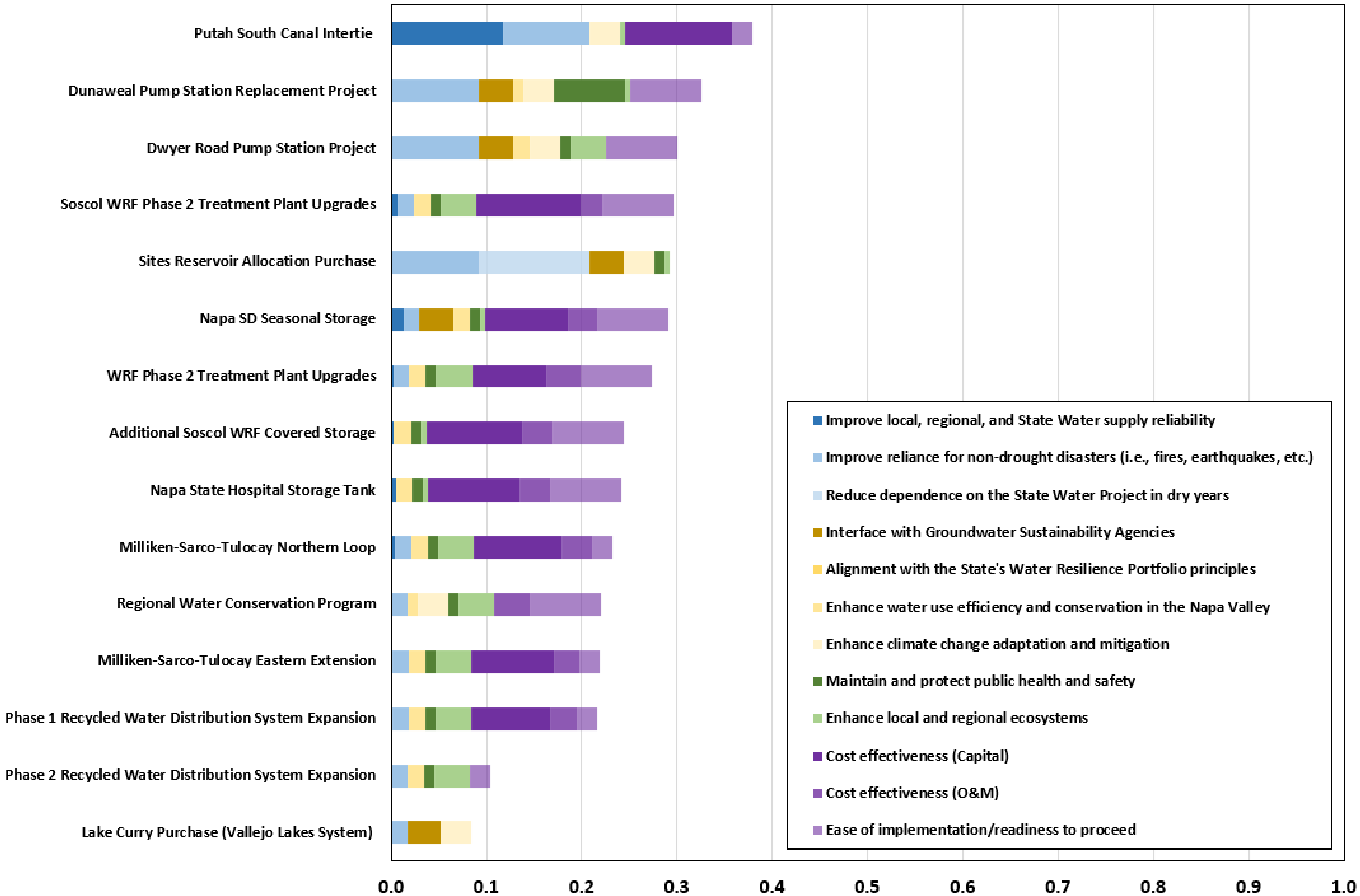

Figure C-2. Implementation ready projects evaluation results – objectives level

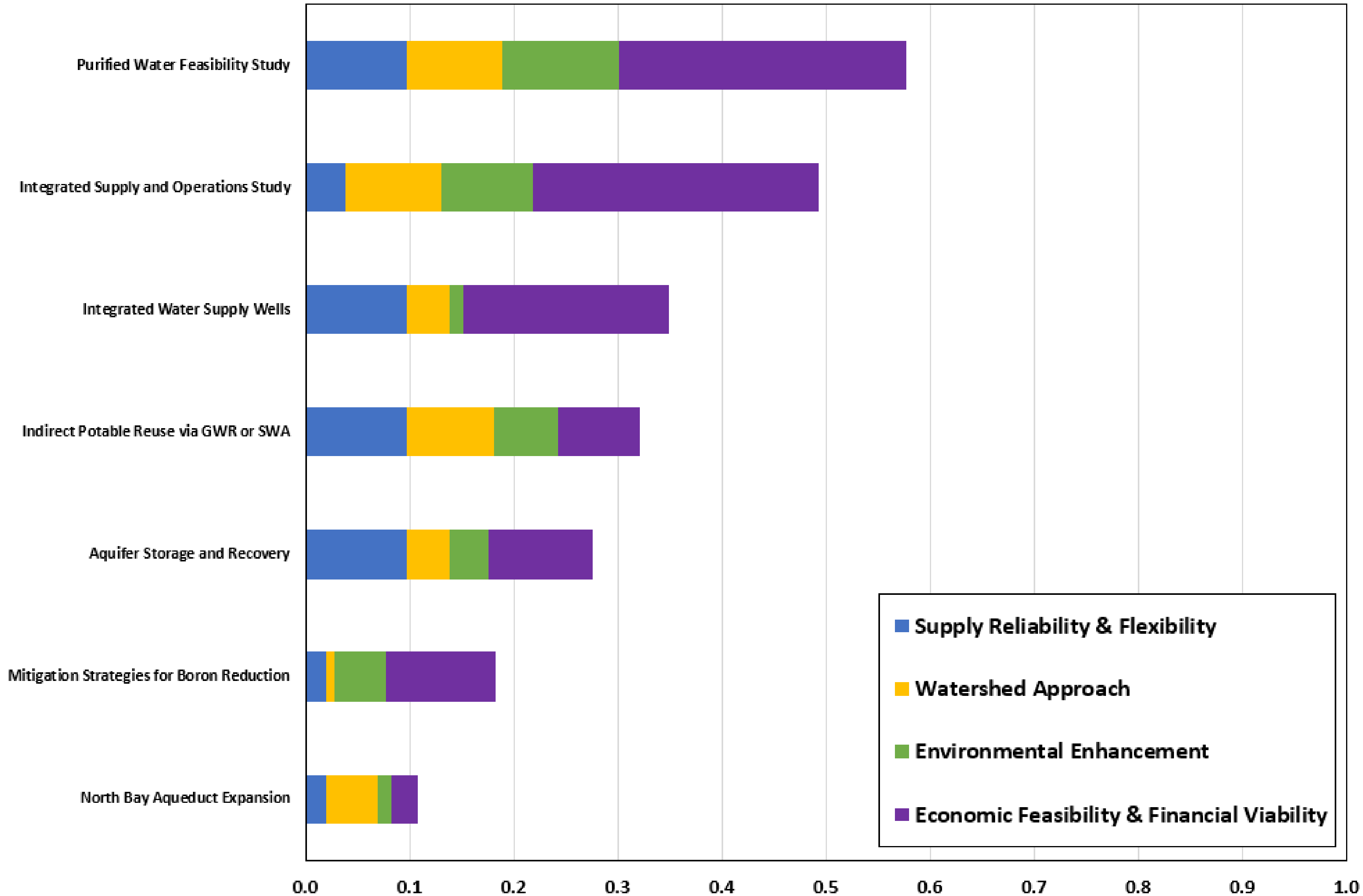

Figure C-3. Planning projects evaluation results – goal level

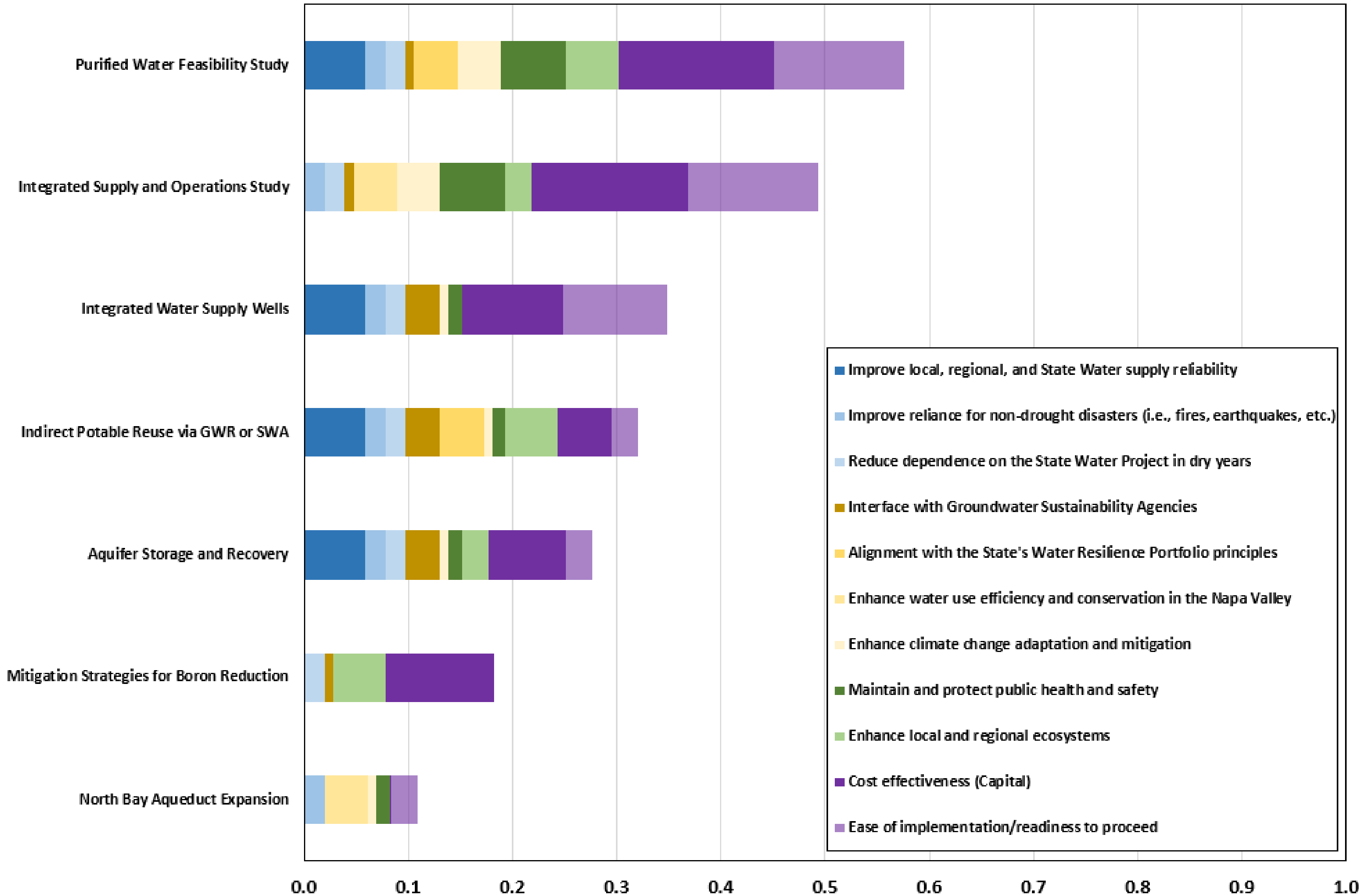

Figure C-4. Planning projects evaluation results – objectives level

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Appendix D: Napa Valley Purified Water Assessment

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Technical Memorandum

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Prepared for: City of Napa and Napa Valley Drought Contingency Plan Task Force

Project title: Napa Valley Drought Contingency Plan

Technical Memorandum

Subject: Napa Valley Purified Water Assessment

Date: November 24, 2021

To: Napa Valley Drought Contingency Plan Task Force

From: Rene Guillen, P.E., Brown and Caldwell, Consultant Team Project Manager

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μm	micrometers
AB	Assembly Bill
AF	acre feet
American Canyon	City of American Canyon
AWPF	advanced water purification facility
Basin Plan	San Francisco Bay Basin Water Quality Control Plan
CEC	constituent of emerging concern
DDW	State Water Resources Control Board Division of Drinking Water
DPR	direct potable reuse
EPA	United States Environmental Protection Agency
FAT	full advanced treatment
ft	foot/feet
GAC	granular activated carbon
gpm	gallon(s) per minute
I&I	inflow & infiltration
IAP	independent advisory panel
in	inch/inches
IPR	indirect potable reuse
Jamieson WTP	Edward I. Barwick Jamieson Canyon Water Treatment Plant
LRV	log reduction values
MF	microfiltration
mgd	million gallons per day
mJ/cm^2	millijoules per square centimeter
Napa	City of Napa
NapaSan	Napa Sanitation District
NDMA	N-nitrosodimethylamine
nm	nanometer
NPDES	National Pollutant Discharge Elimination System
NVDCP	Napa Valley Drought Contingency Plan
O&M	operations and maintenance
O_3-BAC	ozone-biologically active carbon
PDT	pressure decay tests
PL	pipeline
PS	pump station
Regional Board	San Francisco Bay Regional Water Quality Control Board
RO	reverse osmosis
ROC	reverse osmosis concentrate
RWA	raw water augmentation
TDH	total dynamic head
TDS	total dissolved solids
TOC	Total Organic Carbon
TM	technical memorandum
TMF	technical, managerial, and financial
TWA	treated water augmentation
UF	ultrafiltration
UV/AOP	ultraviolet/advanced oxidation process
V/G/C	virus, *Giardia* cysts, *Cryptosporidium* oocysts
WRF	water reclamation facility
WTP	water treatment plant
WWTP	wastewater treatment plant

Section 1: Introduction

The Napa Valley Drought Contingency Plan (NVDCP) identified a comprehensive list of potential projects that would help the agencies participating in the NVDCP's development, collectively referred to as the Local Agencies, build long-term resiliency into their regions' water supply by:

- Mitigating risks posed by drought
- Decreasing regional vulnerabilities
- Reducing the need for drought response actions

Included in the list of projects was a Potable Reuse Feasibility Study (Drought Mitigation Measure number 15 in Table 6-3 of the NVDCP) that would look at identifying and evaluating potential project alternatives that would take available treated wastewater effluent from the City of American Canyon (American Canyon) and Napa Sanitation District (NapaSan) and purify it through a multi-barrier treatment process to produce purified water for the region. The study would help identify potential infrastructure needs, identify likely major processes and systems for full-scale design, and determine an approach that satisfies regulatory requirements while minimizing cost and maximizing water produced.

As a first step, the City of Napa (Napa), American Canyon, and NapaSan were interested in a preliminary assessment of the concept's overall feasibility. This preliminary assessment considers several alternatives for advancing potable reuse projects in the region and identifies areas that need to be further evaluated in a future feasibility study. A viable purified water facility would establish a new drought-resilient water supply for the region to increase water supply reliability, resiliency, and diversity for years to come.

1.1 Types of Direct Potable Reuse

There are various types of potable reuse. The focus of the alternatives in this technical memorandum (TM) are considered direct potable reuse (DPR) options. DPR is defined by the absence of a significant environmental buffer prior to a purified wastewater effluent source becoming a potable water supply, DPR is accomplished through raw water augmentation (RWA) or treated water augmentation (TWA). Where RWA refers to the planned placement of purified water into a raw water supply or an untreated water distribution system and TWA refers to the planned placement of purified water into the treated water distribution system. DPR projects have significantly reduced time to detect and respond to failures or compromises in treatment prior to distribution.

While source water quantity, intended end uses, and production goals have shaped the alternatives, permitting requirements will likely drive treatment process selection and other considerations, such as degree of treatment; monitoring and response requirements; enhanced source-control program requirements; and technical, managerial, and financial (TMF) capacity needs. The following subsections summarize the permitting requirements that shaped the treatment process designs in this TM.

1.1.1 Regulatory Setting

Permitting requirements differ across specific types of potable reuse. In many cases, these differences are linked to the existence and size of an environmental buffer. In DPR—including both RWA and TWA—the environmental buffer may be significantly reduced or eliminated compared to indirect potable reuse (IPR). Consequently, this results in enhanced requirements for pathogen control (e.g., pathogen log reduction values [LRV] for the target pathogens, including viruses, *Giardia* cysts, and *Cryptosporidium* oocysts [V/G/C]), chemical attenuation, real-time monitoring, engineered storage, and blending (Figure 1-1). Development of regulations for DPR are being driven by Assembly Bill (AB) 574. The legislative mandate requires the State Water Resources Control Board's Division of Drinking Water (DDW) to develop a single DPR regulatory package that encompasses requirements for both RWA and TWA by December 2023.

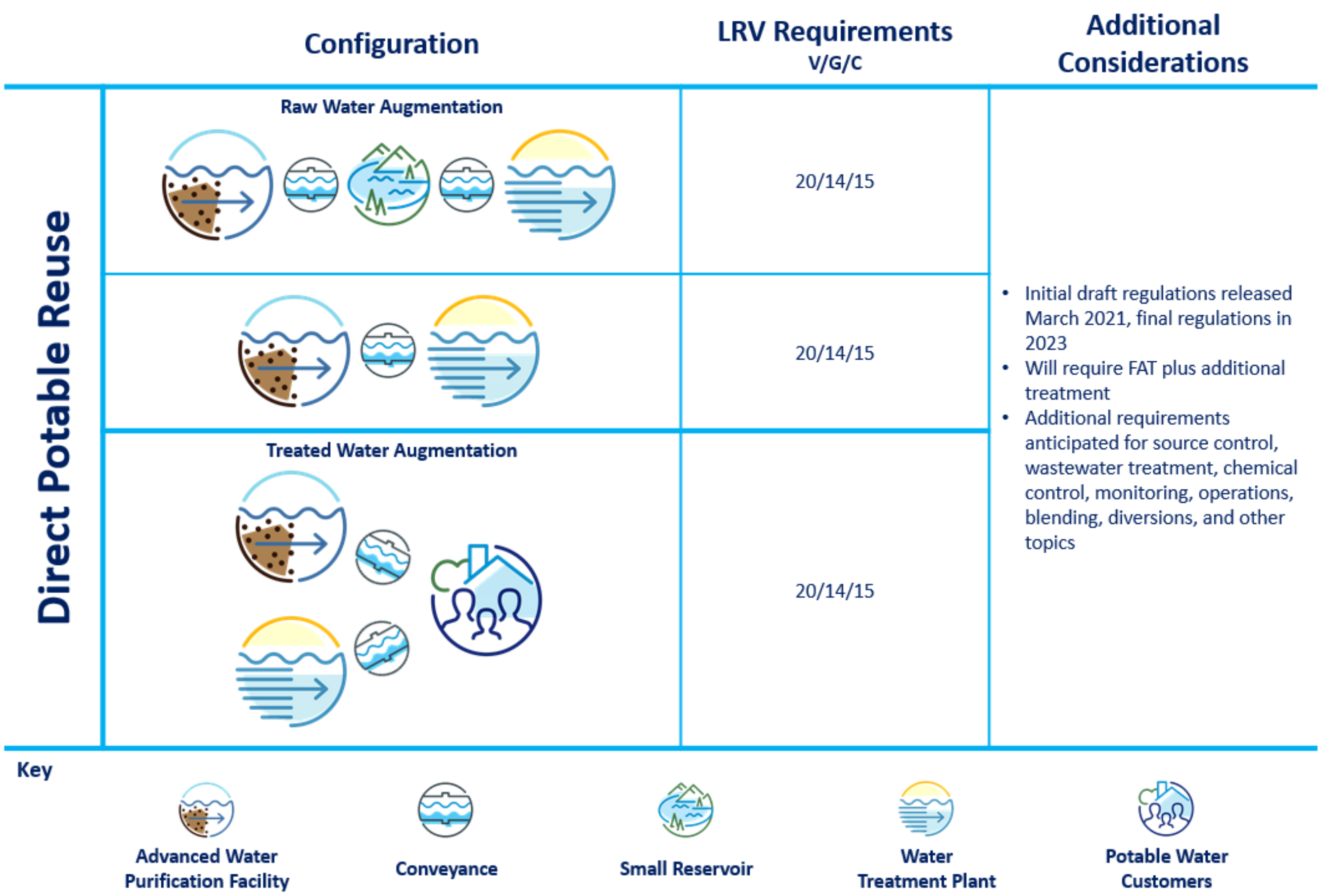

Figure 1-1. Summary of DPR forms

Note: The reservoir shown in the first RWA configuration would be considered too small to meet IPR regulations for residence time and dilution.

On March 22, 2021, the DDW released an initial draft of DPR regulations. Significant elements of the draft regulations are summarized below:

- **TMF capacity:** The draft regulations significantly increase required TMF capacity for DPR projects and clarify DDW's proposed approach for evaluating TMF capacity of a DPR project's responsible agency and respective project partners. The State Board will evaluate TMF capacity across multiple domains, including funding continuity, interagency agreements, staffing, and operator certification. Compliance will require documentation through an extensive suite of reports, programs, and plans beyond those currently required for IPR projects.
- **Chemical control:** The draft regulations include prescriptive requirements for additional treatment (including design, operation, and performance), expanded monitoring requirements, significant expansion of source control programs, and more stringent control and response limits. Three separate and diverse treatment mechanisms that provide chemical control must be included.
- **Pathogens:** It is anticipated DPR will require significantly higher LRV requirements than IPR for all indicator pathogens. The regulations further clarify how those values must be met in terms of the number, types, and diversity of barriers, as well as protocols for validation and continuous verification of the performance of each treatment process.

- **Monitoring and control:** The draft regulations require a higher degree of monitoring (i.e., frequency, locations, and range of contaminants) and more stringent operational control (e.g., automatic diversions and shutdowns) than IPR to prevent distribution of water that is not compliant with requirements.
- **Independent Advisory Panel (IAP):** DDW may require that an IAP be convened for a number of activities, including reviewing continuous improvement plans to support treatment optimization, auditing a Water Safety Plan, reviewing the enhanced source control program, or development of TMF capacity as well as reviewing water quality data and providing recommendations for water quality investigations.
- **Enhanced source control:** Enhanced source control programs for DPR are required for any collection system providing source water to the DPR system; thus, if the source is provided by more than one agency, collaboration regarding enhanced source control is likely and an IAP may be required by DDW, as noted above.

The treatment trains considered in this assessment adhere closely to the DPR requirements included in the draft regulations. It is anticipated they will likely comply with most if not all of the final regulation requirements without significant alterations. However, Napa, American Canyon, and NapaSan should continue to monitor DPR regulatory development and associated impacts to this preliminary assessment and provide necessary updates to maintain the efficacy of this planning document for future potable reuse implementation.

1.1.2 Environmental Permitting

The San Francisco Bay Regional Water Quality Control Board (Regional Board) regulates discharge facilities in the Napa Valley. They are responsible for implementing water quality planning and regulatory decisions for their specific region which can include both issuing waste discharge requirements (i.e., discharge permits) and administering National Pollutant Discharge Elimination System (NPDES) permits for receiving surface water bodies. NPDES permits for discharges to surface waters contain specific requirements that limit the pollutants in discharged effluent. As it pertains to water reuse, the Regional Board is responsible for specific regulatory actions including:

1. Approving pollutant source control programs for wastewater systems
2. Issuing and enforcing water reclamation (reuse) requirements to producers and users
3. Defining beneficial uses of surface water and groundwater bodies through water quality control plans
4. Regulating treatment facility operator requirements
5. Determining water rights regarding reuse

Most potable reuse applications in California use full advanced treatment (FAT), producing significant volumes of reverse osmosis concentrate (ROC) that contain concentrated levels of total dissolved solids (TDS), nutrients, metals, and may have heightened toxicity. Depending on the circumstances, reuse projects that discharge ROC to surface water may require a new NPDES individual permit, modification of an existing NPDES permit, or an industrial permit if discharged into an existing sewer system. The latter would require coordination and agreement with the agency that manages the respective sewer system (e.g., NapaSan). Routing a ROC stream to an existing outfall requires careful review of potential impacts to existing NPDES permits to determine whether the ROC stream may compromise compliance with effluent discharge water quality requirements and whether further waste stream treatment and/or permit modifications are needed.

Other ROC management strategies, such as deep well injection or evaporation ponds, trigger waste discharge requirement permits. Like discharges to surface water bodies, discharge of ROC streams by American Canyon and/or NapaSan would also need to comply with the applicable San Francisco Bay Basin Water Quality Control Plan (Basin Plan) requirements. More information on the management of ROC is included in Section 3.4.

Section 2: General Characteristics of the Alternatives

This assessment focuses its analysis on three distinct alternatives that if implemented could introduce purified water as another source of water supply to the Napa Valley region. The three alternatives are as follows:

- **Alternative 1 – Combined regional advanced water purification facility (AWPF) for RWA located at the Edward I. Barwick Jamieson Canyon Water Treatment Plant (Jamieson WTP) site.** The new AWPF would be built at the Jamieson WTP and treat available effluent from both NapaSan and the American Canyon Water Reclamation Facility (WRF) to produce purified water. The purified water produced by the new AWPF would be blended with raw water on site prior to undergoing conventional water treatment.
- **Alternative 2 – Combined regional AWPF for RWA located at NapaSan.** The new AWPF would treat available effluent from both NapaSan and the American Canyon WRF at NapaSan wastewater treatment plant (WWTP) to produce purified water. The purified water produced at this new AWPF would be conveyed to the Jamieson Canyon WTP where it would be blended with another raw water source prior to undergoing conventional water treatment.
- **Alternative 3 – Combined regional AWPF for TWA located at NapaSan.** The new AWPF would be constructed at the NapaSan WWTP to treat available effluent from both NapaSan and the American Canyon WRF to produce purified water. The purified water would be introduced directly into Napa potable water distribution system through a water main that is close to the existing NapaSan WWTP.

This section presents the general characteristic of the alternatives being evaluated in this assessment which includes a description of the analysis that was used to estimate available effluent for the new AWPFs and the proposed treatment trains for both the RWA and TWA alternatives. Section 3 of this assessment provides additional details on each of the alternatives including preliminary site layouts, overlay of critical infrastructure, and summary of costs.

2.1 Available Source Flow

Feed flow for the new AWPFs would be supplied from both the American Canyon WRF and NapaSan WWTP. Currently, a substantial portion of the wastewater effluent from both facilities is utilized to supply recycled water demands, particularly during the summer months. Based on discussions with both American Canyon and NapaSan staff, it is anticipated that any AWPF in the region would likely only be operational during the winter months (i.e., November to April) due to existing recycled water demands during the summer months. As such, the alternatives being explored in this assessment focus on using these facilities projected remaining effluent over that annual window as source water for DPR.

Assumed monthly influent flows from both facilities are summarized in Table 2-1. Flow data between 2016 and 2021 was assessed for the American Canyon WRF. Since the flow data over this period remained fairly constant year to year, monthly flows were simply averaged out across the years and carried forward in the assessment. Influent flow data from NapaSan showed a bit more year to year variability. This is partly due to the inflow & infiltration (I&I) prevention projects NapaSan has implemented over the past decade, which has reduced the amount of I&I flows into their sewer collection system. Ultimately, it was decided that using average flows from the last observed drought period (2012-16) for the analysis would provide a conservative estimate of the range of flows that would likely work best to help size the AWPFs.

Table 2-1. WWTP Influent Flows			
	American Canyon WRF	NapaSan WWTP	
Month	2016-21 Average (mgd)	2012-16 Average (mgd)	Total (mgd)
January	2.02	8.93	10.95
February	2.18	9.11	11.29
March	2.03	11.17	13.21
April	1.82	9.02	10.84
November	1.40	6.82	8.22
December	1.58	11.36	12.94

a. Raw influent data provided by American Canyon and NapaSan staff.
mgd = million gallons per day

Using the monthly flows from Table 2-1, a DPR yield evaluation was performed to assess the potential water supply for the proposed AWPFs. The DPR yield evaluation accounted for a variety of flow commitments and/or allocations of flow, including the following four:

1. Non-potable recycled water demands
2. Winter storage in the NapaSan effluent ponds to help meet summer demands (assumed 2,000 acre feet [AF]); thus, during the winter and spring, this flow for storage would not be available as feed water to the AWPF
3. Spring deliveries to local farmers (assumed 300 AF)
4. Advanced treatment process losses (i.e., ROC)

These commitments and allocations were subtracted from the assumed influent to determine the remaining effluent available for DPR. The evaluation considered monthly flow availability, and a sensitivity analysis of AWPF capacities for DPR was used to identify AWPF capacity and associated yield at the facility. Table 2-2 summarizes average monthly flows and DPR yields for the proposed AWPF, based on this evaluation.

Table 2-2. Summary of Projected Flows and Yields							
Month	Combined WWTP Influent (mgd)	NapaSan Recycled Water Demands[a] (mgd)	American Canyon Recycled Water Demands (mgd)	Winter Storage and Spring Deliveries (mgd)	Calculated Net Effluent Remaining[b] (mgd)	Advanced treatment process losses[c] (mgd)	Anticipated Purified Water Yield[d] (mgd)
January	10.95	0.07	0.24	4.73	5.91	1.29	4.62
February	11.29	0.38	0.30	3.78	6.84	1.49	5.35
March	13.21	1.27	0.30	5.26	6.38	1.39	4.99
April	10.84	1.40	0.43	3.80	5.21	1.14	4.07
November	8.22	1.04	0.44	1.63	5.11	1.11	4.00
December	12.94	0.36	0.26	5.52	6.79	1.48	5.31

a. NapaSan recycled water demands are based on recycled water delivers during 2018 and 2019.
b. Calculated Net Effluent Remaining = Combined WWTP Influent – (NapaSan Recycled Water Demands + American Canyon Recycled Water Demands + Winter Storage and Spring Deliveries).
c. UF has an assumed recovery rate of 92% and RO an assumed recovery rate of 85%.
d. Anticipated Purified Water Yield = Calculated Net Effluent Remaining – Advanced treatment process losses.
mgd = million gallons per day

The evaluation shows that, when combined, effluent from American Canyon and NapaSan have the potential to sustain a 5 mgd AWPF, with a 92 percent utilization. Which is to say that when the facility is in operation during the winter months (as mentioned previously, due to existing recycled water demands during the summer months there is not enough effluent flows to sustain operations year around), it'll be able to produce 5 mgd worth of purified water 92 percent of the time. Given the amount of source water available from both American Canyon and NapaSan, any facility larger than 5 mgd would likely have higher costs with diminishing benefits (in terms of yield), as shown below in Figure 2-1.

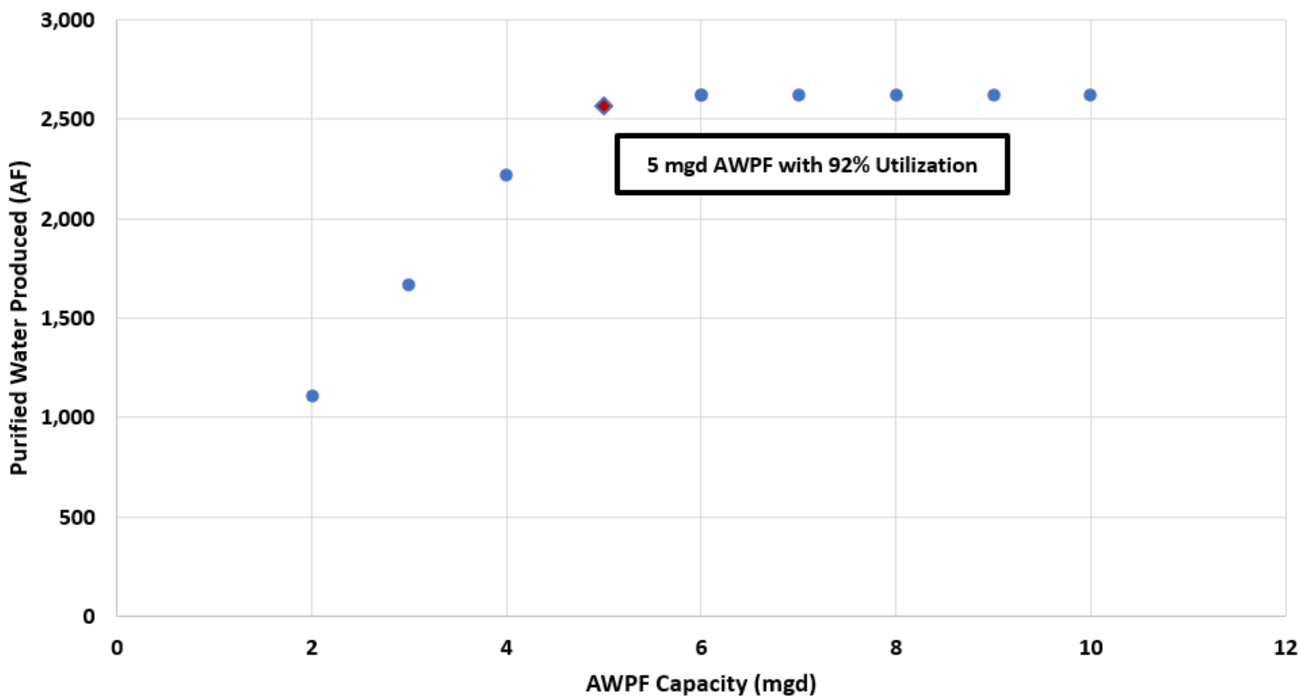

Figure 2-1. AWPF utilization curve

Note: Production quantities shown in the figure represent annual totals with no operation in the summer months (i.e., May to October)

2.2 Treatment Processes

Treatment requirements for water reuse are dependent on several parameters. These can include the quality of the source water, existing WWTP processes, intended use of product water, regulatory requirements, and local/regional requirements and setting. Included below are general descriptions of the various treatment unit processes used by the proposed AWPFs. Included in the descriptions are the primary treatment objectives and key process variables for monitoring compliance and performance verification.

- **Ozone-Biologically Active Carbon (O_3-BAC).** The O_3 process is a chemical oxidation and disinfection process that (1) oxidizes organic matter for ready biodegradation by microorganisms in the BAC, and (2) provides targeted LRV credits required for the AWPFs. BAC is a biological process that metabolizes the organic matter in the O_3 effluent to increase the removal of organic carbon (quantified using the bulk parameter Total Organic Carbon [TOC]) and will remove some constituents of emerging concern (CEC). In the proposed RWA and TWA treatment trains, O_3 and BAC is a combined pre-treatment process that removes organic matter and CECs, including trace organics such as N-nitrosodimethylamine (NDMA). The O_3-BAC process helps address two of the priority topics for DPR in California—control of chemical peaks and low-molecular weight compounds, e.g., certain disinfection byproducts. O_3-BAC treatment is also expected to reduce CECs in the ROC. BAC is typically designed using granular activated carbon (GAC) media because GAC has a larger surface area to attract microorganisms to the particle surfaces. BAC does not provide pathogen reduction or reduce salinity. A contact vessel provides the necessary residence time for reaction, and O_3 residuals are monitored at multiple points along the contactor vessel. Each residual monitoring point can be used for performance verification. Performance can also be monitored via TOC analyzers on the filtrate.

- **Membrane Filtration.** Membrane filtration refers to low-pressure membrane processes including microfiltration (MF) and ultrafiltration (UF). MF and UF operate primarily by size exclusion; UF membranes, which are included in the proposed RWA and TWA treatment trains, have an effective pore size of about 0.01 micrometers (µm). Membrane filtration removes particles larger than the membrane's effective pore size, including *Giardia* cysts and *Cryptosporidium* oocysts, but is relatively ineffective at removing viruses and does not remove dissolved organic compounds, or salinity. It is typically used as a pretreatment process that protects downstream reverse osmosis (RO) performance and integrity by removing some protozoa and particles that may damage the RO membranes. Membrane integrity can be verified using continuous turbidity measurements and daily pressure decay tests (PDT). Log removal credit is limited by the PDT resolution such that credits for 4-log removal of Cryptosporidium and Giardia can be acquired.
- **RO.** RO involves pushing water at high pressure through a semi-permeable membrane and thereby removing dissolved organic compounds and ions from the water, including most CECs. RO is used to remove pathogens, TDS, and many chemical constituents. When the integrity of the RO membrane is sound, it is understood to remove essentially all pathogens from the permeate (Note: Unlike MF/UF membranes, RO does not have an integrity test). RO creates a residual stream (concentrate) that is typically 15 to 20 percent of the feed stream volume and creates challenges for inland disposal. Parameters used for monitoring RO performance include conductivity and TOC (often using on-line TOC analyzers). TOC removal is often used to approximate pathogen removal but regulations limit LRV credit to 2-logs for V/G/C when monitoring using TOC. Technologies such as the Trasar™ additive may be used in some situations to demonstrate greater microbial log removal credits. The use of such markers could allow for 3-logs or more credit each for V/G/C.
- **Ultraviolet/Advanced Oxidation Process (UV/AOP).** UV/AOP uses very high-intensity UV light combined with an oxidant such as chlorine or hydrogen peroxide to provide advanced disinfection as a final polishing step following RO. Hydrogen peroxide is used as the oxidant in this analysis. UV is highly effective for disinfection, providing up to 6-log inactivation of V/G/C. The UV doses used for UV/AOP are significantly greater than the dose required in most drinking water applications. A typical dose for UV/AOP is at least 800-900 millijoules per square centimeter (mJ/cm^2), but only 100 mJ/cm^2 for disinfected tertiary recycled water and around 40 mJ/cm^2 for typical drinking water applications (for *Giardia* and *Cryptosporidium* removal credit). The key parameters for verifying UV/AOP system performance are UV intensity, flow rate, UV transmittance (UVT) at 254 nanometers (nm), and chemical dosing rate. RO permeate typically has a UVT between 96 and 98 percent.
- **Product Water Stabilization.** RO permeate is highly corrosive and must be stabilized to prevent any potential corrosion of pipes downstream of the RO treatment. Decarbonation (where needed) is combined with lime and in some cases caustic addition to accomplish product water stabilization. Decarbonators reduce dissolved carbon dioxide, which helps raise the pH (and reduce subsequent chemical treatment requirements to reach a target stable pH). The decarbonators may also help reduce water temperature to address aesthetics concerns and provide an additional mechanism of chemical control (volatilization) to complement other barriers – thus, for the purposes of this planning document, costs for decarbonators are included. Lime addition increases the pH (thus increasing the alkalinity) and adds calcium to the water and acts to stabilize the water and minimize corrosivity. In this scenario, only

a portion of the product water will be decarbonated and then blended with remaining product water to achieve the treated water goal. The amount of lime needed, as well as the entire post-treatment strategy, is determined using various corrosivity indices, such as the Langelier Saturation Index or Aggressiveness Index, and would be informed by corrosion control studies. Sodium hypochlorite would also be added to the product water to help neutralize the remaining hydrogen peroxide from the AOP and provide a free chlorine residual to prevent microbial growth in the conveyance pipeline.

- **Chlorine Disinfection.** Chlorine disinfection provides additional protection against microbes and viruses, as well as a residual for distribution. It is used to provide additional LRV credits for both RWA and TWA. Dose and contact time may be based on the United States Environmental Protection Agency (EPA) guidance for disinfection of drinking water. Free chlorine disinfection can achieve additional LRV credits for viruses and *Giardia*, it is ineffective for *Cryptosporidium*. Chlorine can also provide residual disinfectant to control biofilm growth in the distribution system. For TWA, purified water would be routed through chlorine contact basins that would provide sufficient detention time for disinfection to occur; additionally, an 8-hour clearwell provides emergency storage in the event of process interruptions. Free chorine disinfection would be implemented in the pipeline between the AWPF and the respective delivery points for both RWA and TWA.

2.2.1 Raw Water Augmentation

While DDW has not yet finalized pathogen requirements for DPR (either RWA or TWA), an initial assessment of processes for the RWA treatment train were selected considering guidance included in the recently released draft regulations for both pathogen and chemical treatment (DDW, 2021). The proposed treatment train includes FAT with the addition of O_3-BAC pretreatment and free chlorine disinfection to help comply with the stricter requirements for both pathogen and chemical control.

Table 2-3 provides assumed LRVs for each unit process and denotes which processes reduce organic constituents and salinity. In the proposed treatment train, virus and *Giardia* pathogen reduction will likely be in compliance with future final DPR regulations. *Cryptosporidium* LRV just meets the anticipated LRV requirements for DPR. LRV redundancy will be beneficial for operating AWPFs and maintaining a high degree of system availability (i.e., online reliability). This benefit supports the strategy of seeking additional credits, which may be most cost-effectively accomplished by seeking higher credits for existing processes. Some processes may be credited with higher LRVs than assumed here (e.g., through treatment studies or different monitoring approach) within the future DPR regulations.

Table 2-3. RWA FAT-Based Advanced Treatment Performance								
	Microbiological LRVs			Organic Matter Removal				
Unit Processes	Viruses	*Giardia*	*Crypto-sporidium*	Dissolved TOC	CECs[a]	Chemical Peaks	Low-molecular-Weight Compounds	Salinity[b]
Default credits								
Tertiary effluent	0.4[c]	0.2[c]	0[c]	Yes	Yes	--	--	No
O_3-BAC	6	6	1	Yes	Yes	Yes	Some	No
UF	0	4	4	No	No	No	No	No
RO	2	2	2	Yes	Yes	Yes	Some[d]	Yes
UV/AOP	6	6	6	No	Yes[e]	Some[e]	Some[e]	No
Decarbonation	0	0	0	No	No	Some[h]	Some[h]	No
Free chlorine disinfection	6	1	0	No	No	No	No	No
WWTP and AWPF total	20.4	19.2	13	--	--	--	--	--
WTP credits[f]	4	3	2	No	No	No	No	No
Total	24.4	22.2	15	--	--	--	--	--
Required credits								
Required	20	14	15	Yes	Yes[g]	Yes	Yes	No[b]

a. Each unit process targets certain CECs, but not all CECs will be removed.

b. Managing salinity is a long-term sustainability issue that must be considered in the treatment process selection. Not every system will require salinity removal.

c. Default credit expected for secondary treatment extrapolated from Rose (2004) study

d. RO is typically less effective for control of low molecular-weight organic compounds that are uncharged and polar (e.g., acetone). Rodriguez, C et al. (2009)

e. UV/AOP will provide some treatment for chemical peaks of constituents amenable to treatment by the process (e.g., 1,4-dioxane)

f. Current regulations for surface water augmentation allow for some pathogen removal credits from the surface WTPs. It is assumed that RWA could be granted the same credits; however, the current understanding of the DPR regulations suggest that the credits will have to be validated and demonstrated with monitoring, similar to crediting for potable reuse facilities.

g. Not all CECs require specific removal rates. The requirements can vary based on known or perceived human health risk and are informed by site-specific water quality monitoring and current and proposed regulations. Typical removal rates range from 70% to more than 99%, depending on the unit processes.

h. Decarbonators might provide another barrier for chemical control, such as removal of volatile organic compounds.

The proposed 5-mgd RWA AWPFs would treat combined effluent from both NapaSan and American Canyon to produce purified water. Preliminary design criteria for the AWPF are included in Attachment A. Figure 2-2 depicts the process flow diagram for this facility.

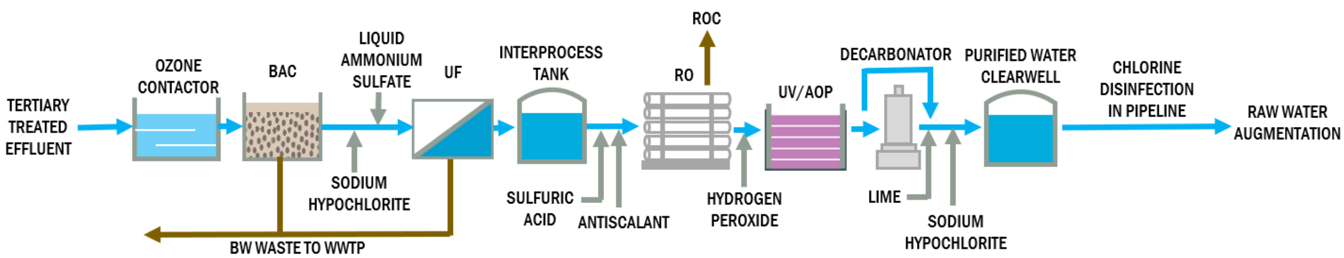

Figure 2-2. AWPF process flow diagram for RWA

2.2.2 Treated Water Augmentation

Similar to the RWA treatment train, FAT with the addition of O_3-BAC pretreatment and chlorine disinfection was assumed to be the minimum requirement for TWA facilities. With ample pathogen reduction in the treatment processes for RWA, the TWA treatment train focuses on additional chemical control and/or chemical peak attenuation, post-treatment stabilization, temperature, and barriers to allow appropriate response time. In lieu of additional LRV requirements, this treatment train considers the potential to demonstrate higher LRVs for the upstream WWTP(s) or RO (Table 2-4), if needed.

Table 2-4. TWA FAT-Based Advanced Treatment Performance

Unit Processes	Microbiological Log Removal Credits			Control of Chemical Compounds				Salinity[b]
	Viruses	*Giardia*	*Crypto-sporidium*	TOC	CECs[a]	Chemical peaks	Low Molecular-weight Compounds	
Default credits								
Tertiary WW treatment	0.5[c]	0.5[c]	0.5[c]	Yes	Yes	--	--	No
O_3-BAC	6	6	1	Yes	Yes	Yes	Yes	No
UF	0	4	4	No	No	No	No	No
Cartridge filters	0	2.5	2	Yes	Yes	Yes	Some	Yes
RO	2.5[d]	2.5[d]	2.5[d]	Yes	Yes	Yes	Some[e]	Yes
UV/AOP	6	6	6	No	Yes[f]	Some[f]	Some[f]	No
Decarbonation	--	--	--	No	No	Some[g]	Some	No
Chlorine disinfection	6	1	0	No	No	No	No	No
Total	21	22.5	16	--	--	--	--	--
Required credits								
Required	20	14	15	Yes	Yes[a]	Yes	Yes	No[b]

a. *Not all CECs require specific removal rates. The requirements can vary based on known or perceived human health risk. Typical removal rates range from >70% to over 99%.*
b. *Managing salinity is a long-term sustainability issue that must be considered in the treatment process selection. Not every system will require salinity removal.*
c. *Conservative estimate for pathogen LRVs stemming from site-specific pathogen monitoring study that would be required.*
d. *Assumes facility uses enhanced RO monitoring (such as TRASAR) for additional RO crediting.*
e. *RO is typically less effective for control of low molecular weight organic compounds that are uncharged and polar.*
f. *UV/AOP will provide some treatment for chemical peaks of constituents amenable to treatment by the process (e.g. 1,4-dioxane).*
g. *Decarbonators might provide another barrier for chemical control, such as removal of volatile organic compounds.*

The proposed 5-mgd TWA AWPF would be constructed adjacent to the existing NapaSan WWTP and treat combined effluent from both NapaSan and American Canyon to produce purified water. Treatment processes were selected considering both pathogen and chemical treatment in terms of microbiological log removal, control of chemical compounds, and salinity reduction and structured as a proposed TWA treatment train (Figure 2-3). Current draft DPR regulations include additional requirements to address two topics of concern for chemical control: (a) attenuation of chemical peaks (i.e., high concentrations of chemicals that may be released into the treatment process, as from an industrial spill), including both known and unknown compounds; and (b) increased removal of low molecular weight compounds, including both known and unknown compounds that have been observed to pass through FAT trains. The selected TWA treatment train is believed adequate to address these two DPR chemical control issues.

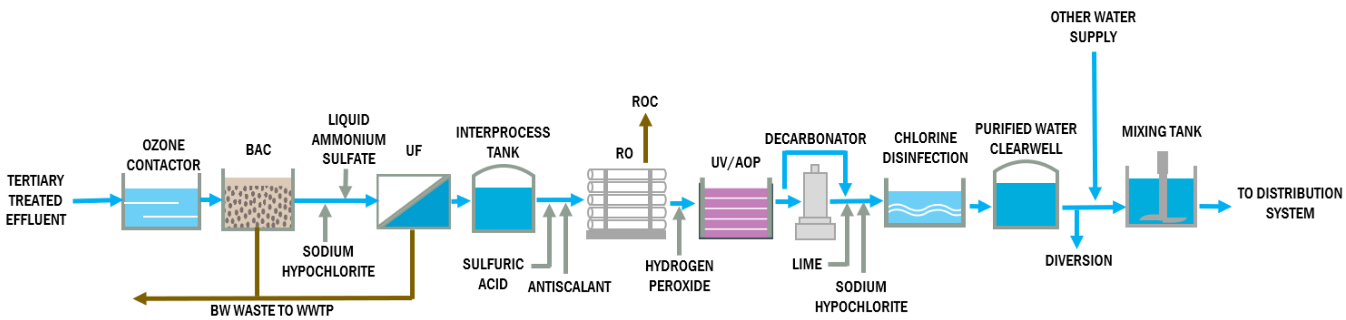

Figure 2-3. AWPF process flow diagram for TWA

Section 3: Purified Water Alternatives

This section summarizes the design details of the conceptual purified water alternatives, including treatment facilities, conveyance/distribution facilities (i.e., pipelines and pump stations), and conceptual cost estimates. These details will need to be further refined and optimized in future studies. The cost estimates are based on vendor quotes specific to the proposed facilities, historical construction estimates, historical costs, and professional experience with similar projects. Note that the estimated costs do not consider impacts of external funding and, thus, do not necessarily represent the costs to the agencies. As a result, comparison of costs as included in this assessment to others (different supplies, projects, or programs) may be misleading at this stage. More detailed information on elements to complement this section are included in the TM attachments.

3.1 Alternative 1 – RWA with AWPF at the Jamieson WTP

Alternative 1 would produce up to 5 mgd for RWA at a new AWPF constructed adjacent to the existing Jamieson WTP. In addition to FAT, the preliminary design of the AWPF for RWA incorporates additional disinfection (ozone) and filtration (biologically active GAC) processes to the multi-process treatment train as the basis for planning and cost estimates. The new AWPF would treat available effluent from both the American Canyon WRF and NapaSan to produce purified water. A preliminary layout of the facility and the various treatment processes is included in Figure 3-1.

Available effluent from the American Canyon WRF would be conveyed through a new 12-inch pipeline (i.e., PL 1) that is separated into two segments. The first segment would leverage an unused portion of recycled water pipe along Devlin Road, as shown in Figure 3-2. This first connection would help American Canyon implement one of their near-term capital improvement projects identified in their 2016 Recycled Water Master Plan (i.e., RW 1 Tower/Devlin/South Kelly Road). The second segment of pipe would rely on a new booster pump station (i.e., PS 1) to convey available effluent through a new pipeline heading north along Highway 29 to NapaSan's existing recycled water main that is located near Airport Boulevard. From there, the new segment of pipe would follow the existing recycled water pipeline alignment to NapaSan WWTP. The combined effluent from American Canyon and NapaSan would be conveyed through NapaSan's existing 24-inch recycled water pipeline that conveys recycled water to various customers along Sheehy Creek. A new booster pump station (i.e., PS 2) and segment of pipe (i.e., PL 2) would be needed to convey the available effluent from the location where NapaSan's existing recycled water distribution system ends to the new proposed AWPF at the Jamieson WTP (see Figure 3-1).

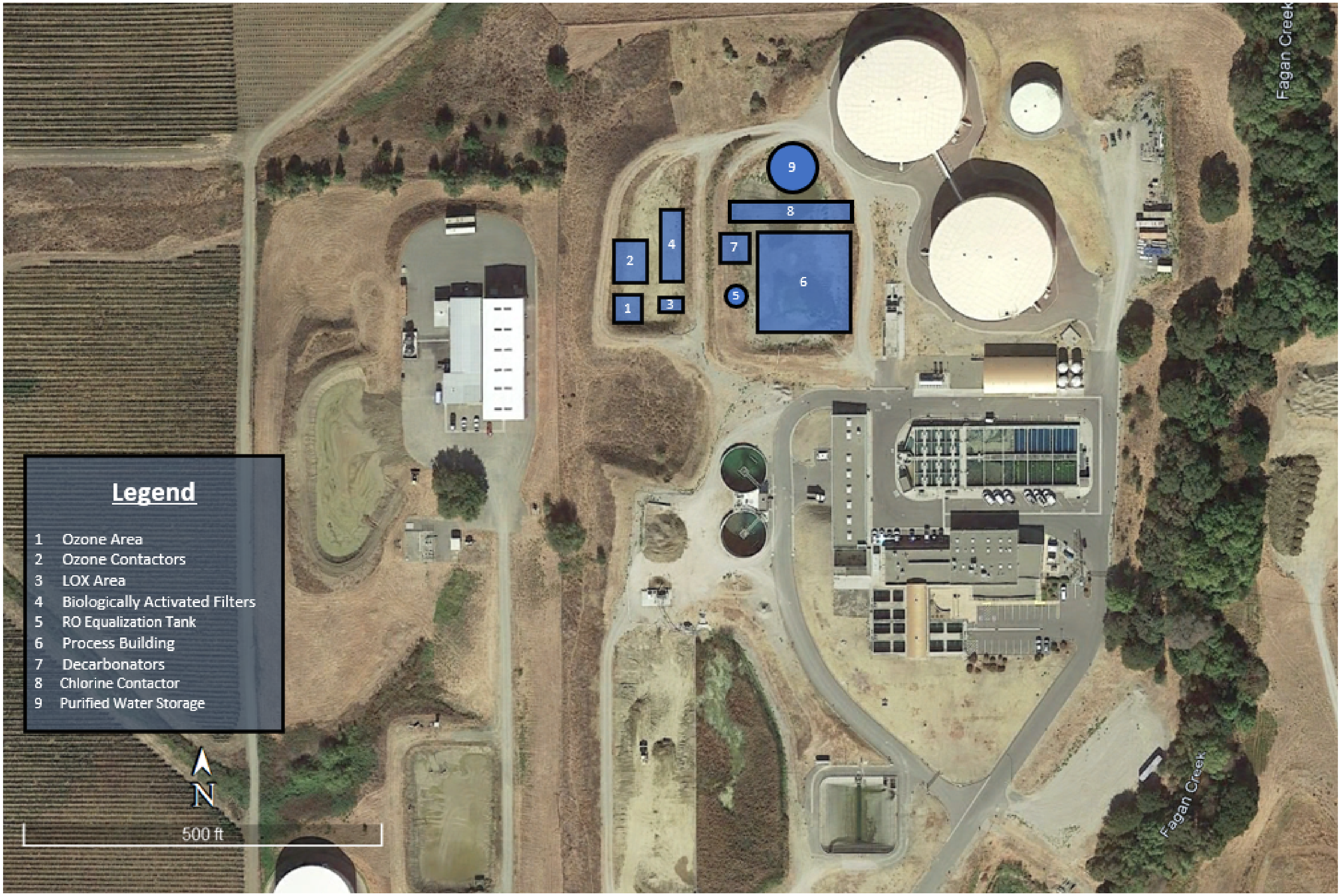

Figure 3-1. Site layout for RWA at the Jamieson WTP

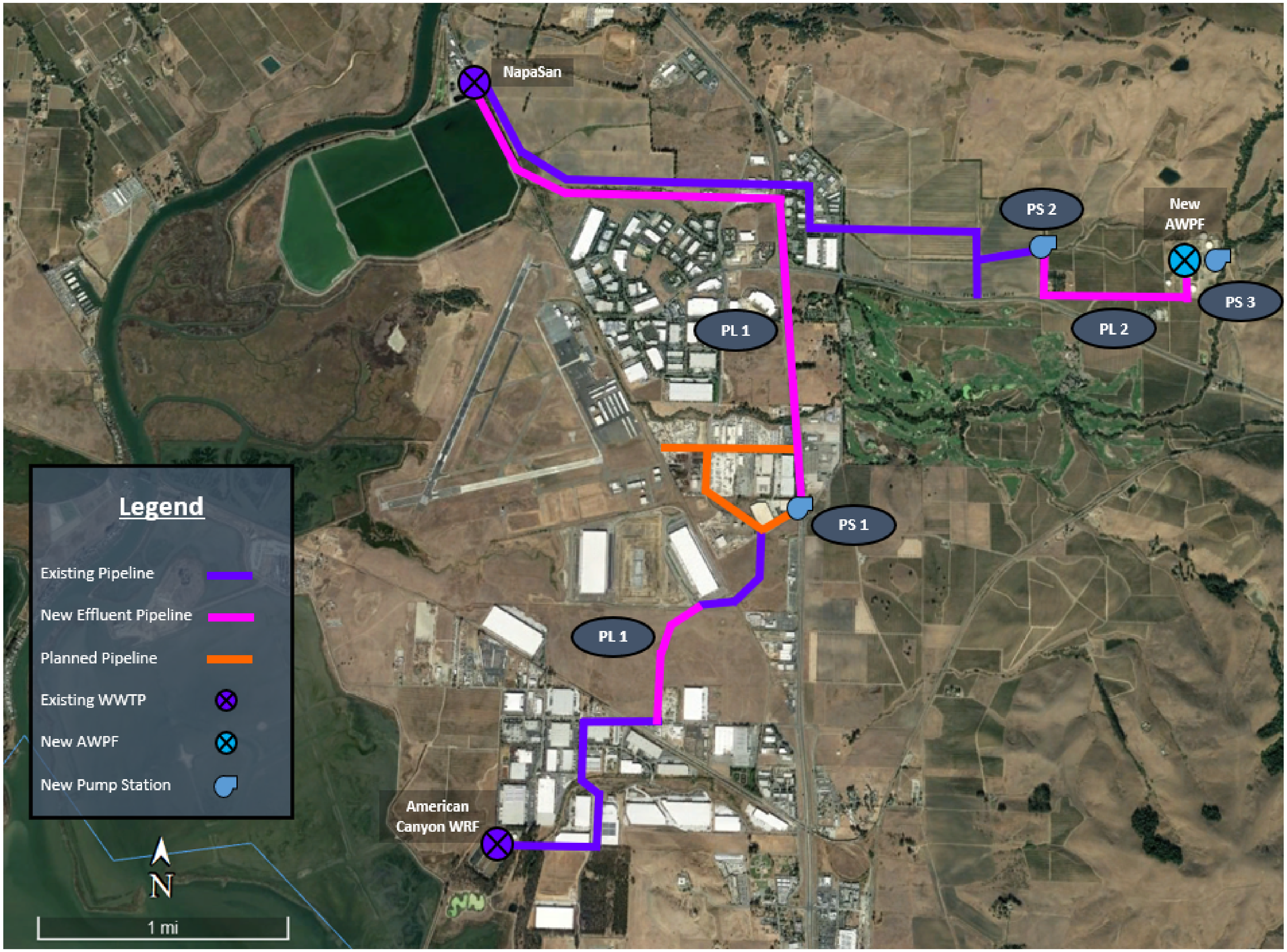

Figure 3-2. Overview map of Alternative 1 facilities and delivery point

Note that for both booster pump stations, the specific location is not yet determined but assumed to be located on American Canyon/NapaSan-owned property and absent of sensitive habitat. Table 3-1 summarizes Alternative 1 facilities.

Table 3-1. Summary of Alternative 1 Major Project Components

Element	Capacity	
AWPF for RWA	5 mgd	
Pump station	**Capacity**	**TDH**
PS 1 – Booster pump station to convey effluent flow to NapaSan from American Canyon WRF	833 gpm	179 ft
PS 2 – Booster pump station to convey effluent flow to the new AWPF at the Jamieson WTP site	4,860 gpm	25 ft
PS 3 – Pump station to convey purified water from the new AWPF to mixing tank at the Jamieson WTP site	3,475 gpm	116 ft
Pipelines	**Diameter**	**Length**
PL 1 – Effluent from American Canyon WRF to NapaSan	12 in	17,150 ft
PL 2 – Combined effluent from American Canyon and NapaSan to new AWPF at Jamieson Site	24 in	5,200 ft
Storage	**Size**	**Retention Time**
Purified Water Clearwell	0.83 MG	4 hours

ft = foot/feet
gpm = gallons per minute
in = inch/inches
MG = million gallons
TDH = total dynamic head

Table 3-2 contains estimated capital and annual operations and maintenance (O&M) costs for Alternative 1, presented in 2021 dollars.

Table 3-2. Estimated Cost Summary for Alternative 1

Item	Capital Cost ($2021, in millions) Total (5 mgd)	Annual O&M Cost ($2021, in millions) Total (5 mgd)
Total AWPF Costs	$100.9	$4.6

3.2 Alternative 2 – RWA with AWPF at NapaSan

Alternative 2 includes many of the same project elements as Alternative 1. The AWPF would effectively be the same as the one presented for Alternative 1 with the only difference being that this facility would be located at NapaSan. A preliminary layout of the facility and the various treatment processes is included in Figure 3-3. Note that the AWPF could also be sited on the north end of the existing WWTP, both locations will be further assessed before a final location is determined.

Effluent from the American Canyon WRF would be conveyed using the same new infrastructure that was described for Alternative 1 (i.e., PL 1 and PS 1). However, because the new AWPF is located at NapaSan, Alternative 2 would require a new pump station (PS 4) and pipeline (PL 3) to convey the purified water produced at the NapaSan AWPF to the Jamieson WTP where it would be blended with another raw water source prior to undergoing conventional water treatment. It is assumed that this new purified water pipeline would follow the same alignment as NapaSan's existing 24-inch recycled water pipeline that is currently used to convey recycled water to various customers along Sheehy Creek (see Figure 3-4).

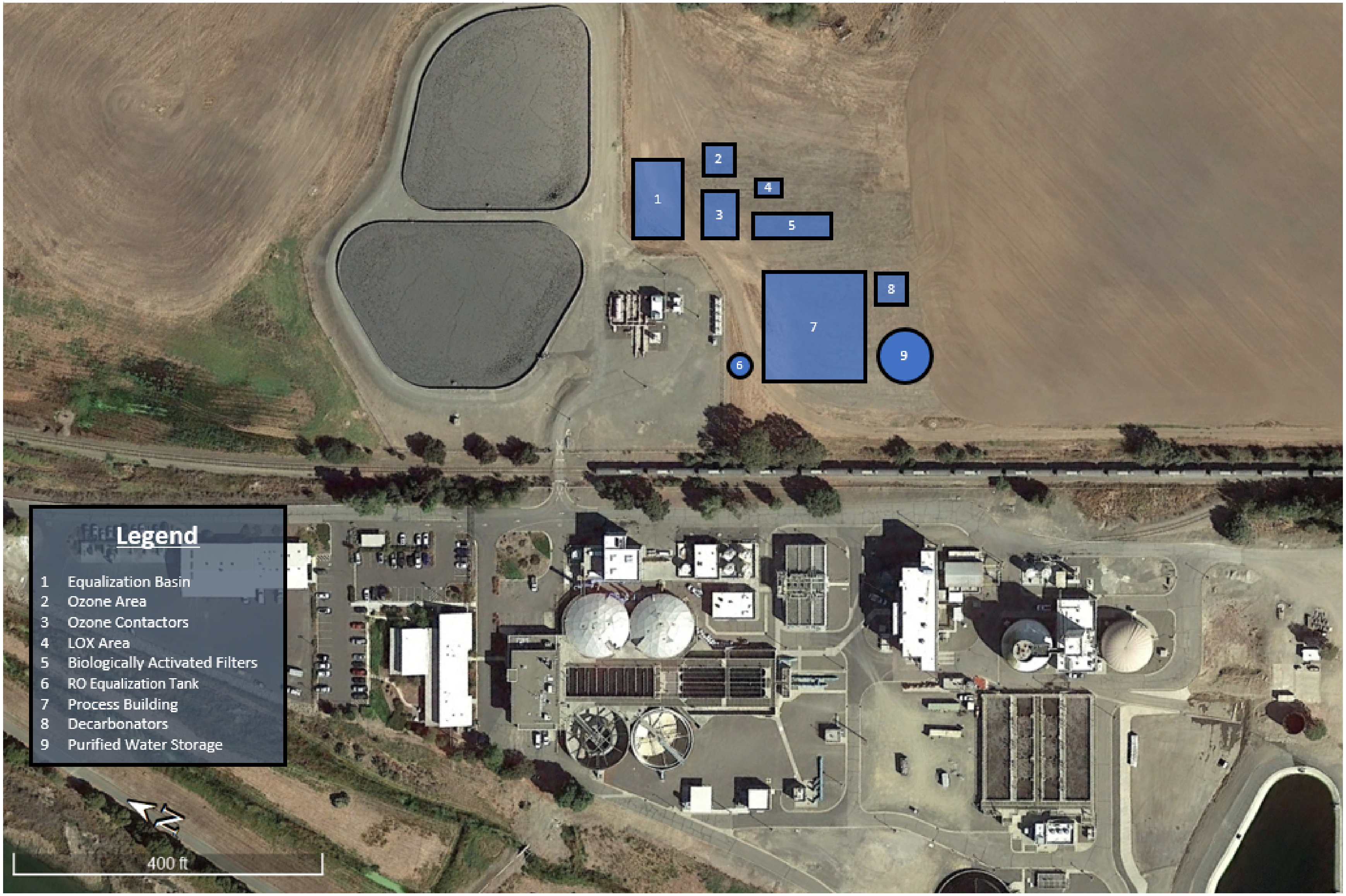

Figure 3-3. Site layout for RWA at NapaSan

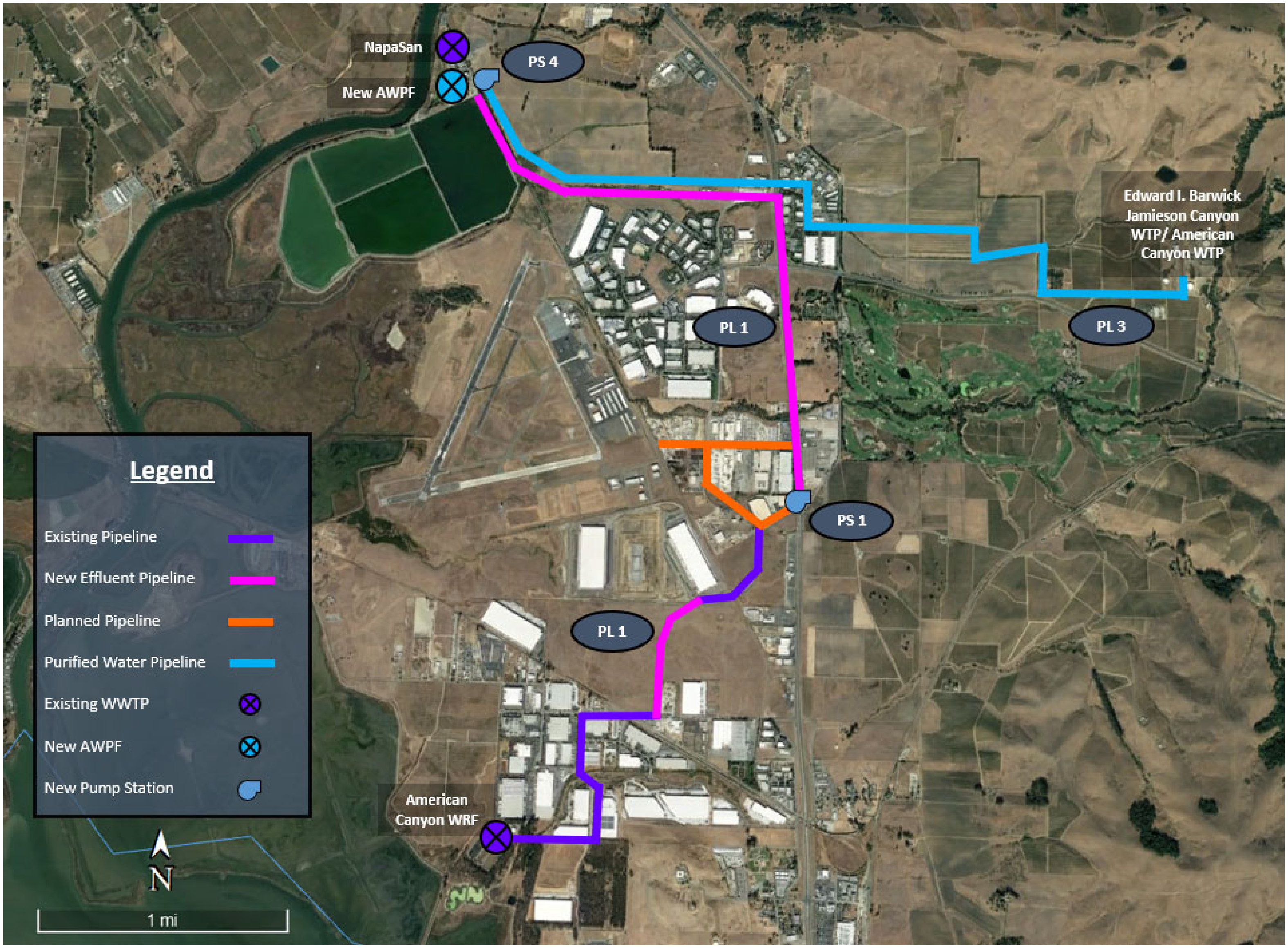

Figure 3-4. Overview map of Alternative 2 facilities and delivery point

Table 3-3 summarizes Alternative 2 facilities.

Table 3-3. Summary of Alternative 2 Major Project Components		
Element	**Capacity**	
AWPF for RWA	5 mgd	
Pump station	**Capacity**	**TDH**
PS 1 – Booster pump station to convey effluent flow to NapaSan from American Canyon WRF	833 gpm	179 ft
PS 4 – Pump station to convey purified water from the new AWPF at NapaSan to the Jamieson WTP site	3,475 gpm	213 ft
Pipelines	**Diameter**	**Length**
PL 1 – Effluent from American Canyon WRF to NapaSan	12 in	17,150 ft
PL 3 – Combined effluent from American Canyon and NapaSan to Jamieson WTP site	24 in	21,000 ft
Storage	**Size**	**Retention Time**
Purified Water Clearwell	0.83 MG	4 hrs

Table 3-4 contains estimated capital and annual O&M costs for Alternative 2, presented in 2021 dollars.

Table 3-4. Estimated Cost Summary for Alternative 2		
	Capital Cost ($2021, in millions)	**Annual O&M Cost ($2021, in millions)**
Item	**Total (5 mgd)**	**Total (5 mgd)**
Total AWPF Costs	$108.2	$4.8

3.3 Alternative 3 – TWA with AWPF at NapaSan

Alternative 3 is premised on treating combined effluent from both the American Canyon WRF and NapaSan at a new AWPF located at NapaSan. The TWA AWPF would be similar to the RWA facilities described in the previous alternatives but would include additional chemical control and/or chemical peak attenuation, post-treatment stabilization, temperature, and barriers to allow appropriate response time. A preliminary layout of the facility and the various treatment processes is included in Figure 3-5. As noted for Alternative 2, the AWPF could also be sited on the north end of the existing WWTP, both locations will be further assessed before a final location is determined.

Like the previous alternatives, effluent from the American Canyon WRF would be conveyed to NapaSan using the same new infrastructure described previously (i.e., PL 1 and PS 1, see Figure 3-6). Once treated, purified water produced at this new AWPF would be introduced directly into Napa potable water distribution system through a water main that is located in close proximity to the existing NapaSan WWTP. A more detailed evaluation of blending ratios of purified water and other supplies at delivery points will need to be conducted in the future. Providing adequate systems to protect against treatment and water quality issues that could lead to the distribution of off-spec (or potentially off-spec) water will be critical. To help mitigate some of these concerns, the conceptual design of the TWA AWPF includes a baffled clearwell that should provide: (a) the ability to respond to upstream performance and water quality issues; (b) hydraulic buffering to manage demands in the distribution system; and (c) a location to divert off-spec water upstream of distribution.

The DPR framework identifies that availability of alternative water supplies will be required for TWA. Systems need the ability to provide an alternate potable water supply on a similarly rapid timescale if needed.

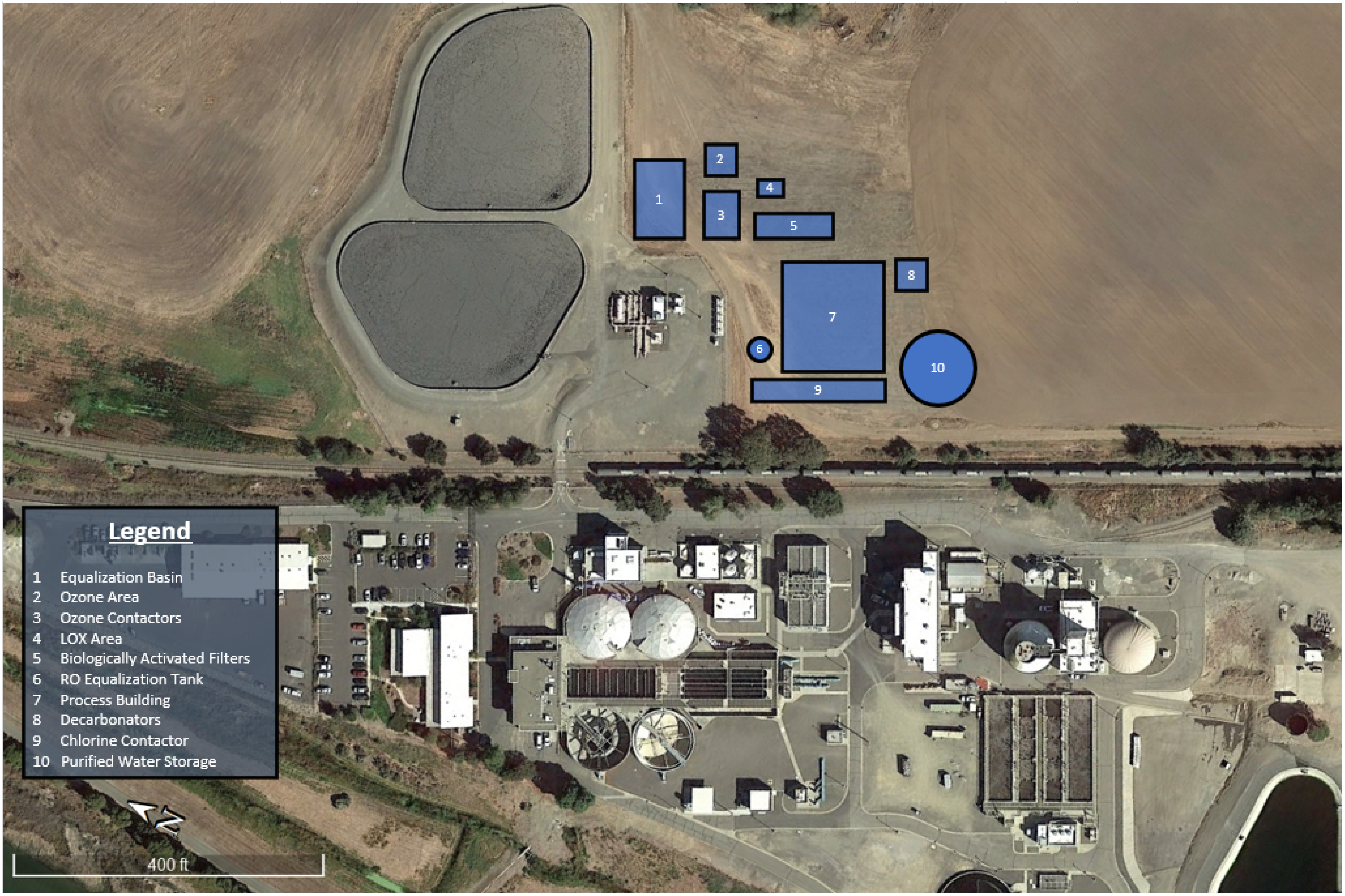

Figure 3-5. Site layout for TWA at NapaSan

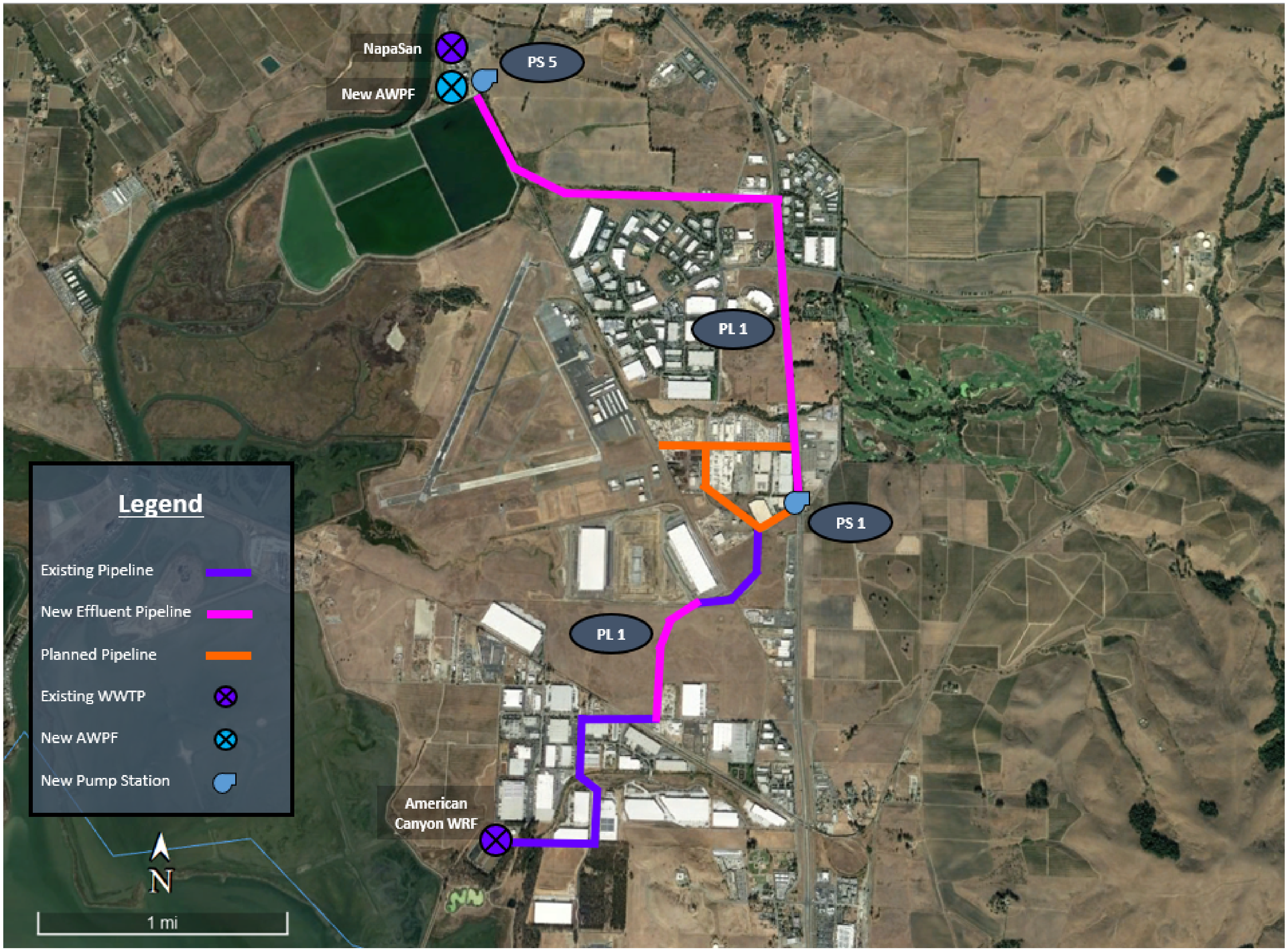

Figure 3-6. Overview map of Alternative 3 facilities and delivery point

Table 3-5 summarizes Alternative 3 facilities.

Table 3-5. Summary of Alternative 3 Major Project Components		
Element	**Capacity**	
AWPF for TWA	5 mgd	
Pump station	**Capacity**	**TDH**
PS 1 – Booster pump station to convey effluent flow to NapaSan from American Canyon WRF	833 gpm	179 ft
PS 5 – Pump station to convey purified water from the new AWPF to Napa potable water system	3,475 gpm	116 ft
Pipelines	**Diameter**	**Length**
PL 1 – Effluent from American Canyon WRF to NapaSan	12 in	17,150 ft
Storage	**Size**	**Retention Time**
Purified Water Clearwell	1.67 MG	8 hrs

Table 3-6 contains estimated capital and annual O&M costs for Alternative 3, presented in 2021 dollars.

Table 3-6. Estimated Cost Summary for Alternative 3		
	Capital Cost ($2021, in millions)	**Annual O&M Cost ($2021, in millions)**
Item	**Total (5 mgd)**	**Total (5 mgd)**
Total AWPF Costs	$90.7	$5.3

3.4 Residuals Management

As described previously, each potential AWPF is anticipated to consist of a process train that includes RO and UV/AOP. Backwash water from the upstream UF process is expected to be returned to the headworks of the nearest WWTP.

For projects that use RO, management of the ROC stream is an important part of the permitting process. As an RO system rejects 95 to 99 percent of dissolved salts, this concentrate stream contains high levels of TDS that must be properly managed. There are various strategies for ROC management that vary depending on the AWPF location. Some of these strategies are summarized below in Table 3-7. A more detailed evaluation will need to be conducted to determine which strategy might work best given the characteristics of each of the proposed AWPF alternatives.

Table 3-7. ROC Management Strategies		
Strategy	Description	Considerations
Sanitary Sewer Discharge	Discharge into an existing sanitary sewer system for treatment at a WWTP. This would require coordination with the managing utility (e.g., American Canyon or NapaSan), which may include acquiring an industrial discharge permit. Multiple costs are associated with this strategy, including those of a new sanitary sewer/treatment plant connection and the potential increase in unit treatment costs due to increased 5-day biochemical oxygen demand (BOD_5) and TSS concentrations of the wastewater influent.	Potential downstream impacts to the collection system or WWTP need to be considered. High sulfate or chloride levels could cause corrosion within the pipeline, and ROC may need to be discharged in locations where there is sufficient flow to provide needed dilution. Pollutant increases could also impact downstream WWTP operations, particularly increases in nutrients and trace metals. These increases in concentrations in WWTP influent can also translate to increased concentrations in the effluent, which could challenge NPDES permit limits (e.g., by contributing to toxicity in the receiving water) or impact downstream advanced water treatment facilities. For example, increases in TDS could impact downstream potable RO systems and create a positive feedback loop.
Discharge through an Outfall	Discharge through an existing or new outfall is another potential strategy. The benefit of this approach is that it avoids impacts on downstream collection systems and WWTP processes. However, the viability of this strategy depends on the impact of the concentrate flow on pollutant concentrations or toxicity limits specified in an existing outfall's NPDES permit.	Anticipated water quality concerns for ROC disposal through existing outfalls include nutrients, TOC, TDS, and trace metals like copper and nickel. Metals are of particular concern because they typically have concentration-based limits. As wastewater effluents are diverted for water reuse, the available dilution volume to reduce the concentrations of these contaminants goes down, making NPDES compliance potentially challenging. Construction of a new outfall could be a regional concentrate disposal solution. However, similar to using an existing outfall, it would require obtaining an NPDES permit and ensuring compliance with the Basin Plan.
Engineered Wetlands and Treatment Cells	ROC could be managed and treated through engineered wetlands. Engineered fresh and brackish water wetlands could reduce the concentrations of nutrients and trace contaminants in ROC. If wetlands are designated as "treatment" wetlands, they would be permitted as part of the overall wastewater treatment process.	If necessary, additional pretreatment of open water treatment cells could be applied to further reduce pollutant loading. However, permitting for treatment cells could be challenging, as there would need to be coordination with the U.S. Army Corps of Engineers, Regional Board, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife, and the SF Bay Conservation and Development Commission. Treated RO concentrate from treatment cells and engineered wetlands would have to be conveyed to another location for ultimate disposal. However, this management strategy could potentially be combined with another disposal option—e.g., the ROC could be treated via engineered wetland before being discharged through an outfall. The wetland would reduce ROC pollutant concentrations and toxicity, potentially maintaining effluent concentrations below the NPDES permit limits.
Evaporation Ponds	Evaporation ponds, either with or without mechanical enhancement tend to be easy to operate and help divert ROC from the SF Bay.	Evaporation ponds typically require large areas of land, which depending on the location, might present some challenges. For permitting requirements, the development of an evaporation pond would be included in the application of an NPDES permit or WDR permit. Any existing NPDES or WDR permits would be subject to revision and re-approval by the Regional Board.
Deep Well Injection	The ROC would be injected into a deep confined aquifer under pressure, and the injection zone would be selected to prevent impacts to any drinking water aquifers (or any other beneficial uses).	This option is viable only in areas where the hydrogeological conditions are favorable. For permitting, the State of California has primacy for Class II – oil and gas related wells; all other injection wells are regulated by the EPA and must be registered through the federal Underground Injection Control program.

Section 4: Next Steps

As stated in the introduction, the purpose of this assessment was to help frame what a purified water project for the region might look like. If there is interest in advancing some of the alternatives presented in this assessment, this could be accomplished through a feasibility study. This would allow the interested parties get a more detailed evaluation of options, refining some of the assumptions that were used for this exercise such as:

- **Economics:** As the alternatives are better defined, capital and O&M costs will need to get updated and priced in more detail (e.g., at a Class 4 level, rather than a Class 5). An economic assessment to determine the unit cost (e.g., cost per AF) of the refined alternatives as a means of comparison with other water supply projects, could be developed. An assessment of the potential impact to water rates, should one of these alternatives be implemented, could be included as part of this work.
- **Environmental benefits, impacts, and permitting:** A more detailed analysis of potential environmental impacts, including energy and greenhouse gas emissions, along with permitting and regulatory considerations (e.g., NPDES permits and California Environmental Quality Act compliance) and ROC management is recommended. Any additional effluent flow requirements (e.g., for discharge or blending) would be considered at this stage.
- **Governance considerations and potential partnership arrangements:** The alternatives in this assessment all involve project elements that require new or extended agreements, such as ownership and operations of a joint AWPF. Roles and responsibilities of potential potable reuse producer(s) and retailer(s) will need to be further developed, along with potential new agreements. As mentioned previously, the draft DPR regulations significantly increase required TMF capacity for DPR projects. Compliance will require documentation through an extensive suite of reports, programs, and plans beyond those currently required for IPR.
- **Residuals management:** As stated in Section 3.4, each potential AWPF is anticipated to consist of a similar process train which will yield a series of residual streams that will need to be managed, especially as it pertains to ROC. While a set of potential strategies was included in this assessment, a more informed evaluation is needed to help identify site-specific ROC management options, costs, and permitting complexity.
- **Water supply integration, operations, and maintenance:** The alternatives would benefit from a more in-depth water supply integration analysis which would evaluate existing contracts, water supply models, infrastructure parameters, seasonal variation, blending requirements, energy use, and permit requirements. This evaluation would consider estimated utilization rates and impacts of proposed alternatives on the regional water cycle. Included would also be a water quality evaluation to better understand the quality of water from each source and refine the treatment train and costs. Based on the draft DPR regulations, operations and maintenance procedures will also need to be carefully assessed and developed. Any DPR facility will require a high degree of monitoring (i.e., frequency, locations, and range of contaminants) and more stringent operational control (e.g., automatic diversions and shutdowns) to prevent distribution of water that is not compliant with requirements.

Implementing any of the alternatives will not be a linear process. The agencies will need to work in tandem on multiple implementation steps simultaneously, and the interdependency of some of those steps adds complexity. In addition to the items listed above, the agencies will likely need to initiate a collaborative potable reuse public outreach and engagement effort informed by the alternative to be implemented, planned project location, and rate impacts.

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Attachment A: Design Criteria

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List of Tables

Attachment A

Design Criteria

A.1 Napa Valley Advanced Water Purification Facilities (AWPF)

A.1.1 Alternatives Evaluated

Table A-1 summarizes the Napa Valley AWPFs that were evaluated as part of the Napa Valley Purified Water Assessment.

Table A-1. Napa Valley AWPFs being Evaluated

Alternative	Description	Source flow	AWPF location	Design capacity and treatment process
1	Combined regional AWPF for raw water augmentation (RWA) located at the Edward I. Barwick Jamieson Canyon Water Treatment Plant (Jamieson WTP) site	Napa Sanitation District (NapaSan) and American Canyon Water Reclamation Facility (WRF)	Jamieson WTP site	5-mgd plant with ozone biological activated carbon (O_3-BAC) followed by full advanced treatment (FAT) and chlorine disinfection
2	Combined regional AWPF for RWA located at NapaSan	Napa Sanitation District and American Canyon Water Reclamation Facility	NapaSan	5-mgd plant with O_3-BAC followed by FAT and chlorine disinfection
3	Combined regional AWPF for treated water augmentation (TWA) located at NapaSan	Napa Sanitation District and American Canyon Water Reclamation Facility	NapaSan	5-mgd plant with O_3-BAC followed by FAT and chlorine disinfection

Notes:

Assume FAT system includes ultrafiltration (UF) system > reverse osmosis (RO) system > decarbonator system > ultraviolet/advanced oxidation process (UV/AOP) > purified water

A.1.2 Water Quality

Estimated feed water quality for this evaluation was based on historical treated effluent water quality provided by NapaSan and the City of American Canyon and is presented in Table A-2. These data were used as a basis for the conceptual design of each of the AWPFs in this assessment.

Table A-2. Estimate Feed Water Quality										
		Napa Sanitation District				City of American Canyon				
		Historical data				Historical data				
Parameter	Units	Min	Max	90th Percentile	Average	Min	Max	90th Percentile	Average	Design value
Alkalinity, total	mg/L as $CaCO_3$	69	204	143.5	109	--	--	--	--	143.5
Ammonia, total	mg/L as N	0	13.3	1.07	0.7	0.17	0.17	0.17	0.17	0.8
Calcium	mg/L	22	43	35.2	31	38	38	38	38	36.0
Chloride	mg/L	84	351	251.4	181	580	580	580	580	350.0
Chlorine, total residual	mg/L	5.0	20.1	10.7	7.8	1.8	13.6	--	4.8	8.9
Conductivity	µS/cm	579	1,718	1,301	1,015	1,136	3,210	--	2,284	1,595.9
Magnesium	mg/L	16	39	30.2	23	24	24	24	24	28.3
Nitrate + nitrite (calculated)	mg/L as N	2.94	17.3	15.1	10.3	3.3	4.4	--	3.8	11.7
Nitrogen, total (as N)	mg/L	4.91	22.13	16.2	12.0	--	--	--	--	16.2
pH	unit	6.5	8.5	7.3	7.1	7.2	8.2		7.6	7.4
Total Phosphorus	mg/L	0.12	3.96	1.82	0.9	--	--	--	--	1.8
Phosphate	mg/L as PO_4	--	--	--	--	3.2	3.2	3.2	--	3.2
Sodium	mg/L	70	230	180	129	450	450	450	450	261.0
Sulfate	mg/L	56.8	109	102.7	83	--	--	--	--	102.7
Total dissolved solids (TDS)	mg/L	404	926	756	616	636	1798	--	1279	912.9
Temperature	°C	10.4	25.4	21	17.4	15.8	25.1	--	20.4	10.4
Total organic carbon (TOC)	mg/L	0	15.0	14.0	9.3	--	--	--	--	14.0
Total Kjeldahl Nitrogen (TKN) (as N)	mg/L	0	14.8	3.5	1.8	--	--	--	--	3.5
Turbidity	NTU	0.1	1.7	1.3	1.0	--	0.39	--	--	1.3

Notes:

Source: Water quality data was provided by Napa San and City of American Canyon staff.

Where applicable, an assumed 70/30 percent split (Napa San: American Canyon) on feed flow to the AWPF was assumed for mass balance calculations.

µg/L = micrograms per liter

µS/cm = microsiemens per centimeter

$CaCO_3$ = calcium carbonate

mg/L = milligrams per liter

ng/L – nanogram per liter

NTU = Nephelometric turbidity unit

A.1.3 Influent Pump Station/Equalization Basin

Wastewater effluent from the sources identified in Table A-1 would be conveyed to each of the respective AWPFs being considered. For all of the AWPFs being assessed, wastewater effluent would be conveyed into equalization basins upstream of treatment. Since the equalization basin and AWPF for Alternative 1 are not in the same location, a wetwell at the Jamieson WTP site will be needed to receive incoming feed flow for the new AWPF. For Alternative 2 and 3, this additional wetwell will not be required as the new AWPF will be onsite (NapaSan). The influent pumps described in Table A-3 would convey water to the O_3-BAC system.

Table A-3. Influent Pump Station Design Criteria

Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Feed flow	mgd	6.4	6.4	6.4
Equalization basin volume	MG	0.6	0.6	0.6
Wetwell basin volume	gallons	44,500	--	--
Number of pumps	--	1 duty 1 standby	1 duty 1 standby	1 duty 1 standby
Type	--	Vertical turbine pump	Vertical turbine pump	Vertical turbine pump
Capacity, each	gpm	4,500	4,500	4,500
Total dynamic head (TDH), each	ft	±30	±30	±30
Motor size	hp	50	50	50
Pump efficiency	%	±80%	±80%	±80%
Variable-frequency Drive (VFD)	--	Yes	Yes	Yes

MG = million gallons

A.1.4 Ozone and Biologically Activated Carbon

The O_3-BAC pretreatment is recommended for the RWA and TWA treatment train to gain log removal value (LRV) credit and improve downstream processes, including disinfection, total organic carbon (TOC) reduction, and membrane performance. Details for the O_3-BAC system are presented in Table A-4.

Table A-4. Ozone and BAC Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Ozone System				
Ozone range:TOC (ratio)	N/A (ratio)	0.6-1.3:1	0.6-1.3:1	0.6-1.3:1
Ozone dose	mg/L	6	6	6
Number of contactors (duty + standby)	--	2+1	2+1	2+1
Ozone contact time (including quenching)	min	10	10	10
Ozone generator capacity, each	pounds per day (lb/day)	320	320	320
Number of ozone generators	--	1	1	1
Number of vaporizers	--	2	2	2
Capacity, each	scfh	800	800	800
Liquid oxygen (LOX) tank capacity, each	gal	9,000	9,000	9,000
Number of LOX tanks	--	1	1	1
BAC System				
Number of filters (duty + standby)	--	3+1	3+1	3+1
Filter depth (granular activated carbon [GAC], sand)	in.	72, 12	72, 12	72, 12
Design empty bed contact time (EBCT)(assumes 1 unit down)	min	14	14	14
Design loading rate (assumes 1 unit down)	Gallons per minute per square foot (gpm/ft^2)	4.1	4.1	4.1

scfh = standard cubic feet per hour

A.1.5 Ultrafiltration System

The UF system for this application consists of strainers followed by UF membranes. Design criteria for both are summarized in Tables A-5 and A-6, respectively. A disinfection residual (chloramines) is assumed to be provided upstream of the UF system to minimize biofouling of the UF and RO membranes. Chemicals used and estimated dosing amounts are noted in Table A-5.

Table A-5. Strainer Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Hypochlorite dose for chloramine residual	mg/L	1.5[a,b]	1.5[a,b]	1.5[a,b]
Aqueous ammonia dose for chloramine residual	mg/L	0.5[b]	0.5[b]	0.5[b]
Design feed flow	mgd	6.4	6.4	6.4
Number of strainers	--	10	10	10
Design flow, each	mgd	0.64	0.64	0.64
Vessel material	--	316 SS	316 SS	316 SS
Min. screen pore size (nominal)	µm	300	300	300
Approximate clean strainer headloss, average	psi	5	5	5
Screen material	--	316 SS (punched hole or woven mesh)	316 SS (punched hole or woven mesh)	316 SS (punched hole or woven mesh)

a. *Estimated dose for 2 mg/L chloramine residual.*
b. *Assumes 0.5 mg/L residual from disinfected tertiary effluent.*
SS = stainless steel

Table A-6. Pressure UF System Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Recovery	%	92%	92%	92%
Feed (all trains)	mgd	6.4	6.4	6.4
Reverse filtration flow, all trains (backwash)	mgd	0.5	0.5	0.5
Filtrate (all trains)	mgd	5.9	5.9	5.9
Operation type (pressure/vacuum)	--	Pressure	Pressure	Pressure
Number of trains	--	10	10	10
Design flux	gfd	30	30	30
Number of modules	per train	40	40	40
Number of modules	total	400	400	400
Operating transmembrane pressure, max.	psi	40	40	40
Cleaning frequency				
Maintenance clean	day	14	14	14
CIP	month	3	3	3

A.1.6 Reverse Osmosis System

The RO system would consist of UF/RO interprocess tanks, RO transfer pumps, cartridge filters, RO feed pumps, and the RO treatment vessels. System details are described in Tables A-7 through A-11.

Table A-7. UF/RO Interprocess Tank Design Criteria

Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
RO feed tank flow	mgd	5.9	5.9	5.9
Number of tanks	--	1	1	1
Design detention time	min	15	15	15
Operating volume, each	gal	64,000	64,000	64,000
Height	ft	12	12	12
Diameter	ft	30	30	30
Tank type	--	304 SS, cylindrical, above grade	304 SS, cylindrical, above grade	304 SS, cylindrical, above grade

SS = stainless steel

Table A-8. RO Transfer Pump Design Criteria

Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
RO feed flow, design	mgd	5.9	5.9	5.9
Type	--	Horizontal end suction	Horizontal end suction	Horizontal end suction
Number of pumps	--	4	4	4
Capacity, each	gpm	1,100	1,100	1,100
TDH, each	ft	100	100	100
Motor size	hp	40	40	40
Pump efficiency	%	±80%	±80%	±80%
VFD	--	Yes	Yes	Yes

Table A-9. RO Cartridge Filter Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Number of units	quantity	10	10	10
Design loading rate	gpm/10-in. equivalent	3.7	3.7	3.7
Configuration	--	Parallel	Parallel	Parallel
Number of elements	per housing	22	22	22
Number of elements	total	220	220	220
Type	--	Melt blown polypropylene or equal	Melt blown polypropylene or equal	Melt blown polypropylene or equal
Pore size	µm	5	5	5
Diameter	in.	30	30	30
Length	in.	50	50	50
Design headloss, max.	psi	15	15	15

Table A-10. RO Feed Pumps Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Type	--	Vertical turbine	Vertical turbine	Vertical turbine
Number of pumps	--	10	10	10
Capacity, each	gpm	430	430	430
Maximum design operation pressure	psi	132	132	132
Motor size	hp	50	50	50
Pump efficiency	%	±80%	±80%	±80%
VFD	--	Yes	Yes	Yes

Table A-11. RO System Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
RO flow rates (total)				
Raw feed	mgd	5.9	5.9	5.9
Recirculated flow		0.2	0.2	0.2
Net feed		6.1	6.1	6.1
Total RO concentrate	mgd	1.1	1.1	1.1
Net RO concentrate		0.9	0.9	0.9
Permeate	mgd	5.0	5.0	5.0
Number of trains	--	10	10	10
Permeate per train	mgd	0.5	0.5	0.5
Train Configuration				
Number of stages	--	2	2	2
Array configuration (per train)	pressure vessels by stage	10:4	10:4	10:4
Pressure vessels	per train	14	14	14
RO Elements				
Type	--	Spiral wound	Spiral wound	Spiral wound
Material	--	TFC	TFC	TFC
Diameter	in.	8	8	8
Length	in.	40	40	40
Area	sf	400	400	400
Number of elements	per pressure vessel	7	7	7
Number of elements	total	980	980	980
Nominal sodium chlorine reduction	%	>99.2%	>99.2%	>99.2%
Permeate TOC	mg/L	<0.25	<0.25	<0.25
Total system recovery	%	85%	85%	85%
Anti-scalant to RO feed	mg/L	3	3	3
Sulfuric acid to RO feed	mg/L	6	6	6

TFC = thermo formable composite

A.1.7 Advanced Oxidation Process System

The third treatment operation for these facilities is an AOP using UV light and hydrogen peroxide to provide the primary barrier against pathogens. Details for the proposed systems are described in Table A-12.

Table A-12. Advanced Oxidation Process Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Sodium bisulfite dose	mg/L	3	3	3
Hydrogen peroxide dose range	mg/L	3-5	3-5	3-5
Disinfection Standard				
1,4 -dioxane	log reduction	0.5	0.5	0.5
NDMA	log reduction	1.0	1.0	1.0
UV System				
Manufacturer, model	--	Wedeco K143	Wedeco K143	Wedeco K143
Number of units	--	1 duty, 1 standby	1 duty, 1 standby	1 duty, 1 standby
Flow	mgd	5.0	5.0	5.0
Configuration	--	In pipe, horizontal	In pipe, horizontal	In pipe, horizontal
Width	ft	6.3	6.3	6.3
Length	ft	15.6	15.6	15.6
Lamp type	--	Low pressure, high output	Low pressure, high output	Low pressure, high output
Number of UV lamps	per unit	84	84	84
Number of duty UV lamps	total	84	84	84
UV lamp power	kW per lamp	0.6	0.6	0.6
UV reactor power	kW per unit	57	57	57
Total duty UV system power	kW	57	57	57
UVT (minimum, estimated)	%	96%	96%	96%
UV dose	mJ/cm²	950	950	950

kW = kilowatt
UVT = ultraviolet transmittance
NDMA = N-nitrosodimethylamine

A.1.8 Decarbonation

The RO permeate that feeds into the advanced oxidation process (AOP) has a high corrosivity that could corrode the product water conveyance pipelines depending on pipe material. To mitigate potential corrosion, decarbonation/air stripping towers are proposed to stabilize the product water through the removal of dissolved carbon dioxide (CO_2), which increases the pH of the water. This also reduces the level of chemical consumption associated with post treatment stabilization. The decarbonators/air strippers also help reduce water temperature to address aesthetics concerns and provide an additional mechanism of chemical control (volatilization) to complement other barriers. Table A-13 describes the decarbonator design criteria.

As currently configured, decarbonation is located downstream of the AOP. In some designs, decarbonation is either located upstream of UV-AOP or not included, depending on unconditioned treated water quality and final water quality goals. Relocation of decarbonation upstream of the UV-AOP to allow for flexibility in UV-AOP oxidant selection and optimize water stabilization is recommended for consideration.

Table A-13. Decarbonator/Air Stripping Design Criteria

Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Number of units	--	2	2	2
Tank height	ft	26	26	26
Diameter	ft	9.5	9.5	9.5
Air flow rate, per unit	cfm	14,000	14,000	14,000
Blower size, per unit	hp	20	20	20
Treatment flow rate (each)	gpm	1,736	1,736	1,736
Loading rate, per unit	gpm/sf	25	25	25

cfm = cubic feet per minute
hp = horsepower

A.1.9 Post Treatment Stabilization Process

The primary measure of water stability is the Langelier Saturation Index (LSI). Waters with an LSI of less than 0 are corrosive, with lower values indicating progressively increased corrosiveness. The decarbonated permeate from the RO system is projected to have an LSI of -5.4. Further chemical stabilization is needed. The proposed post-treatment stabilization process includes decarbonation to reduce CO_2 (discussed previously), remineralization and corrosion control using lime and sodium hydroxide with subsequent chemical feed trim capabilities to achieve a selected minimum alkalinity level, a stable water chemistry and for compatibility with the distribution system's water quality.

A.1.10 Chlorine Disinfection Process

Based on the State Water Resources Control Board Division of Drinking Water's (DDW) current position on direct potable reuse (DPR), FAT is anticipated to be the minimum treatment baseline. Additional treatment elements will likely be needed to comply with stricter requirements for pathogen and chemical control. For Alternative 1 and 3, it was assumed that chlorine disinfection basin would form part of the minimum treatment requirements. Chlorine disinfection would provide another treatment barrier for viruses, and the residual free chlorine in the effluent flow from this process would mitigate pathogen regrowth in downstream infrastructure. To receive 6/0/1 LRVs for this treatment step, a minimum contact time (CT) of 18 min-mg/L is needed per *LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual*. The design criteria for chlorine disinfection basin is provided in Table A-14.

Table A-14. Chlorine Disinfection Basin Design Criteria			
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 3 (TWA at NapaSan)
Flow	mgd	5.0	5.0
CT-design	min-mg/L	18	18
Free Chlorine Residual	mg/L	3	3
Basin			
Sodium Hypochlorite Dose	mg/L	TBD	TBD
Reactor type	--	Plug-flow	Plug-flow
Reactor length to width ratio	--	20:1	20:1
Reactor baffling factor	--	0.7	0.7
Side water depth	ft	6	6
Freeboard	ft	2	2
Number of passes	--	2	2
Length per pass	ft	160	160
Width per pass	ft	8	8
Reactor volume	gal	115,000	115,000
Residence time at design flow	min	33	33

A.1.11 Purified Water Storage Clearwell

Once stabilized and disinfected, purified water will be conveyed to onsite tanks (baffled clearwells). For the RWA alternatives, the clearwells were designed with a 4-hour retention time and are primarily meant to help equalize flow feeding the purified water pump stations. For the TWA alternative (i.e., Alternative 3), the clearwell is designed with an 8-hour retention time and will provide the ability to respond to upstream performance and water quality issues, serve as a hydraulic buffer to manage demands in the distribution system, and provide a location to divert off-spec water upstream of distribution. Design criteria for the clearwells is provided in Table A-15.

Table A-15. Purified Water Storage Tank (Clearwell) Design Criteria				
Parameter	Units	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Number of Tanks	--	1	1	1
Inside Diameter	ft	68	68	96
Side Water Depth	ft	31	31	31
Volume	MG	0.83	0.83	1.66
Freeboard	ft	4.5	4.5	4.5

A.1.12 Waste Side-Stream Disposal

Table A-16 summarizes the types and flow rates of waste streams for each AWPF. As noted in Section 3.4 of the TM, there are various strategies for RO concentrate management that vary depending on the AWPF location. A more detailed evaluation will need to be conducted to determine which strategy might work best given the characteristics of each of the proposed AWPF alternatives.

Table A-16. Waste Side-Stream Flows					
Waste Stream	Frequency	Percent of Feed Flows	Alternative 1 (RWA at Jamieson WTP)	Alternative 2 (RWA at Napa San)	Alternative 3 (TWA at NapaSan)
Strainer cleaning flows	Intermittent	<1% of facility influent flow	0.06	0.06	0.06
UF backwash waste flows	Intermittent	~8% of facility influent flow	0.51	0.51	0.51
RO concentrate flows	Continuous	~15% of RO feed flow	0.9	0.9	0.9
CIP solution flows	Intermittent	NA	TBD	TBD	TBD

Attachment B: Cost Estimates for Alternatives

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Engineers Opinion of Probable Costs
Napa Valley Drought Contingency Plan
Alternative 1 - RWA at Jamieson WTP Site

Brown AND Caldwell

Date: 10/22/2021
BC Project Number: 154033
Prepared by: Rene Guillen
Reviewed By: Ryan Manocchio

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes
	Direct Project Capital Costs					
1.0	**Mobilization/Demobilization**	**1**	**LS**	**5%**	**$2,499,000**	5% of Raw Costs.
2.0	**Site Preparation & Concrete**				**$18,823,277**	
2.1	Site Clear and Grub	1.5	Acre	$7,760	$11,640	
2.2	Strip Topsoil	7,260	SY	$6.35	$46,101	
2.3	Backfill Haul to Site	7,260	CY	$17.92	$130,099	Assumed 3' over entire site.
2.4	Backfill Placement	7,260	CY	$3.94	$28,604	Assumed 3' over entire site.
2.5	Excavation	3,704	CY	$5.64	$20,890	
2.6	Compaction	3,630	CY	$2.09	$7,587	
2.7	Grading	7,260	SY	$6.77	$49,150	
2.8	Shoring, Sheeting, and Bracing	1	LS	$8,000	$8,000	Engineer's estimate.
2.9	Offhaul Allowance	1	LS	$15,000	$15,000	Engineer's estimate.
2.10	Aggregate Base	2,420	CY	$58.49	$141,546	
2.11	Asphalt	19,602	SF	$2.76	$54,102	Assumes 4" thick asphalt.
2.12	Gravel	711	SY	$9.20	$6,540	
2.13	Site Dewatering Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
2.14	Landscaping Allowance	1	LS	$150,000	$150,000	Engineer's estimate.
2.15	Lighting and Security Allowance	1	LS	$300,000.00	$300,000	Engineer's estimate.
2.16	Utility Connections Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate for water, internet, and sewer connections.
2.17	New Electrical Service Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate.
2.18	Switchgear Slab	200	CY	$645.00	$129,000	Engineer's estimate.
2.19	Transformer Slab	357	CY	$645.00	$230,098	Engineer's estimate.
2.20	Chain Link Fence Around Facility	4,400	LF	$52.94	$232,936	Based on 4,400' that goes around the Project parcel area.
2.21	Process Building	18,200	SF	$500.00	$9,100,000	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space
2.22	Process Building Concrete	1,348	CY	$645.00	$869,556	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space.
2.23	Equalization Basin Concrete	1,183	CY	$645.00	$763,011	100' by 65', 12' depth.
2.24	Wetwell Basin Concrete	130	CY	$645.00	$83,707	20' by 24', 12' depth.
2.25	Ozone Area Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for ozone generator, ozone chiller, and other pertinent equipment.
2.26	Ozone Contactors Concrete	183	CY	$645.00	$118,250	60' by 45' total, space for 3 contactors, each 20' by 15', 10' depth.
2.27	LOX Area Concrete	49	CY	$645.00	$31,533	20' by 33', assumed space for LOX tanks, vaporizers, and other pertinent equipment
2.28	BAC Filter Concrete	608	CY	$646.00	$392,768	32' by 102', assumed space for 4 filters, each 20' by 18' (9' depth, assumes 2' of free board). Assumes 6' on either side of each filter and 6' in between filters.
2.29	Decarbonator Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for decarb/air stripping and all other pertinent equipment including pumps.
2.30	Chlorine Contact Basin Concrete	789	CY	$645.00	$508,642	172' by 28', actual chlorine contactor is 160' X 16' (assumes 2 passes and 8' depth, includes 2' of freeboard). Added 6' on all sides of contactor.
2.31	Piping Allowance	30%	% of	$16,272,094	$4,881,628	30% of Treatment Costs.
2.32	Misc. Metals Allowance	1	LS	$60,000	$60,000	Engineer's estimate.
2.33	Coating Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
3.0	**Pipelines**				**$6,208,620**	
3.1	Pipeline 1	17,150	LF	$200.00	$3,430,000	Assumed 17,150' of pipe needed, 12-in diameter.
	Sheeting and Shoring	5%	% of	$3,430,000	$171,500	5% of pipeline costs.
	Potholing	172	LF	$1,200.00	$205,800	Assume 1 pothole per 100 feet, $1,200 per pothole.
3.2	Pipeline 2	5,200	LF	$325.00	$1,690,000	Assumed 5,200' of pipe needed, 24-in diameter.
	Sheeting and Shoring	5%	% of	$1,690,000	$84,500	5% of pipeline costs.
	Potholing	52	LS	$1,200.00	$62,400	Assume 1 pothole per 100 feet, $1,200 per pothole.
3.3	Constructability					
	Pipeline Constructability (along roads)	10%	% of	$5,644,200.00	$564,420	Apply percentage to all pipeline costs to reflect site specific geotechnical complexity or currently unknown conditions that could increase construction costs
4.0	**Pump Stations**				**$8,675,000**	
4.1	Pump Station 1					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$1,200,000	$1,200,000	
	Installation	1	LS	$300,000	$300,000	25% of pump station costs.
4.2	Pump Station 2					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$2,900,000	$2,900,000	
	Installation	1	LS	$725,000	$725,000	25% of pump station costs.
4.3	Influent Pumps					Assume 2 pumps, 1 duty and 1 standby. 50 HP each.
	Pumps	2	LS	$20,000	$40,000	
	Installation	1	LS	$10,000	$10,000	25% of pump costs.
4.4	Pump Station 3					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$2,800,000	$2,800,000	
	Installation	1	LS	$700,000	$700,000	25% of pump costs.
5.0	**Treatment**				**$16,272,094**	
5.1	Ozone System					
	Equipment	1	LS	$2,375,000	$2,375,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$593,750	$593,750	25% of equipment costs.
5.2	Ultrafiltration System					
	Equipment	1	LS	$3,761,150	$3,761,150	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$940,288	$940,288	25% of equipment costs.

Concrete Item	Value	Unit
Slab	2	ft
Wall	1.5	ft

Area Type	Depth	Unit
Paved - Asphalt	4	inches
Paved - Ag Base	12	inches
Paved - Backfill	12	inches
Unpaved - Gravel	4	inches
Unpaved - Ag Base	12	inches
Unpaved - Backfill	12	inches
Slab on Grade - Ag Base	12	inches
Depth of Compaction	1.5	ft

Site Layout Type	Area	Unit
Estimated Project Parcel Area	1.50	acre
Estimated Project Parcel Area	65,340	ft^2
Unpaved	6,398	ft^2
Structures at Grade	39,340	ft^2
Paved	19,602	ft^2
Acreage-landscaping, lighting	1.50	acre

Structures at Grade	Area	Unit
Process Building	18,200	ft^2
Equalization Basin	6,500	ft^2
Ozone Area	1,600	ft^2
Ozone Contactors	2,700	ft^2
LOX Area	660	ft^2
BAC Filter Area	3,264	ft^2
Decarbonator Area	1,600	ft^2
Chlorine Contact Basin	4,816	ft^2

5.3	Interprocess Tank (RO Feed Tank)	1	LS	$128,000	$128,000	Assume 64,000 gallon tank. $2 per gallon installed cost.
5.4	Reverse Osmosis System					
	Equipment	1	LS	$3,293,160	$3,293,160	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$823,290	$823,290	25% of equipment costs.
5.5	Decarbonator/Air Stripper System					
	Equipment	1	LS	$357,000	$357,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$89,250	$89,250	25% of equipment costs.
5.6	UV/AOP System					
	Equipment	1	LS	$1,040,000	$1,040,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$260,000	$260,000	25% of equipment costs.
5.7	High Density Lime Slurry Batching and Metering System					
	Equipment	1	LS	$708,965	$708,965	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$177,241	$177,241	25% of equipment costs.
5.8	Purified Water Clearwell	1	LS	$1,725,000	$1,725,000	Based on budgetary proposal from manufacturer.
				Total Raw Construction Costs:	**$52,477,991**	

Summary of Raw Construction Costs

Mobilization/Demobilization	Site Preparation & Concrete	Pipelines	Pump Stations	Treatment	Total Raw Construction Costs
$2,499,000	$18,823,277	$6,208,620	$8,675,000	$16,272,094	**$52,477,991**

Construction Cost Subtotal

Tax on Materials (9%)	General Contractor Overhead and Profit (15%)	
$4,723,019	$7,871,699	**$65,072,708**

Total Capital Cost Summary

Owner's Reserve for Change Orders (15%)	Engineering Services (Design) (15%)	Construction Management (13%)	Engineering Services During Construction (12%)	Total Project Capital Costs
$9,760,906	**$9,760,906**	$8,459,452	**$7,808,725**	**$100,862,698**

Total O&M Costs ($/year)

Item No.	Description	Qty	Units	$/Unit	Total O&M Cost	Notes	
	Annual Operations and Maintenance Costs						
1.0	**Treatment Costs**						
1.1	Ozone System	1	LS	$84,713	$84,713	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.2	Ultrafiltration System	1	LS	$524,274	$524,274	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.3	Reverse Osmosis System	1	LS	$1,687,240	$1,687,240	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.4	Decarbonator/Air Stripper System	1	LS	$15,000	$15,000	Estimated based on other similar facilities.	
1.5	UV/AOP System	1	LS	$252,065	$252,065	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.6	High Density Slurry Batching and Metering System	1	LS	$12,500	$12,500	Estimated based on other similar facilities.	
1.7	Pump Station 1	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.8	Pump Station 2	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.9	Influent Pumps	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.10	Pump Station 3	1	$/year	$112,728	$112,728	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 75 2 490,122
2.0	**Labor Costs**	3	No. of Staff	$100,000	$300,000	Based on estimate of annual salary for full time staff per year including benefits and overhead	
3.0	**Maintenance**	2%	% of	$52,477,991	$1,049,560	Assume 1% of total capital costs.	
4.0	**Legal/Permitting**	2%	% of	$4,150,808	$83,016	Assume 2% of above O&M costs.	
5.0	**Contingency**	10%	%	$4,150,808	$415,081	Assume 10% of above O&M costs.	
				Annual O&M Costs ($/year)	**$4,648,905**		
				Annual Unit O&M Costs ($/AF)	**$830**	Based on Product Flow (AFY) =	5,601
				Annual Unit O&M Costs ($/1000 gal)	**$2.55**		

Summary of O&M Costs ($)

Treatment Costs	Labor Costs	Maintenance	Legal/Permitting	Contingency	Total O&M Costs
$2,801,248	$300,000	$1,049,560	$83,016	$415,081	$4,648,905

Engineers Opinion of Probable Costs
Napa Valley Drought Contingency Plan
Alternative 2 - RWA at NapaSan

Brown AND Caldwell

Date: 10/22/2021
BC Project Number: 154033
Prepared by: Rene Guillen
Reviewed By: Ryan Manocchio

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes
	Direct Project Capital Costs					
1.0	**Mobilization/Demobilization**	**1**	**LS**	**5%**	**$2,682,600**	5% of Raw Costs.
2.0	**Site Preparation & Concrete**				**$18,230,928**	
2.1	Site Clear and Grub	1.5	Acre	$7,760	$11,640	
2.2	Strip Topsoil	7,260	SY	$6.35	$46,101	
2.3	Backfill Haul to Site	7,260	CY	$17.92	$130,099	Assumed 3' over entire site.
2.4	Backfill Placement	7,260	CY	$3.94	$28,604	Assumed 3' over entire site.
2.5	Excavation	3,704	CY	$5.64	$20,890	
2.6	Compaction	3,630	CY	$2.09	$7,587	
2.7	Grading	7,260	SY	$6.77	$49,150	
2.8	Shoring, Sheeting, and Bracing	1	LS	$8,000	$8,000	Engineer's estimate.
2.9	Offhaul Allowance	1	LS	$15,000	$15,000	Engineer's estimate.
2.10	Aggregate Base	2,420	CY	$58.49	$141,546	
2.11	Asphalt	19,602	SF	$2.76	$54,102	Assumes 4" thick asphalt.
2.12	Gravel	711	SY	$9.20	$6,540	
2.13	Site Dewatering Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
2.14	Landscaping Allowance	1	LS	$150,000	$150,000	Engineer's estimate.
2.15	Lighting and Security Allowance	1	LS	$300,000.00	$300,000	Engineer's estimate.
2.16	Utility Connections Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate for water, internet, and sewer connections.
2.17	New Electrical Service Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate.
2.18	Switchgear Slab	200	CY	$645.00	$129,000	Engineer's estimate.
2.19	Transformer Slab	357	CY	$645.00	$230,098	Engineer's estimate.
2.20	Chain Link Fence Around Facility	4,400	LF	$52.94	$232,936	Based on 4,400' that goes around the Project parcel area.
2.21	Process Building	18,200	SF	$500.00	$9,100,000	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space
2.22	Process Building Concrete	1,348	CY	$645.00	$869,556	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space.
2.23	Equalization Basin Concrete	1,183	CY	$645.00	$763,011	100' by 65', 12' depth.
2.24	Ozone Area Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for ozone generator, ozone chiller, and other pertinent equipment.
2.25	Ozone Contactors Concrete	183	CY	$645.00	$118,250	60' by 45' total, space for 3 contactors, each 20' by 15', 10' depth.
2.26	LOX Area Concrete	49	CY	$645.00	$31,533	20' by 33', assumed space for LOX tanks, vaporizers, and other pertinent equipment
2.27	BAC Filter Concrete	608	CY	$646.00	$392,768	32' by 102', assumed space for 4 filters, each 20' by 18' (9' depth, assumes 2' of free board). Assumes 6' on either side of each filter and 6' in between filters.
2.28	Decarbonator Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for decarb/air stripping and all other pertinent equipment including pumps.
2.29	Piping Allowance	30%	% of	$16,272,094	$4,881,628	30% of Treatment Costs
2.30	Misc. Metals Allowance	1	LS	$60,000	$60,000	Engineer's estimate.
2.31	Coating Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
3.0	**Pipelines**				**$12,348,105**	
3.1	Pipeline 1	17,150	LF	$200.00	$3,430,000	Assumed 17,150' of pipe needed, 12-in diameter.
	Sheeting and Shoring	5%	% of	$3,430,000	$171,500	5% of pipeline costs.
	Potholing	172	LS	$1,200.00	$205,800	Assume 1 pothole per 100 feet, $1,200 per pothole.
3.2	Pipeline 3	21,000	LF	$325.00	$6,825,000	Assumed 5,200' of pipe needed, 24-in diameter.
	Sheeting and Shoring	5%	% of	$6,825,000	$341,250	5% of pipeline costs.
	Potholing	210	LS	$1,200.00	$252,000	Assume 1 pothole per 100 feet, $1,200 per pothole.
3.3	Constructability					
	Pipeline Constructability (along roads)	10%	% of	$11,225,550.00	$1,122,555	Apply percentage to all pipeline costs to reflect site specific geotechnical complexity or currently unknown conditions that could increase construction costs
4.0	**Pump Stations**				**$6,800,000**	
4.1	Pump Station 1					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$1,200,000	$1,200,000	
	Installation	1	LS	$300,000	$300,000	25% of pump station costs.
4.2	Influent Pumps					Assume 2 pumps, 1 duty and 1 standby. 50 HP each.
	Pumps	2	LS	$20,000	$40,000	
	Installation	1	LS	$10,000	$10,000	25% of pump costs.
4.3	Pump Station 4					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$4,200,000	$4,200,000	
	Installation	1	LS	$1,050,000	$1,050,000	25% of pump costs.
5.0	**Treatment**				**$16,272,094**	
5.1	Ozone System					
	Equipment	1	LS	$2,375,000	$2,375,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$593,750	$593,750	25% of equipment costs.
5.2	Ultrafiltration System					
	Equipment	1	LS	$3,761,150	$3,761,150	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$940,288	$940,288	25% of equipment costs.
5.3	Interprocess Tank (RO Feed Tank)	1	LS	$128,000	$128,000	Assume 64,000 gallon tank. $2 per gallon installed cost.
5.4	Reverse Osmosis System					
	Equipment	1	LS	$3,293,160	$3,293,160	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$823,290	$823,290	25% of equipment costs.
5.5	Decarbonator/Air Stripper System					
	Equipment	1	LS	$357,000	$357,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$89,250	$89,250	25% of equipment costs.
5.6	UV/AOP System					
	Equipment	1	LS	$1,040,000	$1,040,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$260,000	$260,000	25% of equipment costs.
5.7	High Density Lime Slurry Batching and Metering System					
	Equipment	1	LS	$708,965	$708,965	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$177,241	$177,241	25% of equipment costs.

Concrete Item	Value	Unit
Slab	2	ft
Wall	1.5	ft

Area Type	Depth	Unit
Paved - Asphalt	4	inches
Paved - Ag Base	12	inches
Paved - Backfill	12	inches
Unpaved - Gravel	4	inches
Unpaved - Ag Base	12	inches
Unpaved - Backfill	12	inches
Slab on Grade - Ag Base	12	inches
Depth of Compaction	1.5	ft

Site Layout Type	Area	Unit
Estimated Project Parcel Area	1.50	acre
Estimated Project Parcel Area	65,340	ft^2
Unpaved	6,398	ft^2
Structures at Grade	39,340	ft^2
Paved	19,602	ft^2
Acreage-landscaping, lighting	1.50	acre

Structures at Grade	Area	Unit
Process Building	18,200	ft^2
Equalization Basin	6,500	ft^2
Ozone Area	1,600	ft^2
Ozone Contactors	2,700	ft^2
LOX Area	660	ft^2
BAC Filter Area	3,264	ft^2
Decarbonator Area	1,600	ft^2
Chlorine Contact Basin	4,816	ft^2

5.8	Purified Water Clearwell	1	LS	$1,725,000	$1,725,000	Based on budgetary proposal from manufacturer.
				Total Raw Construction Costs:	**$56,333,727**	

Summary of Raw Construction Costs					
Mobilization/Demobilization	**Site Preparation & Concrete**	**Pipelines**	**Pump Stations**	**Treatment**	**Total Raw Construction Costs**
$2,682,600	$18,230,928	$12,348,105	$6,800,000	$16,272,094	**$56,333,727**

Construction Cost Subtotal		
Tax on Materials (9%)	**General Contractor Overhead and Profit (15%)**	
$5,070,035	$8,450,059	**$69,853,821**

Total Capital Cost Summary				
Owner's Reserve for Change Orders (15%)	**Engineering Services (Design) (15%)**	**Construction Management (13%)**	**Engineering Services During Construction (12%)**	**Total Project Capital Costs**
$10,478,073	**$10,478,073**	$9,080,997	**$8,382,459**	**$108,273,423**

Item No.	**Description**	**Qty**	**Units**	**Total O&M Costs ($/year)** $/Unit	**Total O&M Cost**	**Notes**	
	Annual Operations and Maintenance Costs						
1.0	**Treatment Costs**						
1.1	Ozone System	1	LS	$84,713	$84,713	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.2	Ultrafiltration System	1	LS	$524,274	$524,274	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.3	Reverse Osmosis System	1	LS	$1,687,240	$1,687,240	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.4	Decarbonator/Air Stripper System	1	LS	$15,000	$15,000	Estimated based on other similar facilities.	
1.5	UV/AOP System	1	LS	$252,065	$252,065	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.6	High Density Slurry Batching and Metering System	1	LS	$12,500	$12,500	Estimated based on other similar facilities.	
1.7	Pump Station 1	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.8	Influent Pumps	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.9	Pump Station 4	1	$/year	$180,365	$180,365	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 60 4 784,195
2.0	**Labor Costs**	3	No. of Staff	$100,000	$300,000	Based on estimate of annual salary for full time staff per year including benefits and overhead	
3.0	**Maintenance**	2%	% of	$56,333,727	$1,126,675	Assume 1% of total capital costs.	
4.0	**Legal/Permitting**	2%	% of	$4,257,983	$85,160	Assume 2% of above O&M costs.	
5.0	**Contingency**	10%	%	$4,257,983	$425,798	Assume 10% of above O&M costs.	
				Annual O&M Costs ($/year)	**$4,768,941**		
				Annual Unit O&M Costs ($/AF)	**$851**	Based on Product Flow (AFY) =	5,601
				Annual Unit O&M Costs ($/1000 gal)	**$2.61**		

Summary of O&M Costs ($)					
Treatment Costs	**Labor Costs**	**Maintenance**	**Legal/Permitting**	**Contingency**	**Total O&M Costs**
$2,831,309	$300,000	$1,126,675	$85,160	$425,798	$4,768,941

Engineers Opinion of Probable Costs
Napa Valley Drought Contingency Plan
Alternative 3 - TWA at NapaSan

Brown AND Caldwell

Date: 10/22/2021
BC Project Number: 154033
Prepared by: Rene Guillen
Reviewed By: Ryan Manocchio

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes
	Direct Project Capital Costs					
1.0	**Mobilization/Demobilization**	**1**	**LS**	**5%**	**$2,248,300**	5% of Raw Costs.
2.0	**Site Preparation & Concrete**				**$18,904,570**	
2.1	Site Clear and Grub	1.5	Acre	$7,760	$11,640	
2.2	Strip Topsoil	7,260	SY	$6.35	$46,101	
2.3	Backfill Haul to Site	7,260	CY	$17.92	$130,099	Assumed 3' over entire site.
2.4	Backfill Placement	7,260	CY	$3.94	$28,604	Assumed 3' over entire site.
2.5	Excavation	3,704	CY	$5.64	$20,890	
2.6	Compaction	3,630	CY	$2.09	$7,587	
2.7	Grading	7,260	SY	$6.77	$49,150	
2.8	Shoring, Sheeting, and Bracing	1	LS	$8,000	$8,000	Engineer's estimate.
2.9	Offhaul Allowance	1	LS	$15,000	$15,000	Engineer's estimate.
2.10	Aggregate Base	2,420	CY	$58.49	$141,546	
2.11	Asphalt	19,602	SF	$2.76	$54,102	Assumes 4" thick asphalt.
2.12	Gravel	711	SY	$9.20	$6,540	
2.13	Site Dewatering Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
2.14	Landscaping Allowance	1	LS	$150,000	$150,000	Engineer's estimate.
2.15	Lighting and Security Allowance	1	LS	$300,000.00	$300,000	Engineer's estimate.
2.16	Utility Connections Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate for water, internet, and sewer connections.
2.17	New Electrical Service Allowance	1	LS	$50,000.00	$50,000	Engineer's estimate.
2.18	Switchgear Slab	200	CY	$645.00	$129,000	Engineer's estimate.
2.19	Transformer Slab	357	CY	$645.00	$230,098	Engineer's estimate.
2.20	Chain Link Fence Around Facility	4,400	LF	$52.94	$232,936	Based on 4,400' that goes around the Project parcel area.
2.21	Process Building	18,200	SF	$500.00	$9,100,000	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space
2.22	Process Building Concrete	1,348	CY	$645.00	$869,556	140' by 130', assume UF, RO, UV AOP, staff facilities, and electrical/control areas are all covered under this space
2.23	Equalization Basin Concrete	1,183	CY	$645.00	$763,011	100' by 65', 12' depth.
2.24	Ozone Area Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for ozone generator, ozone chiller, and other pertinent equipment.
2.25	Ozone Contactors Concrete	183	CY	$645.00	$118,250	60' by 45' total, space for 3 contactors, each 20' by 15', 10' depth.
2.26	LOX Area Concrete	49	CY	$645.00	$31,533	20' by 33', assumed space for LOX tanks, vaporizers, and other pertinent equipment
2.27	BAC Filter Concrete	608	CY	$646.00	$392,768	32' by 102', assumed space for 4 filters, each 20' by 18' (9' depth, assumes 2' of free board). Assumes 6' on either side of each filter and 6' in between filters.
2.28	Decarbonator Concrete	119	CY	$645.00	$76,444	40' by 40', assumed space for decarb/air stripping and all other pertinent equipment including pumps.
2.29	Chlorine Contact Basin Concrete	789	CY	$645.00	$508,642	172' by 28', actual chlorine contactor is 160' X 16' (assumes 2 passes and 8' depth, includes 2' of freeboard). Added 6' on all sides of contactor.
2.30	Piping Allowance	30%	% of	$16,822,094	$5,046,628	30% of Treatment Costs
2.31	Misc. Metals Allowance	1	LS	$60,000	$60,000	Engineer's estimate.
2.32	Coating Allowance	1	LS	$100,000	$100,000	Engineer's estimate.
3.0	**Pipelines**				**$4,188,030**	
3.1	Pipeline 1	17,150	LF	$200.00	$3,430,000	Assumed 17,150' of pipe needed, 12-in diameter.
	Sheeting and Shoring	5%	% of	$3,430,000	$171,500	5% of pipeline costs.
	Potholing	172	LS	$1,200.00	$205,800	Assume 1 pothole per 100 feet, $1,200 per pothole.
3.3	Constructability					
	Pipeline Constructability (along roads)	10%	% of	$3,807,300.00	$380,730	Apply percentage to all pipeline costs to reflect site specific geotechnical complexity or currently unknown conditions that could increase construction costs
4.0	**Pump Stations**				**$5,050,000**	
4.1	Pump Station 1					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$1,200,000	$1,200,000	
	Installation	1	LS	$300,000	$300,000	25% of pump station costs.
4.3	Influent Pumps					Assume 2 pumps, 1 duty and 1 standby. 50 HP each.
	Pumps	2	LS	$20,000	$40,000	
	Installation	1	LS	$10,000	$10,000	25% of pump costs.
4.4	Pump Station 5					Cost includes all pertinent pump station items including pumps.
	Pump Station	1	LS	$2,800,000	$2,800,000	
	Installation	1	LS	$700,000	$700,000	25% of pump costs.
5.0	**Treatment**				**$16,822,094**	
5.1	Ozone System					
	Equipment	1	LS	$2,375,000	$2,375,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$593,750	$593,750	25% of equipment costs.
5.2	Ultrafiltration System					
	Equipment	1	LS	$3,761,150	$3,761,150	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$940,288	$940,288	25% of equipment costs.
5.3	Interprocess Tank (RO Feed Tank)	1	LS	$128,000	$128,000	Assume 64,000 gallon tank. $2 per gallon installed cost.
5.4	Reverse Osmosis System					
	Equipment	1	LS	$3,293,160	$3,293,160	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$823,290	$823,290	25% of equipment costs.
5.5	Decarbonator/Air Stripper System					
	Equipment	1	LS	$357,000	$357,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$89,250	$89,250	25% of equipment costs.

Concrete Item	Value	Unit
Slab	2	ft
Wall	1.5	ft

Area Type	Depth	Unit
Paved - Asphalt	4	inches
Paved - Ag Base	12	inches
Paved - Backfill	12	inches
Unpaved - Gravel	4	inches
Unpaved - Ag Base	12	inches
Unpaved - Backfill	12	inches
Slab on Grade - Ag Base	12	inches
Depth of Compaction	1.5	ft

Site Layout Type	Area	Unit
Estimated Project Parcel Area	1.50	acre
Estimated Project Parcel Area	65,340	ft^2
Unpaved	6,398	ft^2
Structures at Grade	39,340	ft^2
Paved	19,602	ft^2
Acreage-landscaping, lighting	1.50	acre

Structures at Grade	Area	Unit
Process Building	18,200	ft^2
Equalization Basin	6,500	ft^2
Ozone Area	1,600	ft^2
Ozone Contactors	2,700	ft^2
LOX Area	660	ft^2
BAC Filter Area	3,264	ft^2
Decarbonator Area	1,600	ft^2
Chlorine Contact Basin	4,816	ft^2

5.6	UV/AOP System					
	Equipment	1	LS	$1,040,000	$1,040,000	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$260,000	$260,000	25% of equipment costs.
5.7	High Density Lime Slurry Batching and Metering System					
	Equipment	1	LS	$708,965	$708,965	Based on budgetary proposal from manufacturer.
	Installation	1	LS	$177,241	$177,241	25% of equipment costs.
5.8	Purified Water Clearwell	1	LS	$2,275,000	$2,275,000	Based on budgetary proposal from manufacturer.
				Total Raw Construction Costs:	**$47,212,994**	

Summary of Raw Construction Costs

Mobilization/Demobilization	Site Preparation & Concrete	Pipelines	Pump Stations	Treatment	Total Raw Construction Costs
$2,248,300	$18,904,570	$4,188,030	$5,050,000	$16,822,094	**$47,212,994**

Construction Cost Subtotal

Tax on Materials (9%)	General Contractor Overhead and Profit (15%)	
$4,249,169	$7,081,949	**$58,544,113**

Total Capital Cost Summary

Owner's Reserve for Change Orders (15%)	Engineering Services (Design) (15%)	Construction Management (13%)	Engineering Services During Construction (12%)	Total Project Capital Costs
$8,781,617	**$8,781,617**	$7,610,735	**$7,025,294**	**$90,743,375**

Item No.	Description	Qty	Units	Total O&M Costs ($/year) $/Unit	Total O&M Cost	Notes	
	Annual Operations and Maintenance Costs						
1.0	**Treatment Costs**						
1.1	Ozone System	1	LS	$84,713	$84,713	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.2	Ultrafiltration System	1	LS	$524,274	$524,274	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.3	Reverse Osmosis System	1	LS	$1,687,240	$1,687,240	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.4	Decarbonator/Air Stripper System	1	LS	$15,000	$15,000	Estimated based on other similar facilities.	
1.5	UV/AOP System	1	LS	$252,065	$252,065	Based on budgetary proposal provided by manufacturer. Cost accounts for total estimated annual operation costs of these treatment systems including energy costs associated with pumping and chemical usage.	
1.6	High Density Slurry Batching and Metering System	1	LS	$12,500	$12,500	Estimated based on other similar facilities.	
1.7	Pump Station 1	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.9	Influent Pumps	1	$/year	$37,576	$37,576	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 50 1 163,374
1.10	Pump Station 5	1	$/year	$112,728	$112,728	*Operational Hours (hr/yr) =* *Energy Cost ($/kwh) =* *Pump Size (HP) =* *No. Duty Units =* *Annual Energy Use (kwh) =*	4,380 $0.23 75 2 490,122
2.0	**Labor Costs**	4	No. of Staff	$100,000	$400,000	Based on estimate of annual salary for full time staff per year including benefits and overhead	
3.0	**Maintenance**	3%	% of	$47,212,994	$1,416,390	Assume 1% of total capital costs.	
4.0	**Legal/Permitting**	5%	% of	$4,580,062	$229,003	Assume 2% of above O&M costs.	
5.0	**Contingency**	10%	%	$4,580,062	$458,006	Assume 10% of above O&M costs.	
				Annual O&M Costs ($/year)	**$5,267,071**		
				Annual Unit O&M Costs ($/AF)	**$940**	Based on Product Flow (AFY) =	5,601
				Annual Unit O&M Costs ($/1000 gal)	**$2.89**		

Summary of O&M Costs ($)

Treatment Costs	Labor Costs	Maintenance	Legal/Permitting	Contingency	Total O&M Costs
$2,763,672	$400,000	$1,416,390	$229,003	$458,006	$5,267,071

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September 2022

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