2023

Water Shortage Contingency Plan

STANFORD UNIVERSITY WATER RESOURCES AND CIVIL INFRASTRUCTURE
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Definitions

For the purposes of this Water Shortage Contingency Plan (WSCP), the following definitions shall apply:

- **Aesthetic water use:** water consumption for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.
- **Commercial and Institutional water use:** water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as schools, hospitals, clinics, retail establishments, hotels and motels, restaurants, and office buildings.
- **Conservation:** those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.
- **Customer:** any person, company, or organization using water supplied by the Stanford University water system.
- **Domestic water use:** water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.
- **Even number address:** street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.
- **Industrial water use:** the use of water in processes designed to convert materials of lower value into forms having greater usability and value.
- **Landscape irrigation use:** water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, rights-of-way, and medians.
- **Non-essential water use:** water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:
  a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this WSCP
  b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle
  c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas
  d) use of water to wash down buildings or structures for purposes other than immediate fire protection
  e) flushing gutters or permitting water to run or accumulate in any gutter or street
  f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools
  g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life
  h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and use of water from hydrants for construction purposes or any other purposes other than firefighting or hauling water for a domestic water use
- **Non-functional turf:** turf that is solely ornamental and not regularly used for human recreational purposes or for community events. Non-functional turf does not include sports fields and turf that is regularly used for human recreational purposes.
- **Odd numbered address:** street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

- **Senate Bill 552**: Passed and signed by Governor Gavin Newsom in September 2021, it states that State and local governments will share the responsibility in preparing and acting in the case of a water shortage event. These new requirements are expected to improve the ability of Californians to manage future droughts and help prevent catastrophic impacts on drinking water for communities vulnerable to impacts of climate change. The bill outlines the new requirements for small water suppliers, county governments, the California Department of Water Resources (DWR), and the State Water Resources Control Board (SWRCB) to implement more proactive drought planning and be better prepared for future water shortage events or dry years.

Abbreviations and Acronyms

- BAWSCA- Bay Area Water Supply and Conservation Agency (SFPUC Wholesale Customers)
- DDW- Division of Drinking Water (California State Water Resources Control Board)
- CEF- Central Energy Facility
- DAPER- Stanford Department of Athletics, Physical Education and Recreation
- DRA- Drought Risk Assessment
- DWR- Department of Water Resources
- EOC- Emergency Operation Center (Stanford University)
- ERP- Emergency Response Plan
- FEMA- Federal Emergency Management Agency
- FSH- Faculty Staff Housing
- FY- Fiscal Year (July – June)
- GSA- Groundwater Sustainability Agency
- GSB- Graduate School of Business
- ISG- Individual Supply Guarantee
- lake water- non-potable irrigation
- LBRE- Land, Buildings, and Real Estate
- MG- million gallons
- MGD- million gallons per day
- R&DE- Residential and Dining Enterprises
- SCRL- Stanford Campus Residential Leaseholders
- SFPUC- San Francisco Public Utilities Commission
- SOP- Standard Operating Procedure
- State OES- California Office of Emergency Services
- SWRCB- State Water Resources Control Board
- UWMP- Urban Water Management Plan
- WPS- Water Planning & Stewardship
- WRCI- Water Resources and Civil Infrastructure
- WSCP- Water shortage contingency plan

Introduction and Executive Summary

As required by and in accordance with Senate Bill 552, this Water Shortage Contingency Plan (WSCP) has been prepared to document guidelines and a variety of potential actions that could be taken in the event of a short-term, long-term, or emergency water shortage at Stanford University (Stanford) to reduce demands and further ensure supply reliability at various levels of water shortage. As in previous droughts, each specific event will require a tailored response with some or all the recommended actions. Evaluation and a recommended approach will be given to Land, Buildings, and Real Estate (LBRE) management by the Water Resources and Civil Infrastructure (WRCI) group. The final approved actions and associated directives will be issued by WRCI directly to customers and in some cases through communications from the university. The WSCP is a living document and can be updated as needed when operations or situations change. Changes to the WSCP will be made as needed, and the document will be maintained by the Water Planning & Stewardship (WPS) team within WRCI.

The WSCP includes the stages of response to a water shortage caused by drought or by supply interruptions resulting from infrastructure failure, regulatory mandate, or catastrophic human-caused or natural events. The primary objective of the WSCP is to ensure that Stanford has the necessary resources and management responses needed to protect health and human safety, minimize economic and research disruption, and preserve environmental and community assets during water supply shortages and interruptions. The WSCP also includes procedures to conduct assessment of water supply and demand to determine whether water shortage conditions are likely to exist in the forthcoming year, and to proactively begin the process of implementing WSCP stages of action, as appropriate.

In the case of domestic water system failure or water quality issues requiring immediate response and action, refer to the December 2022 Emergency Response Plan (ERP) (*contact the Stanford Water Planning & Stewardship Associate Director for the latest version*).

Practically, this WSCP guides WRCI to ask its customers and user groups for a shared contribution towards meeting water reduction goals during periods of water shortage. It further directs WRCI to focus the campus' water conservation efforts on reducing discretionary water uses, such as outdoor irrigation, while attempting to minimize economic and other impacts to its residential and campus customers.

To conserve the available water supply and protect the integrity of Stanford's supply facilities, with regard for domestic water use, sanitation, and fire protection, to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, WRCI establishes this WSCP for consideration in water shortages. The WSCP focuses on the reduction of domestic water, but the shortage response actions could also apply to lake water under extreme water shortages.

Water uses that are requested to be reduced or halted under this WSCP are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water, and additional actions may be taken as defined in the section Compliance and Enforcement.

This WSCP is applicable to a range of water shortage conditions mainly affecting Stanford's long term (i.e., weeks to months) water supply volume or system delivery capability impairment, including but not limited to:

- Natural disaster (e.g., extensive flood, earthquake, fire, wind damage);
- Impacted distribution system infrastructure;
- Water quality issues with San Francisco Public Utilities Commission (SFPUC) supply or Stanford's distribution system;
- Regulatory-imposed shortage restrictions; and
- Drought conditions resulting in water shortages or mandatory reductions.

In case of domestic water system failure or water quality issues requiring immediate response and action, refer to the December 2022 ERP (*contact the Stanford Water Planning & Stewardship Associate Director for the latest version*). Examples of short-term emergencies not considered as part of this WSCP include:

- Main break or other distribution system failure;
- SFPUC water treatment plant failure, not impacting long-term water quality and compliance at Stanford; Stanford could supply domestic water to its customers from storage or wells.

Water Supply Reliability Analysis

Stanford relies on the SFPUC Regional Water System (RWS) for its domestic water supply. In accordance with the SFPUC's perpetual obligation to Stanford's Supply Assurance, Stanford has an Individual Supply Guarantee (ISG) of 3.03 million gallons per day (MGD), or 1,105.95 million gallons (MG) per year. Information regarding the RWS can be found in Attachment A.

The SFPUC has committed to, among other things, meeting the retail and wholesale customer's average annual water demand during non-drought years and meeting dry-year delivery needs while limiting rationing to a maximum 20% system-wide reduction in water service during extended drought. However, several potential constraints have been identified on the future supply availability of the SFPUC RWS. One of the key factors is the adoption of the 2018 Bay-Delta Plan Amendment. If the Bay-Delta Plan Amendment is implemented, the SFPUC is anticipated to have sufficient supplies to meet the project water demand in normal years but would experience significant supply shortages in single dry years or multiple dry years.

Based on the current allocation methodology (Attachment B) and SFPUC dry year cutbacks, Stanford is anticipated to experience up to 7.5 MG (1%) supply shortfall in single dry years by 2025. However, numerous uncertainties remain in the implementation of the Bay-Delta Plan Amendment and the allocation of the available supply between the wholesale customers. The actual supply reliability and the frequency of supply shortfalls for Stanford cannot currently be known. WRCI has placed high priority on working with SFPUC and the Bay Area Water Supply and Conservation Agency (BAWSCA) to better refine the estimates of RWS supply reliability and may revise this WSCP accordingly. The SFPUC and BAWSCA have also been taking various actions to improve the reliability of the RWS supply, including implementing several dry year water supply projects, exploring alternative water supplies, and implementing long-term reliable Water Supply Strategy recommendations.

In 2014, 2021, and 2023 WRCI and Maddaus Water Management collaborated to develop a drought model to review the reliability of supplies under numerous scenarios. The drought model is explained in Attachment B. The American Water Works Association manual *M60 Drought Preparedness and Response* for (AWWA, 2011), can serve as an additional, helpful resource to this Plan.

Annual Water Supply and Demand Assessment Procedures

WRCI will conduct an Annual Supply-Demand Assessment (Annual Assessment) to identify the likelihood of a water shortage condition in the following year. Because Stanford sources its domestic water supply from the SFPUC RWS, the evaluation of supplies for a particular year will be based on information provided by the SFPUC or BAWSCA. The procedure used by BAWSCA in conducting and Annual Assessment is outlined in Attachment A.

Initial water shortage declaration and actions by SFPUC and/or State Water Resources Control Board (SWRCB) will be the main triggers to review stages of action. The water shortage stage determination and declaration will be recommended by WRCI to LBRE leadership. Under normal water supply conditions (within stage 0), the "Normal" Stage is active, meaning that routine water conservation and best practices are being implemented. When water supply conditions are restricted, either for voluntary or mandatory cutbacks above 10%, one of six (6) stages will be in effect, depending on the severity of water supply shortages and requested cutbacks.

The decision to change the Water Shortage Stage will be recommended by WRCI to LBRE leadership and a notice about the situation will be broadly communicated to the Stanford community through various media sources (electronic, newspapers, etc.). Communication procedures are outlined in the Communication Protocols section.

Water Shortage Levels

WRCI will implement an appropriate stage based on current water conditions. Each stage has a list of actions that will be considered but are not required for that stage. Higher stages will be implemented as shortages continue and/or if customer response does not bring about necessary water savings. Restrictions and potential penalties will build on each other as higher stages are implemented. Shortage Level 6 will typically apply to address a more immediate crisis such as a major infrastructure failure or disaster, and water supply would be available only to meet health and safety needs.

The WRCI Senior Director, or designee, monitors water supply and/or demand conditions regularly and will determine when conditions warrant initiation or termination of each stage of the WSCP when the specified "triggers" are reached.

The triggering and termination criteria described in subsequent sections of this document are based on: water supply conditions from the SFPUC; water supply conditions from Valley Water; groundwater well elevations and/or well production capacities relative to system demands; statewide drought declarations from the SWRCB or Governor; projected drought conditions on the DWR California Water Watch Tool (https://cww.water.ca.gov); county, State or federal Drought Emergency Orders; and emergencies such as fire, earthquake, etc. resulting in potential water outages.

WRCI has defined six different shortage stages as described in Table 1. Six of the stages are in response to water shortage conditions. Stages will be defined based on the calculated supply-demand ratios for the service area. Shortage response actions include a broad range of customer-class or water use-specific demand reduction initiatives, supply augmentation responses, system infrastructure and operations responses, and increasingly stringent water use prohibitions.

Table 1- Magnitude of Water Shortage

Shortage Stage	Domestic Water Shortage	Water Shortage Condition
0	0% (Normal)	WRCI proceeds with planned water efficiency best practices to support consumer demand reduction in line with state-mandated requirements and local goals for water supply reliability. Permanent water waste prohibitions are in place as adopted by the state and Valley Water.
1	Up to 10%	**Any short- or long-term water system operational issues identified by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to a 10% cutback in demand.** For long-term supply shortage conditions, evidence and forecasts suggest an abnormally dry water year in the SFPUC watersheds and service area or a call to action by SFPUC and/or the SWRCB. Less than full storage is anticipated in all/most reservoirs. Due to drought or other supply reduction of up to 10%, WRCI will notify the campus community that a demand reduction of up to 10% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 1 measures identified in this WSCP.
2	20%	**For long-term, evidence of severe drought conditions forecasted by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to a 11-20% cutback in demand.** Due to drought or other supply reduction of 11-20%, WRCI will notify the campus community that a demand reduction of up to 20% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 2 measures identified in this WSCP.

Shortage Stage	Domestic Water Shortage	Water Shortage Condition
3	30%	**Evidence of extreme drought conditions are forecasted by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to a 21-30% cutback in demand.** Due to extreme drought or other supply reduction of up to 21-30%, WRCI will notify the campus community that a demand reduction of up to 30% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 3 measures identified in this WSCP.
4	40%	**Evidence of extreme drought conditions are forecasted by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to a 31-40% cutback in demand.** Due to extreme drought or other supply reduction of up to 31-40%, WRCI will notify the campus community that a demand reduction of up to 40% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 4 measures identified in this WSCP.
5	50%	**Evidence of extreme water shortage conditions are forecasted by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to a 41-50% cutback in demand.** Due to extreme drought or other supply reduction of up to 41-50%, WRCI will notify the campus community that a demand reduction of up to 50% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 5 measures identified in this WSCP.

Shortage Stage	Domestic Water Shortage	Water Shortage Condition
6	>50%	**Evidence of disastrous drought or supply conditions are forecasted by SFPUC, SWRCB, California Governor, Valley Water, or Stanford's management to warrant calling for this stage and requiring the need to increase to over 50% cutback in demand.** Due to disastrous drought or other supply reduction of over 50%, WRCI will notify the campus community that a demand reduction in excess of 50% is necessary to make more efficient use of water and respond to existing water conditions. WRCI will evaluate and direct implementation of the Stage 6 measures identified in this WSCP.

Shortage Response Actions and Demand Reduction Methods

This section describes the response actions WRCI could take to address the shortages associated with each of the six stages explained in Table 1. A list of the specific demand reduction actions can be found in Table 2. Details of the operation and supply augmentation actions are discussed in the following subsections.

A focus of WRCI's planned demand reduction measure is to increase campus outreach and keep user groups informed of the water shortage emergency actions they can take to reduce consumption. The outreach efforts that WRCI will implement to respond to a water shortage are described in Communication Protocols.

Table 2- Demand Reduction Actions, Operational Actions, and Supply Augmentation

Drought Stage	Overall Impact	Demand Reduction Actions	Operation Actions	Supply Augmentation Action
0	<10%	1. Hoses must be equipped with a shut-off valve for washing vehicles, sidewalks, walkways, or buildings. 2. Potable water shall not be applied in any manner to any driveway, sidewalk, or other hard surface except when necessary to address immediate health or safety concerns. 3. Potable water shall not be used to water outdoor landscapes in a manner that causes runoff onto non-irrigated areas, walkways, roadways, parking lots, or other hard surfaces. 4. Potable water cannot be applied to outdoor landscapes during and up to 48 hours after measurable rainfall. 5. Removing, replacing, altering, or damaging any water meter is prohibited. 6. Other measures as may be recommended by WRCI.	1. Regular operation planning exercises. 2. Annual supply demand assessment.	
1	<10%	1. Community outreach and messaging (expand campus information campaign). 2. Encourage customers to wash only full loads when washing dishes or clothes. 3. Encourage customers to use pool covers to minimize evaporation. 4. Fix leaks or faulty sprinklers promptly/within 3 day(s) after notification. 5. Watering or irrigation of vegetated areas prohibited between 7 am and 7 pm except	1. Expanded frequency/scope of regular operations planning exercises to consider drought risks/uncertainties more explicitly. 2. Continued monitoring of long-lead drought indices. 3. Increase campus outreach, including publishing water conservation information on the Stanford Water Resources website and promoting	

Drought Stage	Overall Impact	Demand Reduction Actions	Operation Actions	Supply Augmentation Action
		by use of a handheld device, hose equipped with an automatic shutoff device, for adjusting or repairing an irrigation system for short periods of time, or to ensure continued health of trees, perennial non-turf plantings and food gardens. 6. WRCI may implement other prohibited water uses as determined, after notice to customers.	conservation through bill inserts and direct emails. 4. Expand outreach for existing water conservation program.	
2	<20%	1. Continue with actions and measures from Stage 1 except where superseded by more stringent requirements. 2. All non-essential landscape irrigation for commercial and industrial use should cease. 3. Fix leaks or faulty sprinklers within 2 day(s) after notification. 4. Irrigation with potable water is limited to 3 days per week. Plant containers, trees, shrubs, and vegetable gardens may be watered for additional days using only drip irrigation or hand watering. 5. Pools and Spas - Require covers for all pools and spas when not in use. 6. WRCI may implement other prohibited water uses as determined, after notice to customers.	1. Increase campus outreach, and distribute water bill inserts regarding landscape irrigations restrictions. 2. Expand outreach for existing water conservation programs.	
3	<30%	1. Continue with actions and measures from Stage 2 except where superseded by more stringed requirements. 2. Decorative water features that use potable water must be drained and kept dry.	1. Increase campus outreach, including penalties for non-compliance. 2. Consider implementation of a drought rate structure and/or rate surcharge. 3. Consider water waste patrols.	

Drought Stage	Overall Impact	Demand Reduction Actions	Operation Actions	Supply Augmentation Action
		3. Require a construction water use plan be submitted to WRCI that addresses how impacts to existing water uses will be mitigated (such as dust control). Utilizing recycled water or non-potable water is an option. 4. Irrigation with potable water is limited to 2 days per week. Plant containers, trees, shrubs, and vegetable gardens may be watered for additional days using only drip irrigation or hand watering. 5. WRCI may implement other prohibited water uses as determined, after notice to customers.		
4	<40%	1. Continue with actions and measures from Stage 3 except where superseded by more stringed requirements. 2. Existing pools shall not be emptied and refilled using potable water unless required for public health and safety purposes. 3. No new pools will be allowed to be filled. 4. Irrigation with potable water is limited to 1 day per week. Plant containers, trees, shrubs, and vegetable gardens may be watered for additional days using only drip irrigation or hand watering. 5. WRCI may reduce water allocations in all categories to meet the available water supply.	1. WRCI may modify the operation of Stanford's water systems to reduce water use, including reduction of water main flushing and reduction of distribution systems pressures. 2. WRCI may establish water budgets set at a certain percentage reduction from the amount of use on the customer's premises during the corresponding billing period during the prior calendar year (or other baseline year). Waivers or reductions may be granted to individual customers as deemed appropriate by WRCI. No customer shall be required to reduce water consumption below the minimum amount required for health and safety, as determined by WRCI.	1. Consider groundwater blending.

Drought Stage	Overall Impact	Demand Reduction Actions	Operation Actions	Supply Augmentation Action
5	<50%	1. Continue with actions and measures from Stage 4 except where superseded by more stringed requirements. 2. Moratorium or net zero demand on new connections. 3. WRCI may shut off all non-essential water services. All irrigation is prohibited, including parks, school grounds, recreation, and sports fields. 4. Water for commercial, manufacturing, or processing purposes shall be reduced in volume by up to 50% or exceeded if necessary for public health and safety purposes. 5. Water use for public health and safety purposes only. Customer rationing may be implemented. 6. WRCI may implement other prohibited water uses as determined, after notice to customers.	1. Increase water budget reduction requirements.	1. Consider groundwater blending.
6	>50%	1. Continue with actions and measures from Stage 5 except where superseded by more stringed requirements. 2. WRCI may implement other prohibited water uses as determined, after notice to customers.	1. Implement other short-term emergency actions.	1. Consider groundwater blending.

Special Water Feature Distinction

WRCI distinguishes between "decorative water features" such as ponds, lakes, and fountains that are artificially supplied with water and "recreational water features" such as swimming pools and spas. Prohibitions on water use for decorative water features are listed separately from those for recreational water features (see Table 2).

Decorative water features do not include recreational water features, such as swimming pools and spas as defined in subdivision (a) of Section 115921 of the Health and Safety Code. Aesthetic water use is water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens. This water is not considered essential. Similarly, water that is used in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life is also non-essential.

Table 3- Water Feature Artificially Supplied with Water

Water Feature	Water Source
Fountains	Potable
Lake Lagunita	Non-potable

Supply Augmentation

Stanford has groundwater production wells that can serve as a backup domestic water supply (see Table 4). Long term backup domestic water supply is available from three of the wells located on Stanford property (Well 1, Well 2, and Well 3R) that comply with domestic water quality standards. Stanford has two other wells. Well 5 is a "standby" well due to high manganese and can be used for no more than 5 consecutive days, or a total of 15 calendar days per year, unless an exception or longer emergency use is granted by the SWRCB Division of Drinking Water (SWRCB-DDW). Well 4R is currently only used for non-potable uses in the lake water system due to elevated nitrate concentrations. All wells are tested routinely for all required domestic water quality parameters. Before using the wells, WRCI will coordinate with campus water users and confirm with SWRCB-DDW that the well water operations and monitoring program are compliant and that the wells can be tied into Stanford's domestic water distribution system.

Using well water to supply the domestic water system could reduce the available water supply to the non-potable lake water system. Especially during dry years, reducing well water as a source for the lake water system could reduce the amount of non-potable irrigation water available to campus. Additionally, the change in domestic water quality could in some cases increase the demand for domestic water by facilities with sensitive processes and onsite water treatment (e.g., the Central Energy Facility and lab buildings). The communication plan when switching from SFPUC to well production (or blending) is outlined in the ERP. Additionally, sensitive users and laboratories can sign up for water quality notices that are frequently sent by email to communicate changes in water quality based on source water shifting by SFPUC or locally within Stanford's water system. These notices would also be used to communicate in the event of planned groundwater blending.

Table 4- Wells Production Potential

Name	Capacity (gpm)	Capacity (mgd)	Status
Well 1	500	0.72*	Active
Well 2	500	0.72	Active
Well 3R	1,200	1.73	Active
Well 4R	400	0.58	Inactive
Well 5	500**	0.03**	Standby
Total	**3,100*** **		

*Normal well use is about 0.3 mgd
** Restricted to 15 days per year
*** Actual total well capacity will be less than the total indicated. Simultaneous pumping of wells will affect the individual well pumping rates. Wells are also periodically taken out of service for maintenance.

Operational Changes

This WSCP lists the operational changes that WRCI could implement during each shortage stage including to: (1) carefully flushing water mains, only to maintain water quality, (2) reducing the water age by limiting operation of reservoirs on campus to the minimum needed for fire flows, and (3) developing water budgets.

Resiliency and Emergency Response

WRCI updates its ERP at least annually to ensure restoration of water service for essential use if a catastrophic supply interruption (e.g., power outage, earthquake, or other non-dry period related emergency), were to temporarily interrupt water supply. The ERP is made available to WRCI and LBRE staff, and identifies actions to be taken if there is a catastrophic supply interruption. Stanford WRCI staff responsible for water distribution, treatment, and monitoring have established the ERP to guide assessment, prioritization, and repair of Stanford's water facilities that could be potentially damaged during such a disaster.

Catastrophic supply interruptions are considered in WRCI's determination of water supply shortages. Specific water shortage levels are not directly tied to supply interruptions as the nature of the interruption and the availability of alternative supplies can mitigate any shortage level experienced by Stanford water customers. To the extent that supply interruptions contribute toward the total Stanford water system shortage, the response actions associated with the determined water shortage level from this WSCP will apply.

Interaction with other Agencies and Mutual Aid

Stanford is a wholesale customer of the SFPUC and a member of BAWSCA. Stanford is located within the Santa Clara Subbasin for which the Santa Clara Valley Water District (Valley Water) is the Groundwater Sustainability Agency (GSA). WRCI actively engages with SFPUC, BAWSCA, Valley Water, and the water agencies in the Bay Area that are also members of BAWSCA and retailers of Valley Water.

Response to a catastrophic interruption of supply is handled through a series of interconnected plans. All Disaster or Act of War Plans, from the state to local levels, use the Federal Civil Defense and Emergency Planning systems as a model, with additions that take into consideration any unique conditions or situations that may exist within their jurisdictions.

At the national level, the Federal Emergency Management Agency (FEMA) controls all functions of Civil Defense or Emergency Planning for the Federal Government. FEMA will not assume control of an emergency until the President declares a State of Emergency or an Act of War occurs. At that point, FEMA will assume control through the State of California Office of Emergency Services (State OES) and will make resources available.

At the state level, the State OES will manage response to any disaster within the state and make its resources available after a State of Disaster has been declared by the governor. The State OES further controls the Master Mutual Aid Agreement that can also be used in a local disaster (Stanford is a member of California's Water Agency Response Network, Region 2, a mutual aid system for water utilities, in accordance with State requirements).

At the county level, the Santa Clara County OES will manage response to any disaster within the unincorporated areas of the County within which Stanford is located. It will coordinate mutual aid within the County and act as an intermediary between local governments or utilities and the State mutual aid office.

On the campus level, WRCI will respond to all emergencies with the aid of its ERP. The Water Incident Commander may declare an emergency at which time representatives of all campus departments will report to the Emergency Operations Center.

As a part of emergency response and resiliency, Stanford's water system has interties with the City of Palo Alto as summarized in Table 5. Additional information on interties is provided in the ERP.

Table 5- Interties with Other Agencies

Name	Number	Diameter (inches)
Roth Way	1	8
Sandhill	1	8

Seismic Risk Assessment

The Bay Area has multiple major earthquake faults, including the San Andreas Fault, that has a predicted 62% probability of at least one magnitude 6.7 or greater earthquakes between 2003 and 2032. If a major earthquake were to occur, it has the potential to damage key regional water aqueducts and disrupt imported water supplies.

Temporary impairment of the domestic water supply may not warrant activating a stage (beyond "Normal") of the WSCP. Stanford has a total of 8 MG of domestic water storage capacity in two domestic water reservoirs. The reservoirs are mainly constructed underground and are supported by the surrounding ground, making them more resistant to seismic events. A third reservoir with an additional

1.5 MG of capacity is located on campus in the faculty staff housing area (also partially underground) but is only operated seasonally (typically removed from operation fall through spring for water quality and water age reasons). The appropriate stage of action, beyond normal operations, will be determined based on the severity and projected duration of the shortage. For example, an emergency condition where more than 50% of the supply is unavailable may warrant an alert for Stage 5 – Water Emergency. This determination will be recommended to LBRE leadership by WRCI.

Depending on the conditions during a water shortage event, WRCI will determine the appropriate response and if a shortage stage is invoked. If outreach is needed to the community, various methods of transmitting the message are available. The options for outreach methods are listed in Communication Protocols. WRCI will notify customers when the water supply conditions no longer warrant water reduction.

Shortage Response Action Effectiveness

To evaluate and ensure that effective actions will be taken with the proper level of intensity, WRCI can review the Water Shortage Model, an excel based tool developed by Maddaus Water Management. The model calculates domestic water demands, shortages, and anticipated savings by implementing each stage of action. Further explanation of the model is provided in Attachment B.

In addition to the modeling, WRCI staff will continue to review monthly water use consumption data to ensure that each of the user groups are participating in necessary action to reduce water use. WRCI can closely monitor water usage via its approximately 2,000 domestic and lake water meters located throughout the campus. Domestic water use in academic buildings and support facilities is metered separately from domestic water used for landscaping. Approximately 85% of campus grounds are irrigated with non-potable (lake) water. A map highlighting areas irrigated by domestic and lake water can be found in Attachment C. Since most of the campus landscaping is not irrigated with domestic water, when domestic water reductions are mandated, the Stanford campus has limited savings opportunities outdoors. WRCI will; however, focus on the remaining landscape that irrigates with domestic water. Indoor domestic water reductions will also need to be implemented.

Baseline Water Use Profile

This section provides a general overview of how domestic and non-potable (lake water) irrigation are used by the various campus groups, sometimes referred to as “user groups”. The major campus user groups are: Academic Research and Administrative Support, School of Medicine (SOM), Residential and Dining Enterprises (R&DE), Faculty and Staff Housing (FSH), Department of Athletics (Athletics or DAPER), and the Central Energy Facility (CEF). The groups that manage these campus areas have significant roles and responsibilities in drought response implementation based on their detailed understanding of their facilities, landscapes, operations, and maintenance. These groups will take actions locally to reduce water use, identifying additional opportunities to conserve, and monitoring efficiency initiatives within their purview. Water se is also categorized by type of use, as summarized in Table 6.

Table 6- Demands for Potable and Non-Potable Water- Actual

			Actual Totals (MG)	
Use Type	**Description**	**Level of Treatment**	**2019**[1]	**2022**[1]
Commercial		Drinking Water	0.37	0.65
Flushing		Drinking Water	8.14	22.18
Industrial		Drinking Water	47.05	49.37
Institutional/Government		Drinking Water	118.72	86.29
Landscape Irrigation	Dedicated irrigation meters only	Drinking Water	43.87	41.18
Multi-family Residential	5+ dwelling units	Drinking Water	160.55	194.07
Single-family Residential	1-4 dwelling units	Drinking Water	123.99	122.73
Non-Revenue Water		Drinking Water[2] Non-Potable[3]	18.95 12.97	16.77 3.76
Construction		Non-Potable	1.37	1.62
Flushing		Non-Potable	7.49	0.20
Irrigation		Non-Potable	308.99	370.63
Lake Lagunita		Non-Potable	31.89	-
Other Outdoor		Non-Potable	6.24	7.57
TOTAL			**858.68**	**896.47**

Notes:

1. Water consumption by customer class is presented in BAWSCA Year (July – June)
2. Non-revenue water (loses) for the domestic water system are calculated as the difference between total customer category use and SFPUC invoices.
3. Non-revenue water (loses) for the lake water system are calculated as the difference between lake water production and consumption values.

Figure 1 and Figure 2 present the breakdown of water use by user group for both domestic and lake water sources, respectively. Campus maps illustrating key responsible management groups are shown in Attachment D. Stanford's lake water supply is the main source of irrigation water for the university, including athletic fields, the golf course, and campus landscaping.

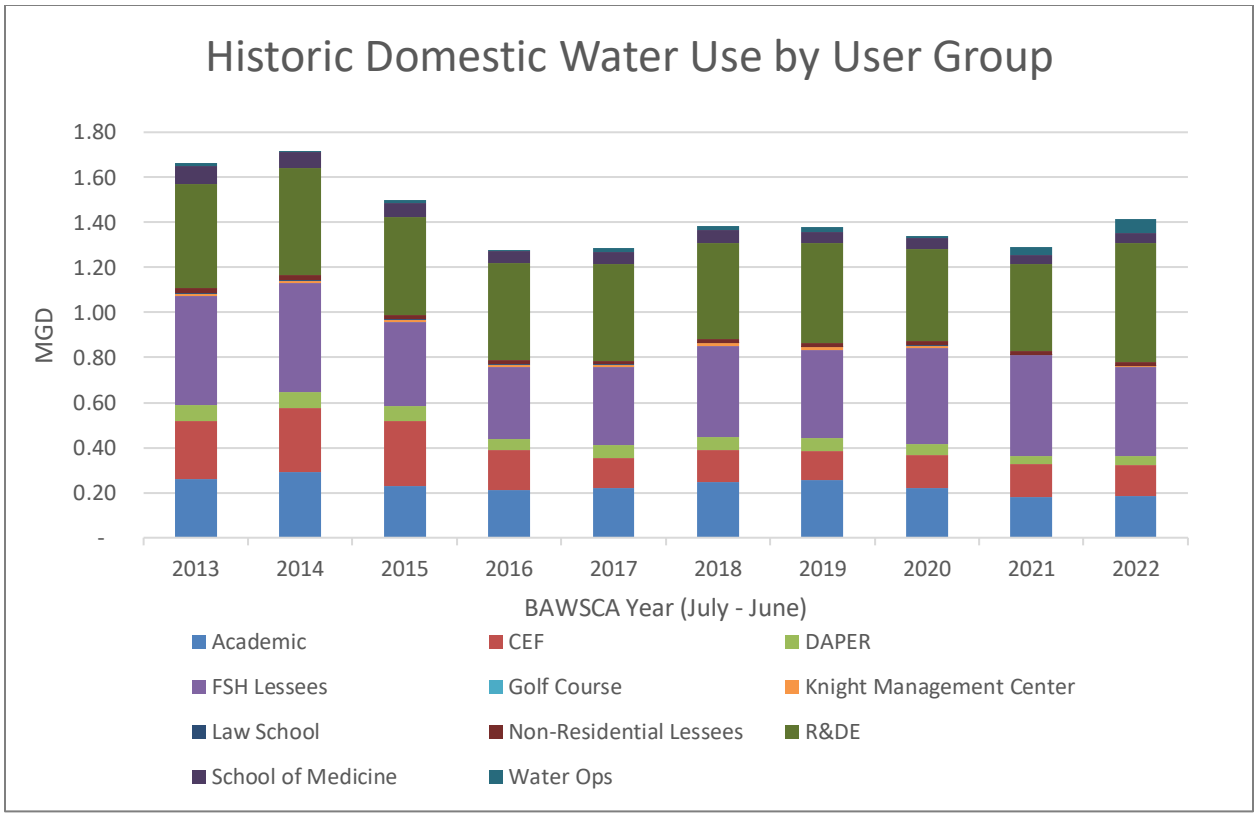


Figure 1- Historic Domestic Water Consumption by User Group

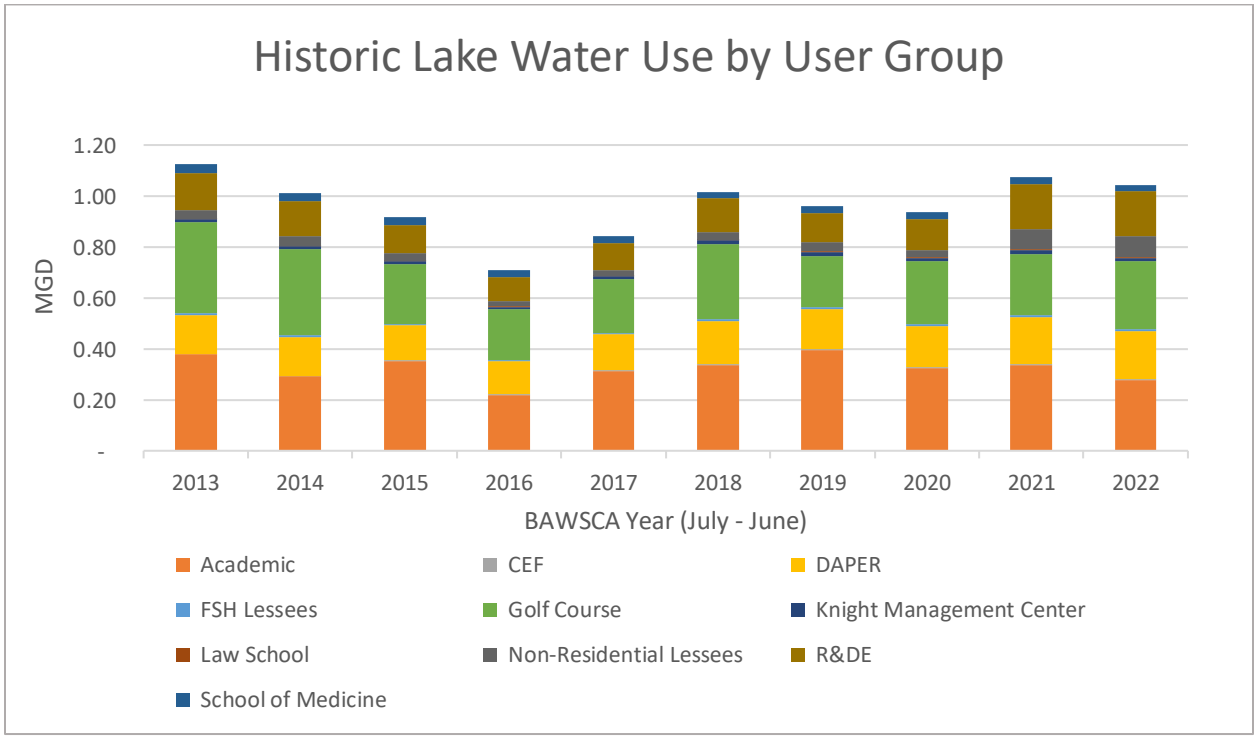


Figure 2- Historic Lake Water Consumption by User Group

Communication Protocols

The WPS team falls withing the WRCI group. Most customer communications originate from the WPS team but can be guided given direction by the Senior Director and LBRE leadership.

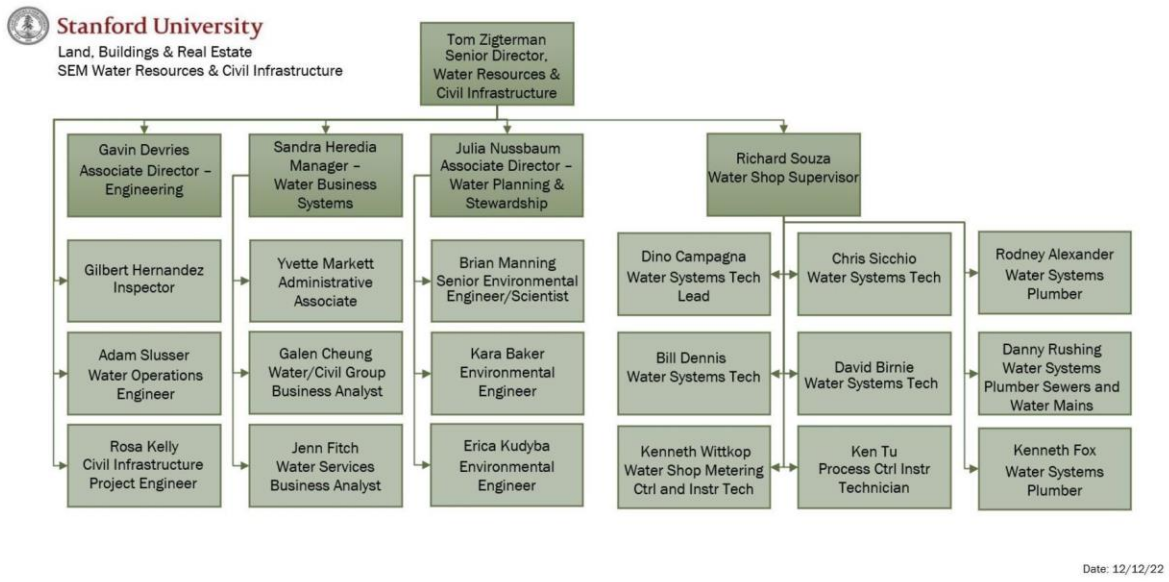


Figure 3- Internal WRCI Staff

Each stage of the WSCP is implemented following discussions within WRCI following the determination that either the SFPUC or another governing authority has required a voluntary or mandatory reduction in water use due to a water supply shortage or emergency, or local conditions impacting the quantity or quality of Stanford's water supply warrant the need for a reduction in water use.

WRCI will regularly provide the campus community and user groups with information about the WSCP, including information about the conditions under which each stage of the WSCP is to be initiated or terminated and the drought response measures to be implemented in each stage, including but not limited to demand reduction actions, operational actions, and supply augmentation actions. General outreach will occur for the entire campus, but targeted involvement and participation from campus user groups is necessary.

The WPS group routinely communicates with customers via monthly bill inserts, website updates, the WaterSmart dashboard, and direct emails. For user group customers, quarterly or monthly check-ins are held, and monthly water use consumption reports are shared. For Stage 2 and beyond, additional outreach will be issued to update the community on current water conditions and encourage campus participation to reduce water use.

The outline below summarizes the various methods of communicating with customers.

1. WRCI staff organization with direct communication with customers (see Figure 3).
2. Media Outreach
    a. **Website -** webpages dedicated to monthly updates about drought, regulatory and news updates, call for action, drought water conservation measures, water supply conditions, water efficiency rebate program, information for reporting leaks and water waste.
        i. https://suwater.stanford.edu/drought
        ii. https://suwater.stanford.edu/watersupplyconditions
        iii. https://suwater.stanford.edu/efficiency-overview
    b. **Electronic Newsletters** – drought updates, articles, information for reporting leaks and water waste.
        i. **Stanford Report**
        ii. **Sustainable Stanford Newsletter**
        iii. **From the Ground Up (Building Manager and Buildings & Grounds Maintenance [BGM] Newsletter)**
3. Water use and reduction goals and tracking by campus residential lot size categories (additionally water use by different lot sizes in the single-family home meters can be tracked). Reduction goals, drought updates and information sent monthly through residential bill inserts.
4. Campus group meetings: BGM, RD&E, SOM, Athletics, Golf Course, and Stanford Campus Residential Leaseholders (SCRL).
5. Monthly report cards (example in Attachment E) to each major campus group about their metered domestic and non-potable irrigation (lake water) use, indoors, outdoors: BGM, SOM, RD&E, Athletics, SCRL, Law School, Carnegie Institute, Graduate School of Business (GSB).
6. WaterSmart's Group Messenger feature to alert specific customers or groups of customers about high-water use, drought updates, or other concerns.
7. Door hangers to alert residents of runoff or other excessive water use. WRCI interns and staff performed site inspections to identify and have excessive irrigation runoff corrected.
8. Direct email communication for SCRL via WaterSmart.
9. Campaigns (partnership with Office of Sustainability – MyCardinal Green, Sustainable Stanford newsletter and website, posters/fliers in student housing and dining halls).
10. Drought Implementation Plan with specific drought conservation measures.

Compliance and Enforcement

WRCI has found customer outreach, communication, and responding to water waste reports submitted through the (650) 723-2281 service request system to be effective methods for enforcing water use prohibitions and restrictions. WRCI reviews reports of potential water waste and violation of prohibitions submitted through the service request system. If a report contains sufficient information and reflects restricted water use, WRCI issues a written notice to the water account holder, property owner, and occupant. If reports of waste continue, WRCI staff will call or visit the site to try to verify that there is waste. If water waste is verified and continues, WRCI staff will issue additional warning letters to the account holder. Account holders that receive multiple warnings of verified water waste may be subject to additional action.

In the event of a severe or extended water shortage, excess use penalties may be implemented. However, Stanford does not currently issue penalties for water waste practices. It is expected that in the event of future mandatory rationing from the SFPUC, Stanford may respond by setting excess use charges to discourage use in excess of health and safety needs.

Implementation Authorities

WRCI can declare and rescind a Water Shortage Emergency based on water supply conditions as described under the WSCP shortage levels. The WRCI Senior Director, or designee, will provide an evaluation and recommended approach to LBRE leadership. The approved declaration and associated directives will be issued by WPS or Stanford leadership if implementation is necessary to protect public health, safety, and welfare. The WRCI Senior Director, or designee, will initiate or terminate drought or other water supply emergency response measures as described in this WSCP through consultation with LBRE leadership. The contact information for the WRCI Senior Director is: (650) 619-6142 (cell) and twz@stanford.edu.

Financial Consequences of Water Shortage

Since the domestic water service center largely relies on revenue based on per unit volume of water consumed, WRCI would experience a reduction in revenue upon implementation of water conservation measure pursuant to the WSCP. There may be additional expenses due to increased campus outreach, emergency water transfers, groundwater treatment, additional charges from SFPUC, and impacts to equipment from the change in water quality due to groundwater blending.

Due to the Federal requirement that Stanford service centers revenue and expenses must fall within +/- 5% of each other, WRCI may analyze their revenue and determine, in coordination with LBRE Finance, that raising rates per volume of water is necessary to compensate for the expected revenue reduction cause by conservation. The implementation of a monthly service charge on domestic and lake water meters beginning in September 2022 will help to buffer this potential shortfall since some revenue is now fixed.

Monitoring and Reporting

Water demands are monitored frequently during emergency water shortages to enable WRCI to effectively manage the balance between supply and demand. WRCI plans to increase the frequency of monitoring as it implements more strict stages of the WSCP.

- Stage 0 and 1: In Stage 0 and 1, production figures are recorded monthly.
- Stage 2 and 3: When Stage 2 or 3 of the WSCP is enacted, weekly production numbers could be tracked.
- Stages 4, 5, and 6: When Stage 4, 5, or 6 of the WSCP is enacted, the monitoring from Stages 2 and 3 will be continued, with the additional option of a daily report to the WRCI Senior Director.

WSCP Refinement Procedures

WRCI will monitor its water consumption and apply the necessary demand reduction action to achieve its reduction goals. If the results indicate that these goals are not being attained, WRCI may implement additional demand reduction actions.

Plan Adoption, Submittal, and Availability

A copy of this WSCP was posted on the Stanford Water Resources website on July 1, 2023.

Conclusion

The WSCP has been prepared to provide guidelines and recommendation of actions that could be taken in the event of a short-term, long-term, or emergency water shortage. As with past droughts, each specific event will likely require a tailored response with some or all the recommended actions. An evaluation will be carried out by WRCI and a recommended approach will be presented to LBRE leadership, with associated directives issued by WRCI or Stanford leadership if deemed necessary.

In case of domestic water system failure or water quality issues requiring immediate response and action, refer to the December 2022 ERP (*contact the Stanford Water Planning & Stewardship Associate Director for the latest version*).

Attachment A- Annual Water Supply and Demand Assessment Procedures

The SFPUC and the wholesale customers have negotiated and adopted a plan to allocate the RWS supply during system-wide shortages of 20% or less. To address the instances where the supply shortfalls are projected to be greater than 20%, BAWSCA has developed a revised methodology to allocate the RWS supply. This allocation method is intended to serve as the preliminary basis for the 2020 Urban water Management Plan (UWMP) supply reliability analysis and does not in any way imply an agreement by BAWSCA member agencies as to the exact allocation methodology.

ANNUAL WATER SUPPLY AND DEMAND ASSESSMENT PROCEDURES

Each year the SFPUC evaluates the amount of total water storage expected to occur throughout the RWS and compares it to expected demands. This annual Water Supply and Demand Assessment (WSDA) is described in the subsections below, which are organized by the sequential steps the SFPUC takes to conduct the assessment each year and reference the relevant California Water Code requirements for a WSDA.[1]

The SFPUC's annual WSDA is a robust planning system that considers a range of input factors unique to the SFPUC's water supplies and system configuration while also providing the flexibility to consider new factors. Traditional surface water supplies from the SFPUC's up country, East Bay, and Peninsula reservoirs are the backbone of the water supply, but the SFPUC extends and protects those supplies in many additional ways by: (1) partnering with the community to help save water through robust conservation programs; (2) minimizing the need for additional water to serve new developments through an onsite water reuse program; (3) recycling wastewater resources to deliver water for large non-potable uses; (4) utilizing local groundwater supplies to supplement surface water supplies; (5) investigating new, alternative water supply options such as purified water and desalination; and (6) investing in innovations that allow for creative solutions to meet diverse needs. These efforts help the SFPUC conserve water and diversify supplies to reduce likelihood of a water shortage condition.

1.1 DEMAND ASSESSMENT [WATER CODE SECTION 10632(A)(2)(B)(I)]

To calculate unconstrained customer demand for the purpose of an annual WSDA, the SFPUC collects information on both the retail and wholesale system demands. Retail customer demand is estimated based on the best available information to date, and typically includes the previous year's demands as well as consideration of current demand use patterns or other conditions impacting demands, such as weather and growth. Each year, in February, the SFPUC receives from BAWSCA a report of estimated Wholesale Customer demand for the upcoming year. BAWSCA typically estimates unconstrained demands for the Wholesale Customers by using total water purchased by those customers in the prior year along with other relevant information. Relatively small demands from the two additional wholesale customers not part of the WSA are estimated based on the best available information to date, and typically includes the previous year's demands as well as consideration of current demand use patterns or other conditions impacting demands, such as weather and growth.

1.2 SUPPLY ASSESSMENT [WATER CODE SECTIONS 10632(A)(2)(B)(II) AND 10632(A)(2)(B)(V)]

The RWS collects water from the Tuolumne River watershed in the Sierra Nevada and from local reservoirs in the Alameda and Peninsula watersheds. The RWS draws an average of 85 percent of its supply from the Tuolumne River watershed. This water feeds into an aqueduct system delivering water 167 miles by gravity to Bay Area reservoirs and customers. The remaining RWS supply is drawn from local surface waters in the Alameda and Peninsula watersheds. The split between these resources varies from year to year depending on the water year hydrology and operational circumstances.

To project and evaluate water supply conditions, the SFPUC uses measurements of precipitation and snowpack in the watersheds above Hetch Hetchy, Cherry, and Eleanor Reservoirs. Snowpack conditions are evaluated regularly by the Cooperative Snow Survey (conducted by the SFPUC in partnership with state and federal agencies) beginning in late January of each year. The SFPUC also estimates snowpack conditions using information from airborne snow observatory (ASO) and other sources. The SFPUC maintains a hydrologic model

[1] California Water Code section 10632(a)(1) requires "*the analysis of water supply reliability conducted pursuant to Section 10635.*" Additional information about the SFPUC's water supply reliability analysis can be found in Chapter 7 of the SFPUC's 2020 UWMP.

of the watersheds that uses this information to project expected runoff for the coming year. This process also includes a statistical analysis of additional expected precipitation. In addition to projected runoff, the determination of projected available water supply also takes into account stored water throughout the RWS, water acquired by the SFPUC from non-SFPUC sources, inactive storage, reservoir losses, and allowances for carryover storage.

Additionally, the SFPUC accounts for groundwater provided by the San Francisco Groundwater Supply Project for the in-City retail system and recycled water provided for irrigation at Harding Park, Fleming and Sharp Park Golf Courses.

The RWS relies on precipitation and snowmelt captured and stored in its reservoirs. During droughts, water supply deliveries can exceed inflows, such that water stored in previous years is relied upon to meet demands. Because of the importance of carry-over storage, the SFPUC constantly monitors and evaluates water supply conditions in the RWS. Look-ahead forecasts are updated as a year's hydrology and operations change. Generally, in early winter of any year, SFPUC staff can begin providing a forecast of water supply conditions for the upcoming year based on known and anticipated winter and spring precipitation and snowpack. The predictive power of this forecast improves greatly through the spring. The annual precipitation, snowmelt, and carry-over storage together constitute the SFPUC's reservoir storage condition. Using data for each of these factors, the SFPUC can determine whether the reservoir system will be capable of serving full deliveries to its customers. Section 1.3 describes the system modeling SFPUC conducts

Table 0-1 shows the availability of RWS supplies for retail customers and Wholesale Customers in normal years. Table 0-2 shows the current and projected RWS supply needs to meet retail and wholesale demands based on information and projections presented in the SFPUC's 2020 UWMP.

The SFPUC sells water to 26 of its 28 wholesale customers under the terms of the 25-year contract known as the Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County (WSA) and associated individual water sales contracts with each Wholesale Customer. The WSA carries forward the SFPUC's "Supply Assurance" of 184 million gallons per day (mgd) to the Wholesale Customers. The SFPUC has agreed to deliver water to the Wholesale Customers up to the amount of the Supply Assurance, and this agreement is perpetual and survives the expiration of the WSA. The Supply Assurance is, however, subject to reduction due to water shortage, drought, scheduled RWS maintenance activities, and emergencies. The WSA also describes the temporary limitation on water sales established by the Phased Water System Improvement Plan (WSIP) in 2008. This "Interim Supply Limitation" (ISL) limits water sales from the RWS to an average annual amount of 265 mgd. The WSA allocations the ISL between the SFPUC's retail customers and Wholesale Customers as follows:

- Wholesale supply allocation: 184 mgd
- Retail supply allocation: 81 mgd[2]

Table 0-1. Regional Water System Supply Availability in Normal Years (mgd)

RWS Supply Allocation	Actual	Projected				
	2020	2025	2030	2035	2040	2045
Retail Customers[a, b]	81	81	81	81	81	81
Wholesale Customers[c, d]	184	184	184	184	184	184

[2] Groveland CSD is considered a retail customer of the SFPUC. Thus, RWS supplies to Groveland CSD are accounted for in the retail supply allocation of 81 mgd.

Total RWS Supplies	265	265	265	265	265	265

a Groundwater and recycled water are assumed to be used before RWS supplies to meet retail demand. However, if these alternative supplies are not available, up to 81 mgd of RWS supply could be used in normal years.

b Groveland CSD is reported as a wholesale customer for the purposes of this 2020 UWMP, but it is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail and Wholesale Customers. Its demands would be met by the retail supply allocation of 81 mgd.

c Projected Wholesale Customer deliveries are limited to 184 mgd, including the demands of the Cities of San Jose and Santa Clara, which are supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2028).

d Cordilleras MWC is not a party to the WSA, and it is not included in the wholesale supply allocation of 184 mgd. The demands of Cordilleras MWC are minor (projected to be less than 0.01 mgd) and are anticipated to be met with RWS supplies through 2045.

Table 0-2. Regional Water System Supply Utilized in Normal Years (mgd)

RWS Supply Allocation	Actual	Projected				
	2020	2025	2030	2035	2040	2045
Retail Customers[a, b]	66.5	67.2	67.5	68.6	70.5	73.7
Wholesale Customers[c, d]	132.1	146.0	147.9	151.9	156.3	162.8
Total RWS Supplies	198.6	213.2	215.4	220.5	226.8	236.5

a Groundwater and recycled water are assumed to be used before RWS supplies to meet retail demand. However, if these alternative supplies are not available, up to 81 mgd of RWS supply could be used in normal years.

b Groveland CSD is reported as a wholesale customer for the purposes of this 2020 UWMP, but it is considered a retail customer of the SFPUC solely for purposes of allocating RWS supplies between retail and Wholesale Customers. Its demands would be met by the retail supply allocation of 81 mgd.

c Projected Wholesale Customer deliveries are limited to 184 mgd, including the demands of the Cities of San Jose and Santa Clara, which are supplied on a temporary and interruptible basis, with their total supply not exceeding 9 mgd assuming supply is available (decision to be made by end of 2028).

d Cordilleras MWC is not a party to the WSA, and it is not included in the wholesale supply allocation of 184 mgd. The demands of Cordilleras MWC are minor (projected to be less than 0.01 mgd) and are anticipated to be met with RWS supplies through 2045.

1.3 INFRASTRUCTURE CONSIDERATIONS [WATER CODE SECTION 10632(A)(2)(B)(III)]

On an ongoing basis, the SFPUC's Hetch Hetchy Water and Power, Water Supply and Treatment Division, and Hydrology and Water Systems group conduct analyses of the RWS that incorporate planned facility outages and multiple levels of projected system demands to evaluate and plan for potential water delivery constraints. These groups meet quarterly to share plans and coordinate how facility outages, changes in service area demand, wet or dry weather, and other variables shape the operating plans each year. Facility outages due to maintenance or upgrades are coordinated in an adaptive manner to respond to changes as they occur. For new water supplies or new capital projects related to supply distribution, impacts on the system are evaluated extensively prior to initiation of any changes. Results from these modeling efforts are considered in the annual WSDA.

1.4 SYSTEM MODELING [WATER CODE SECTION 10632(A)(2)(B)(IV)]

To proactively plan for conditions that would result in a shortage of water supplies, the SFPUC models conditions using a hypothetical drought that is more severe than what the RWS has historically experienced. This drought sequence is referred to as the "design drought" and serves as the basis for planning and modeling of future scenarios. The design drought consists of an 8.5-year sequence of dry conditions.

In applying its water supply planning methodology, the SFPUC performs an initial model simulation of the system for the design drought sequence and then reviews the ability of the system to deliver water to the service area through the entire design drought sequence. If the projected water supply runs out before the end of the design drought sequence in the initial model run, system-wide water supply rationing is added and the scenario is re-run. This process continues iteratively until a model simulation of the system is achieved in which the water supply in storage at the end of the design drought sequence is brought to the system "dead pool," where no additional storage is available for delivery (currently simulated as 96,775 acre-feet). Drawing system storage down to the dead pool without going below it indicates that water supply delivery, including the adjusted amount of rationing, is maintained through the design drought sequence.

Estimated rationing levels and corresponding storage threshold values can then be used to simulate the operation of the system through the historical record of hydrology, or to evaluate system water supply conditions during an ongoing drought. While the design drought sequence does not occur in the historical hydrology, the rationing and storage threshold values that are adjusted to allow a system configuration to maintain water delivery through the design drought sequence can be used to evaluate system performance in the historical record, or as a comparison for real-time system conditions. Through use of this planning method, the SFPUC can simulate a response to declining water supply in storage that is appropriate for the system conditions being evaluated.

The SFPUC plans its water deliveries using indicators for water supply rationing that are developed through analysis with the design drought sequence. As a result, the SFPUC system operations are designed to provide sufficient carry-over water in SFPUC reservoirs to continue delivering water, although at reduced levels, during multiple-year droughts.

1.5 DECISION-MAKING PROCESS [WATER CODE SECTION 10632(A)(2)(A)]

Regardless of the expectation of shortage conditions, as part of the normal course of business, the SFPUC provides a water supply condition update to its executive team every two weeks throughout the year. The SFPUC also provides water supply estimates to its Wholesale Customers on a monthly basis beginning February 1. A Wholesale Customer Annual Meeting is held in the last week of February at which the SFPUC makes a presentation on current water supply conditions and forecasts. The last snow survey of the season typically occurs within the first week of April, followed by a runoff forecast to determine total system storage expected as of July 1. By the middle of April, the SFPUC sends a formal letter to the Wholesale Customers summarizing the water supply availability for the coming year.

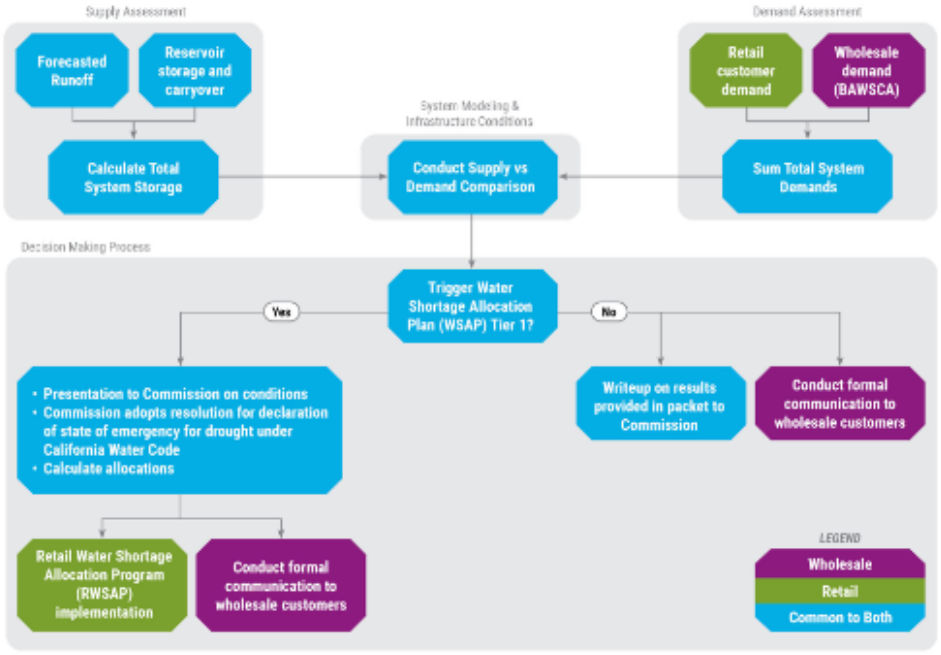
If the RWS appears incapable of meeting system-wide demand due to drought, the SFPUC is expected to declare a water shortage by March 31 of that drought year. The General Manager, or designee, is responsible for declaring such a shortage. A presentation would be made to the Commission as part of the General Manager's report, showing conditions of precipitation to date, snowpack, and storage levels with more information as necessary depending on the particulars of the supply forecast. Depending on the level of shortage, the Commission may adopt a resolution declaring a water shortage emergency under the California Water Code, or lesser actions such as a call for voluntary conservation efforts.

Prior to the initiation of any water delivery reductions to its retail customers, whether it be initial implementation of delivery reductions or implementing a different water shortage level, the SFPUC will outline a drought response plan to address the following: the water supply situation; proposed water use reduction objectives; alternatives to water use reductions; methods to calculate water use allocations and adjustments; compliance methodology and enforcement measures; and budget considerations. Details on the expected allocation program are described further in Section **Error! Reference source not found.**. This drought response plan will be presented

at a regularly scheduled SFPUC Commission meeting and advertised in accordance with the requirements of Section 6066 of the California Government Code.

The overall WSDA process is described visually in the flowchart presented in Figure 0-1.

Figure 0-1: Water Supply and Demand Assessment Process



Shared Vision Planning Process for Defining Drought Scenarios

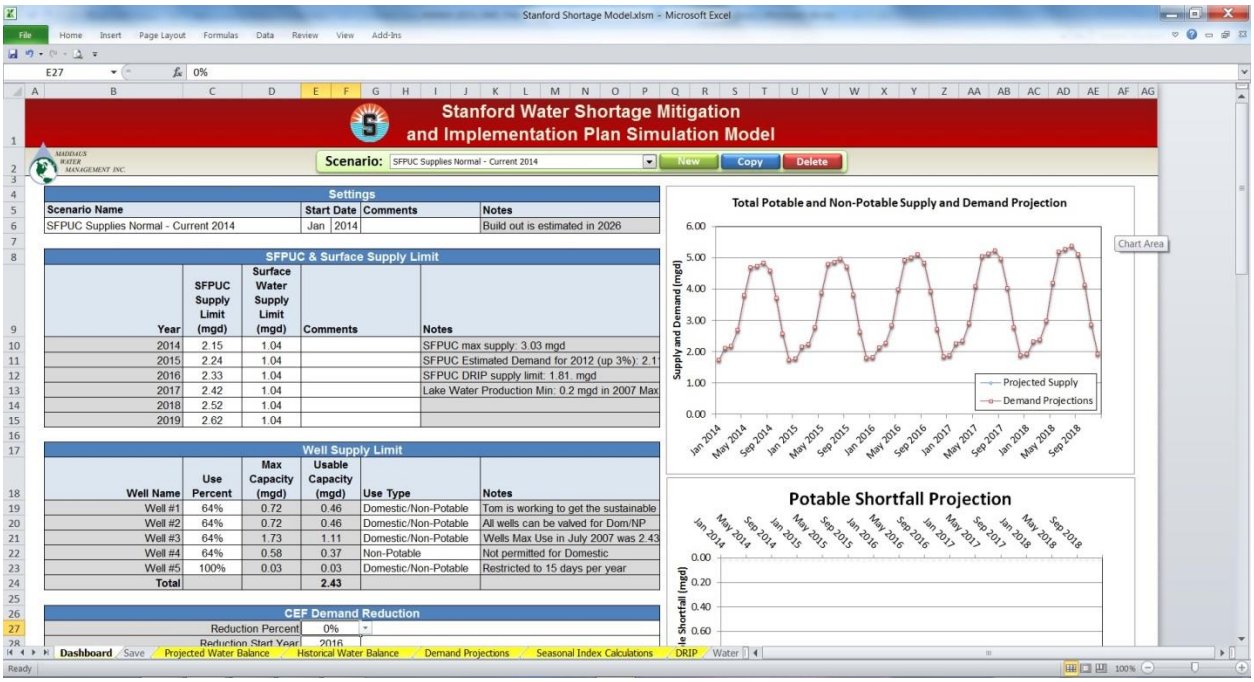
Understanding drought risk and mitigation options is essential to water shortage contingency planning with scenario planning to determine the worst-case boundary conditions under which WRCI may be forced to operate. As part of the planning process, it is necessary to define the extent supplies can be optimized under shortage conditions by WRCI. It is also important to monitor the supply system input and demand reductions during water shortages. Because water shortages generally, and droughts specifically, can be defined in so many ways given the causes (lack of supply) and the effects (adverse impacts to water users), it is critical that Stanford have a mechanism to clearly model, measure, and monitor the impacts.

To this end, Maddaus Water Management worked with WRCI staff to develop a "water balance" based Drought Model. Key drought model inputs that have been incorporated into Stanford University's drought model include:

- SFPUC contract agreements, including scenarios for cutback
- Operating rules for wells under shortage conditions
- Drought staged actions for demand reduction

Presented in Attachment A, Figure 4 is an example partial screenshot of a simulation model that tests supply optimization between potable and non-potable surface supplies and back-up groundwater resources against demand reductions to project water shortages under different supply scenarios.

The purpose of this model is to allow WRCI staff to test scenarios and the level of cutbacks needed to meet shortfalls in supply, both for planning purposes and to aid in decision making during the drought regarding when to change from one staged level of reduction to the next lower stage.

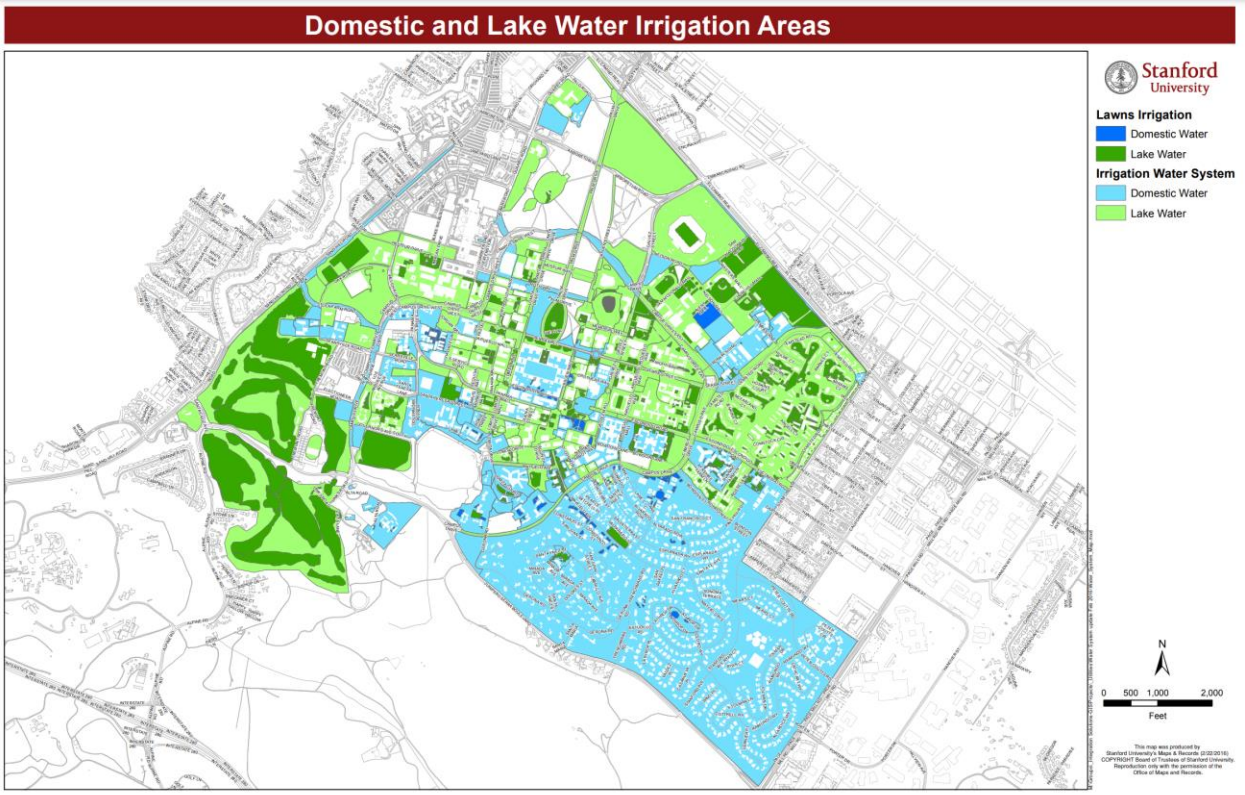


Attachment B, Figure 4- Stanford University's Water Shortage Simulation Model

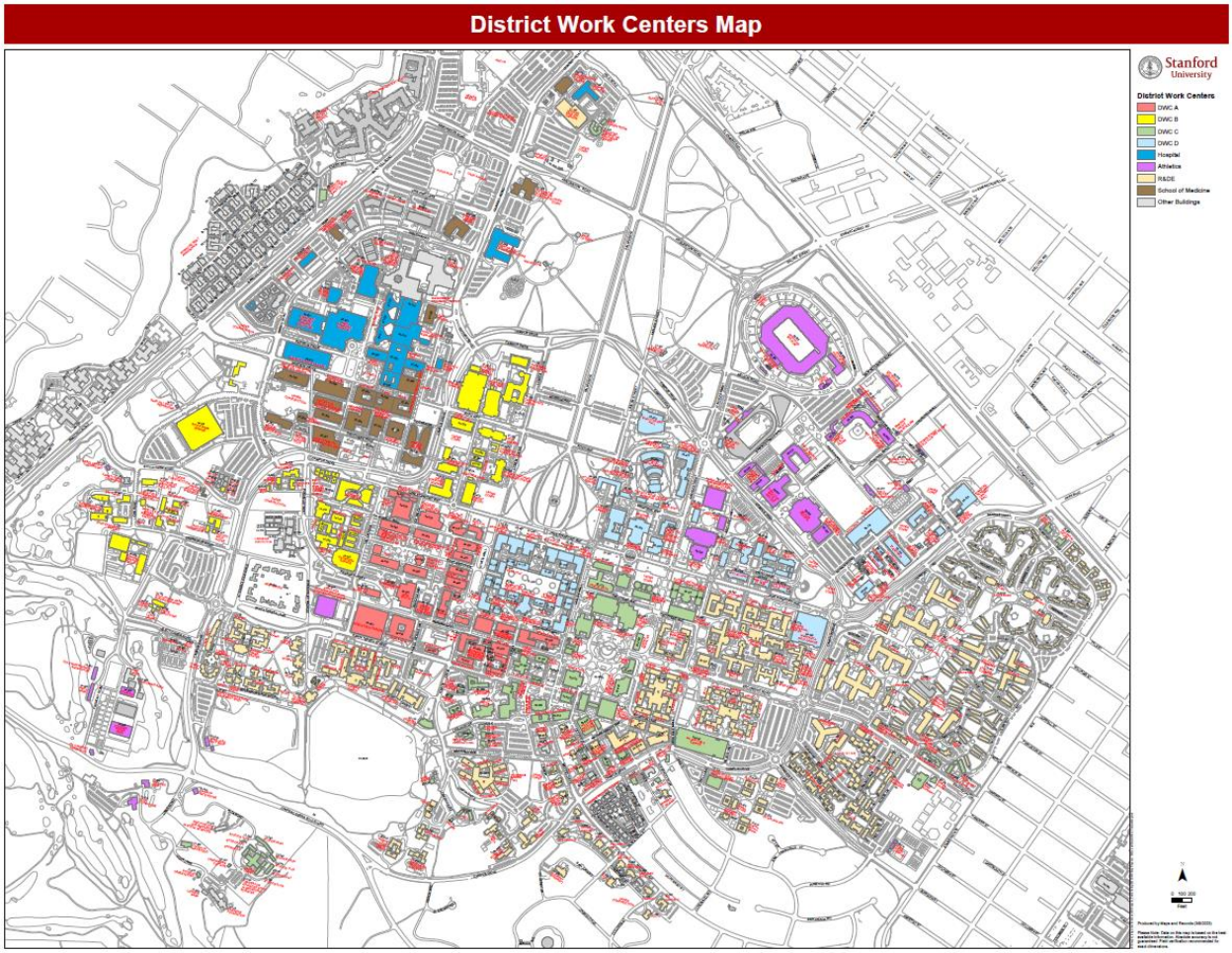
Source: Stanford University (Maddaus Water Management, 2014).

This modeling approach is adapted from the traditional Shared Vision Planning Process (SVP) that uses computer model aided dialogue to create scenario planning for water resources management decisions, which can include testing drought simulations with forecasted supply reliability. Note that the Stanford model does not include climate change scenarios and starts at the decision point that comes from BAWSCA ISG. To aid in drought preparedness decision making, SVP ideally involves modeling, public participation, and collaboration among stakeholders. SVP is supported by the Army Corps of Engineers.

Attachment C- Domestic and Lake water Irrigation Areas



Attachment D- Campus Managed Areas



Attachment E- Water Use Report Card

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission

525 Golden Gate Avenue, 13th Floor
San Francisco, CA 94102
T 415.554.3155
F 415.554.3161
TTY 415.554.3488

January 22, 2021

Danielle McPherson
Senior Water Resources Specialist
Bay Area Water Supply and Conservation Agency
155 Bovet Road, Suite 650
San Mateo, CA 94402

Dear Ms. McPherson,

Attached please find the information you requested on the Regional Water System's supply reliability for use in the Wholesale Customer's 2020 Urban Water Management Plan (UWMP) updates. The SFPUC has assessed the water supply reliability under the following planning scenarios:

- Projected supply reliability for year 2020 through 2045
- Projected single dry year and multiple dry year reliability for base year 2020, both with and without implementation of the Bay-Delta Plan Amendment
- Projected single dry year and multiple dry year reliability for base year 2025, both with and without implementation of the Bay-Delta Plan Amendment

The tables presented below assume full implementation of the Bay-Delta Plan Amendment will begin in 2023. All tables assume that the wholesale customers will purchase 184 mgd from the RWS through 2045. Assumptions about the status of the dry-year water supply projects included in the Water Supply Improvement Program (WSIP) are provided below in the table 'WSIP Project Assumptions'. The tables reflect instream flow requirements at San Mateo and Alameda Creeks, as described in the common language provided to BAWSCA separately.

Concerning allocation of supply during dry years, the Water Shortage Allocation Plan (WSAP) was utilized to allocate shortages between the SFPUC and the Wholesale Customers collectively. The WSAP implements a method for allocating water between the SFPUC retail customers and wholesale customers collectively which has been adopted by the Wholesale Customers per the July 2009 Water Supply Agreement between the City and County of

San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County. The WSAP, also known as the Tier One Plan, was amended in the 2018 Amended and Restated Water Supply Agreement. The wholesale customers have adopted the Tier Two Plan, the second component of the WSAP, which allocates the collective wholesale customer share among each of the 26 wholesale customers.

Compared to the reliability projections that were provided previously for the 2015 UWMP update, the biggest difference in projected future deliveries is caused by the implementation of the Bay-Delta Plan Amendment. Given the uncertainty about the implementation of the Amendment (described further in the common language provided to BAWSCA), tables are included to show future projected supplies both with and without the Bay-Delta Plan Amendment.

It is our understanding that you will pass this information on to the Wholesale Customers. If you have any questions or need additional information, please do not hesitate to contact Sarah Triolo, at striolo@sfwater.org or (628) 230 0802.

Sincerely,

Paula Kehoe

Paula Kehoe
Director of Water Resources

Table 1: WSIP Project Assumptions

	2020	2025 and Beyond
Calaveras Dam Replacement Project	Calaveras Reservoir partially refilled at spring 2020 level of 63,900 AF	Calaveras Reservoir fully refilled
Lower Crystal Springs Dam Improvements	Crystal Springs storage not restored	
Regional Groundwater Storage and Recovery (GSR) Project	GSR account partially filled at spring 2020 level of 23,500 AF; GSR recovery rate of 6.2 mgd	GSR account fully filled; GSR recovery rate of 6.2 mgd
Alameda Creek Recapture Project	Project not built	Project built
Dry-year Transfers	Not in effect	

Table 2: Projected Wholesale Supply from Regional Water System [For Table 6-9]:

Year	2020	2025	2030	2035	2040	2045
RWS Supply (mgd)	265	265	265	265	265	265
Wholesale Supply (mgd)	184	184	184	184	184	184

Table 3: Basis of Water Supply Data [For Table 7-1], 2020 Infrastructure Conditions With Bay Delta Plan

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2020	265	100%	184	
Single dry year		238.5	90%	157.5	• At 10% shortage, wholesale allocation is 64%, or 152.6 mgd • Retail allocation is 36%, or 85.9 mgd • Retail allocations above 81 mgd are re-allocated to Wholesale Customers, per the 2018 WSA • 4.9 mgd added to wholesale allocation, bringing it to 157.5 mgd
Consecutive 1st Dry year		238.5	90%	157.5	• Same as above
Consecutive 2nd Dry year		212	80%	132.5	• At a 20% shortage, wholesale allocation is 62.5%, or 132.5 mgd • Retail allocation is 37.5%, or 79.5 mgd
Consecutive 3rd Dry year[1]		119.25	45%	74.5	• WSA does not define percentage split above a 20% shortage level • Assume same split as for a 20% shortage level, i.e. Wholesale Customers receive 62.5%
Consecutive 4th Dry year		119.25	45%	74.5	• Same as above
Consecutive 5th Dry year		119.25	45%	74.5	• Same as above

[1] Assuming this year represents 2023, when Bay Delta Plan Amendment would come into effect.

Table 4: Basis of Water Supply Data [For Table 7-1], 2020 Infrastructure Conditions Without Bay Delta Plan

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2020	265	100%	184	
Single dry year		238.5	90%	157.5	• At 10% shortage, wholesale allocation is 64%, or 152.6 mgd • Retail allocation is 36%, or 85.9 mgd • Retail allocations above 81 mgd are re-allocated to Wholesale Customers, per the 2018 WSA • 4.9 mgd added to wholesale allocation, bringing it to 157.5 mgd
Consecutive 1st Dry year		238.5	90%	157.5	• Same as above
Consecutive 2nd Dry year		212	80%	132.5	• At a 20% shortage, wholesale allocation is 62.5%, or 132.5 mgd • Retail allocation is 37.5%, or 79.5 mgd
Consecutive 3rd Dry year		212	80%	132.5	• Same as above
Consecutive 4th Dry year		212	80%	132.5	• Same as above
Consecutive 5th Dry year		212	80%	132.5	• Same as above

Table 5: Basis of Water Supply Data [For Table 7-1], 2025 Infrastructure With Bay Delta Plan

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2025	265	100%	184	
Single dry year		132.5	50%	82.8	• WSA does not define percentage split above a 20% shortage level • Assume same split as for a 20% shortage level, i.e. Wholesale Customers receive 62.5%
Consecutive 1st Dry year		132.5	50%	82.8	• Same as above
Consecutive 2nd Dry year		119.25	45%	74.5	• Same as above
Consecutive 3rd Dry year		119.25	45%	74.5	• Same as above
Consecutive 4th Dry year		119.25	45%	74.5	• Same as above
Consecutive 5th Dry year		119.25	45%	74.5	• Same as above

Table 6: Basis of Water Supply Data [For Table 7-1], 2025 Infrastructure Without Bay Delta Plan

Year Type	Base Year	RWS Volume Available (mgd)	% of Average Supply	Wholesale Volume Available (mgd)	Notes on Calculation of Wholesale Supply
Average year	2025	265	100%	184	
Single dry year		238.5	90%	157.5	• At 10% shortage, wholesale allocation is 64% • Retail allocation is 36%, or 85.9 mgd; retail allocations above 81 mgd are re-allocated to Wholesaler Customers, per the 2018 WSA • 4.9 mgd added to wholesale allocation, bringing it to 157.5 mgd
Consecutive 1st Dry year		238.5	90%	157.5	• Same as above
Consecutive 2nd Dry year		238.5	90%	157.5	• Same as above
Consecutive 3rd Dry year		238.5	90%	157.5	• Same as above
Consecutive 4th Dry year		212	80%	132.5	• At a 20% shortage, wholesale allocation is 62.5%, or 132.5 mgd • Retail allocation is 37.5%, or 79.5 mgd
Consecutive 5th Dry year		212	80%	132.5	• Same as above

Table 7: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], With Bay Delta Plan

	2025	2030	2035	2040	2045
First year	82.8	82.8	82.8	82.8	82.8
Second year	74.5	74.5	74.5	74.5	74.5
Third year	74.5	74.5	74.5	74.5	74.5
Fourth year	74.5	74.5	74.5	74.5	74.5
Fifth year	74.5	74.5	74.5	74.5	74.5

Table 8: Projected Multiple Dry Years Wholesale Supply from RWS [For Table 7-4], Without Bay Delta Plan

	2025	2030	2035	2040	2045
First year	157.5	157.5	157.5	157.5	157.5
Second year	157.5	157.5	157.5	157.5	157.5
Third year	157.5	157.5	157.5	157.5	157.5
Fourth year	132.5	132.5	132.5	132.5	132.5
Fifth year	132.5	132.5	132.5	132.5	132.5

Table 9: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], With Bay Delta Plan. This table assumes Bay Delta Plan comes into effect in 2023.

Year	2021	2022	2023	2024	2025
RWS Supply (mgd)	238.5	212	119.25	119.25	119.25
Wholesale Supply (mgd)	157.5	132.5	74.5	74.5	74.5

Table 10: Projected Regional Water System Supply for 5-Year Drought Risk Assessment [For Table 7-5], Without Bay Delta Plan

Year	2021	2022	2023	2024	2025
RWS Supply (mgd)	238.5	212	212	212	212
Wholesale Supply (mgd)	157.5	132.5	132.5	132.5	132.5

Bay Area Water Supply & Conservation Agency

January 25, 2021

TO: BAWSCA Member Agencies

FROM: Danielle McPherson, Tom Francis

SUBJECT: San Francisco Regional Water System Supply Reliability for 2020 Urban Water Management Plans

The purpose of this memorandum is to transmit the San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS) Supply Reliability Letter and provide an explanation of how BAWSCA applied the Tier 2 Drought Allocation to delivery projections.

1. RWS Supply Reliability Letter and Tables

The SFPUC's RWS Supply Reliability Letter is included as Attachment A. The tables provided in the Letter summarize deliveries to the Wholesale Customers under three water supply conditions: (1) a single dry year, (2) five consecutive dry years, and (3) reliability for base year 2020 through 2045. Considering the uncertainty about the outcome of the Bay Delta Plan negotiations, each table is provided under two scenarios:

Scenario 1: With the Bay Delta Plan – 40% unimpaired flows beginning in 2023.

Scenario 2: Without the Bay Delta Plan.

Each agency may choose which scenario to use in their 2020 UWMP. So that you are aware, the SFPUC plans to use Scenario 1 in their UWMP Tables. However, the SFPUC also plans to discuss both scenarios in the body of their UWMP. As you are finalizing your respective UWMPs, please alert BAWSCA as to which scenario you plan to incorporate.

The SFPUC has also provided the projected RWS supply for the required 5-year Drought Risk Assessment (5-year DRA) under both scenarios (Tables 9 and 10 in the Supply Reliability Letter).

Titles provided for each table in the Supply Reliability Letter indicate which UWMP Table they apply to. Below is a summary and explanation to facilitate your review.

Tables 3 – 6 (UWMP Table 7-1):
The SFPUC has provided four scenarios to select from for completing UWMP Table 7-1: Basis of Water Year Data. Tables 3 and 4 were developed with a base year of 2020 and are the basis for what will be included in your agency's 5-year DRA. Tables 5 and 6 were developed with a base year of 2025. The UWMP Guidebook encourages suppliers to use the same years in Table 7-1 as their 5-year DRA. However, the Guidebook provides that suppliers may choose a different five-consecutive dry year period such as the lowest average water supply available to the supplier for five years in a row. To allow for this scenario, the SFPUC has provided in Tables 5 and 6 in the Supply Reliability Letter.

Tables 7 – 8 (UWMP Table 7-4):

Tables 7 and 8 (depending on which scenario you choose) will help your agency complete UWMP Table 7-4: Multiple Dry Years Supply and Demand Projections. As detailed in Table 1 of the Supply Reliability Letter, no new alternative water supply projects are anticipated to be built/filled after 2025. Therefore, delivery projections are stagnant between 2025 and 2045 for each consecutive dry year.

Tables 9 – 10:
The SFPUC has provided supply reliability for your agency's 5-year DRA. As previously explained, your agency may choose to use either Scenario 1 (Table 9) or 2 (Table 2).

2. Tier 2 Allocation for UWMP Single Dry Year and Multiple Dry Year Reliability Analysis

Attachment B provides each agencies' allocation of supply for both planning scenarios based on the most recent Tier 2 Drought Implementation Plan model run (Scenario 1A, October 2020), which is based upon:

a. Actual FY 2018-19 demands
b. A 20% systemwide shortage (a 26% shortage to the BAWSCA Member Agencies based upon Tier 1 allocations)

Individual agency allocations were calculated based on tables provided in the Supply Reliability Letter for both Scenario 1 and 2.

When available supplies to the Wholesale Customers are greater than projected demands, agencies can assume supplies are equal to demands (up to ISG) for those years of the reliability analysis.

3. Application in 2020 UWMPs

Your agency's supply reliability will be input in UWMP Tables 7-1, 7-3, 7-4, and 7-5 and should be discussed in the body of your UWMP. Attachment C provides sample UWMP Tables for Member Agency X (a SFPUC sole source agency) as an example to help you understand how to apply information from SFPUC tables to your agency's UWMP supply reliability tables.

Enclosed: Attachment A: SFPUC Supply Reliability Letter Attachment B: 2020 UWMP Tier 2 Allocation Scenarios
Attachment C: Sample UWMP Tables for Member Agency X

cc: Nicole Sandkulla
Allison Schutte

Agency	Individual Supply Guarantee	Base Year (FY 18-19) SFPUC Purchases	Allocation Factor	Scenarios for Total Available Supply to Wholesale Customers			
				157.5 MGD	132.5 MGD	82.8 MGD	74.5 MGD
ACWD	13.76	7.78	6.78%	10.68	8.98	5.61	5.05
Brisbane/GVMID	0.98	0.66	0.53%	0.84	0.71	0.44	0.40
Burlingame	5.23	3.42	2.80%	4.41	3.71	2.32	2.08
Coastside	2.18	1.12	1.03%	1.62	1.36	0.85	0.77
CalWater Total	35.68	26.43	19.44%	30.63	25.76	16.10	14.49
Daly City[1]	4.29	3.70	2.80%	4.29	3.71	2.32	2.08
East Palo Alto	3.46	1.56	1.46%	2.31	1.94	1.21	1.09
Estero	5.90	4.04	3.12%	4.91	4.13	2.58	2.32
Hayward		13.98	12.46%	19.62	16.51	10.31	9.28
Hillsborough	4.09	2.31	1.77%	2.79	2.35	1.47	1.32
Menlo Park	4.46	2.84	2.20%	3.47	2.92	1.83	1.64
Mid-Peninsula	3.89	2.50	2.04%	3.21	2.70	1.69	1.52
Millbrae	3.15	1.95	1.64%	2.59	2.18	1.36	1.22
Milpitas	9.23	5.30	4.66%	7.33	6.17	3.86	3.47
Mountain View	12.46	7.21	6.14%	9.66	8.13	5.08	4.57
North Coast	3.84	2.29	2.04%	3.21	2.70	1.69	1.52
Palo Alto	16.58	9.43	7.92%	12.47	10.49	6.56	5.90
Purissima Hills	1.63	1.58	0.92%	1.45	1.22	0.76	0.68
Redwood City	10.93	8.08	6.22%	9.80	8.24	5.15	4.63
San Bruno	3.25	0.86	0.83%	1.31	1.11	0.69	0.62
San José	0.00	4.27	2.48%	3.91	3.29	2.06	1.85
Santa Clara	0.00	3.02	1.76%	2.77	2.33	1.45	1.31
Stanford	3.03	1.43	1.36%	2.15	1.81	1.13	1.02
Sunnyvale	12.58	9.01	6.89%	10.86	9.14	5.71	5.14
Westborough	1.32	0.78	0.70%	1.10	0.92	0.58	0.52
Wholesale Total		**125.55**	**100%**	**157.39**	**132.50**	**82.80**	**74.50**

[1] Under the scenario in which total deliveries to the Wholesale Customers is 157.5 MGD, Daly City's allocation is slightly above their ISG. Therefore, Daly City's allocation under this scenario has been manually reduced to equal their ISG.

January 25, 2021

Scenario 1: Without Bay Delta Plan

Agency	Individual Supply Guarantee	Base Year (FY 18-19) SFPUC Purchases	Allocation Factor	Scenarios for Total Available Supply to Wholesale Customers	
				157.5 MGD	132.5 MGD
ACWD	13.76	7.78	6.78%	10.68	8.98
Brisbane/GVMID	0.98	0.66	0.53%	0.84	0.71
Burlingame	5.23	3.42	2.80%	4.41	3.71
Coastside	2.18	1.12	1.03%	1.62	1.36
CalWater Total	35.68	26.43	19.44%	30.63	25.76
Daly City[1]	4.29	3.70	2.80%	4.29	3.71
East Palo Alto	3.46	1.56	1.46%	2.31	1.94
Estero	5.90	4.04	3.12%	4.91	4.13
Hayward		13.98	12.46%	19.62	16.51
Hillsborough	4.09	2.31	1.77%	2.79	2.35
Menlo Park	4.46	2.84	2.20%	3.47	2.92
Mid-Peninsula	3.89	2.50	2.04%	3.21	2.70
Millbrae	3.15	1.95	1.64%	2.59	2.18
Milpitas	9.23	5.30	4.66%	7.33	6.17
Mountain View	12.46	7.21	6.14%	9.66	8.13
North Coast	3.84	2.29	2.04%	3.21	2.70
Palo Alto	16.58	9.43	7.92%	12.47	10.49
Purissima Hills	1.63	1.58	0.92%	1.45	1.22
Redwood City	10.93	8.08	6.22%	9.80	8.24
San Bruno	3.25	0.86	0.83%	1.31	1.11
San José	0.00	4.27	2.48%	3.91	3.29
Santa Clara	0.00	3.02	1.76%	2.77	2.33
Stanford	3.03	1.43	1.36%	2.15	1.81
Sunnyvale	12.58	9.01	6.89%	10.86	9.14
Westborough	1.32	0.78	0.70%	1.10	0.92
Wholesale Total		**125.55**	**100%**	**157.39**	**132.50**

[1] Under the scenario in which total deliveries to the Wholesale Customers is 157.5 MGD, Daly City's allocation is slightly above their ISG. Therefore, Daly City's allocation under this scenario has been manually reduced to equal their ISG.

January 25, 2021