Draft White Paper Discussion On:

Proposed Changes for the 2022 Drinking Water Needs Assessment

January 28, 2022

Important Note: The State Water Board is refining how to assess large public water systems with 3,300 service connections or more in the Risk Assessment. The State Water Board is considering several adjustments to how certain risk indicators are calculated to accommodate for system size and complexity, especially in the Water Quality and Accessibility risk categories. The State Water Board will incorporate these changes into the methodology before the final Needs Assessment and Risk Assessment are published in April 2022.

Water systems with 10,000 service connections or more have been removed from the Preliminary 2022 Risk Assessment spreadsheet. The State Water Board encourages large water systems to review underlying raw data in the spreadsheet for accuracy. This data may ultimately be used in the final Risk Assessment.

Edits were made to this white paper on January 31, 2022 to reflect data corrections.

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Executive Summary

The annual Drinking Water Needs Assessment (Needs Assessment) is an analysis conducted by the State Water Board to help inform the implementation of the Safe and Affordable Funding for Equity and Resilience (SAFER) Program. The State Water Board's Drinking Water Needs Assessment (Needs Assessment) consists of three core components: the Affordability Assessment, Risk Assessment, and Cost Assessment.

The Needs Assessment is used by the State Water Board and the SAFER Advisory Group to inform prioritization of public water systems, tribal water systems, state small water systems, and domestic wells for funding in the Safe and Affordable Drinking Water Fund Expenditure Plan; inform direction for State Water Board technical assistance; and to develop strategies for implementing interim and long-term solutions.

The 2021 Needs Assessment is available here: https://bit.ly/33wSpUC

Overview of Proposed Changes

The State Water Board is seeking stakeholder feedback on the following proposed changes to the Needs Assessment for 2022:

Risk Assessment for Public Water Systems

- **Expand the inventory** of water systems assessed to include large community water systems with more than 3,300 service connections.
- **Remove five risk indicators**: Maximum Duration of High Potential Exposure; Water Source Types; Percent Shut-Offs for Non-Payment; Number of Service Connections, and Extensive Treatment Installed.
- **Add eight new risk indicators**: Contaminants of Emerging Concern; Source Capacity Violations; Bottled or Hauled Water Reliance; Percentage of Residential Arrearages; Residential Arrearage Burden; Days Cash on Hand; Operating Ratio; and Total Annual Income.
- **Updated Risk Indicator Calculation Methodology**: Critically Overdrafted Groundwater Basin, % Median Household Income (MHI), Extreme Water Bill, Past Presence on the Failing: HR2W List, Increasing Presence of Water Quality Trends Towards MCL, and Percentage of Sources Exceeding an MCL.

Risk Assessment for State Small Water Systems and Domestic Wells:

- Re-focus Aquifer Risk Map to section level data instead of census block group risk percentile scores.
- Change definition of "recent" water quality results from 2 to 5 years.
- Incorporate water quality data from cleanup monitoring sites (GeoTracker data).
- New combined Risk Assessment methodology utilizing normalized risk scores from the State Water Board's Aquifer Risk Map and the Department of Water Resources' Drought Vulnerability Risk Tool.

- Display race, ethnicity, median household income (disadvantaged community status), and other CalEnviroScreen 4.0 data.

Cost Assessment

- Rather than conduct a new Cost Assessment for interim and long-term solutions for Failing: HR2W list systems and At-Risk systems and domestic wells, the State Water Board has conducted a targeted Drought Cost Assessment. The Drought Cost Assessment estimates the costs associated with drought infrastructure requirements for small community water systems (15 – 2,999 service connections) in Senate Bill 552.
- The Drought Cost Assessment utilizes cost assumptions from the 2021 Cost Assessment Model as well as new cost data.

Affordability Assessment

- Remove one affordability indicator: Percent Shut-Offs for Non-Payment.
- Add two new affordability indicators: Percent of Residential Arrearages and Residential Arrearage Burden.

Preliminary 2022 Needs Assessment Results

Table 1 summarizes the preliminary results of the Risk Assessment for public water systems, state small water systems, and domestic wells.

- The results of the Risk Assessment for individual public water systems and the underlying data utilized in the assessment is accessible here: https://bit.ly/3G5wHEo
- The results of the Risk Assessment for state small water systems and domestic wells is available here: https://bit.ly/3o2k7Qb

Table 1: Preliminary 2022 Risk Assessment Results

Systems	Total Systems Assessed	At-Risk	Potentially At-Risk	Not At-Risk
Public Water Systems	**3,148**	**824 (26%)**	**479 (15%)**	**1,845 (59%)**
small systems[1]	2,757	779 (28%)	433 (16%)	1,545 (56%)
large systems[2]	391	45 (12%)	46 (12%)	300 (77%)

[1] Public water systems with 3,300 service connections or less.
[2] Public water systems with more than 3,300 service connections.

Systems	Total Systems Assessed	At-Risk	Potentially At-Risk	Not At-Risk
State Small Water Systems	**1,273**	**378 (30%)**	**438 (34%)**	**455 (36%)**
Domestic Wells	**312,187**	**64,176 (21%)**	**90,840 (29%)**	**157,146 (50%)**

Table 2 summarizes the preliminary Drought Infrastructure Cost Assessment results for SB 552 requirements for small water systems with 15 – 2,999 service connections. The results of the Drought Infrastructure Cost Assessment for individual community water systems can be accessed here: https://bit.ly/3r6IU7y

Table 2: Preliminary 2022 Drought Infrastructure Cost Assessment Results for Small Water Systems

Drought Requirement	# Small CWS	Total Small CWS Cost Estimate
Monitor Static Well Levels	871 (33%)	$1,680,000
Membership CalWARN / Mutual Aid	2,674 (100%)	$0
Back-up electrical supply	1,872 (70%)	$224,820,000
Back-up source: new well or intertie	895 (33%)	$1,407,480,000
Meter all service connections	1,275 (48%)	$173,990,000
TOTAL:	**2,674**	**$1,807,970,000**

Table 3 summarizes the preliminary results of the Affordability Assessment for all community water systems by disadvantage community status. The results of the Affordability Assessment for individual community water systems can be accessed here: https://bit.ly/3L1aBXp

Table 3: Preliminary 2022 Affordability Assessment Results

Community Status	Total Systems Assessed	High Affordability Burden	Medium Affordability Burden	Low Affordability Burden
DAC	580	16 (3%)	47 (8%)	67 (12%)
SDAC	1,316	38 (3%)	83 (6%)	203 (15%)
Non-DAC	874	15 (2%)	132 (15%)	150 (17%)
Missing DAC Status	98	0 (0%)	0 (0%)	0 (0%)
TOTAL:	**2,868,**	**69 (24%)**	**262 (9%)2**	**420 (15%)**

1. Proposed Changes to the Risk Assessment for Public Water Systems

Expanding the Inventory of Community Water Systems Assessed

In 2021, the Risk Assessment for public water systems was conducted for community water systems with 3,300 service connections or less and all non-transient non-community water systems which serve K-12 schools. The State Water Board is proposing expanding the 2022 Risk Assessment to include *all* community water systems. The expansion of the Risk Assessment to include 391 systems with greater than 3,300 service connections will allow the State Water Board to more thoroughly track the performance and capacity of community water systems, especially the larger water systems that are or have been on the Failing: HR2W list.

The State Water Board conducted a Risk Assessment for large water systems with more than 3,300 service connections using the 2021 methodology (Table 4). The results of this exercise generated an approximated, hypothetical Risk Assessment baseline for larger water systems. This enabled the State Water Board to compare the 2021 methodology results with the proposed 2022 methodology results. An analysis of large Failing: HR2W list systems, the baseline results has a predictive power of 85%.

Table 4: Modelled Risk Assessment Results for Large Water Systems (greater than 3,300 service connections) Utilizing 2021 Methodology

Number of Systems Assessed	At-Risk	Potentially At-Risk	Not At-Risk
391	34 (9%)	38 (10%)	319 (82%)

The 2022 Risk Assessment will continue to exclude wholesalers because they do not provide direct service to residential customers. Some water system types will be excluded from certain risk categories or specific risk indicators. Please refer to Table 5 for details.

Table 5: Proposed Water Systems to be Analyzed in the 2022 Risk Assessment

Water System Type[3]	Number	Water Quality	Accessibility	Affordability	TMF Capacity
Community Water Systems[4]	2,789	Yes	Yes	Yes[5]	Yes[6]
K-12 Schools[7]	367	Yes	Yes	No	Yes
TOTAL:	**3,156**				

Proposed Risk Indicators to be Removed

The State Water Board is proposing removing five risk indicators from the Risk Assessment. The following provides a brief justification for their removal:

Maximum Duration of High Potential Exposure (HPE)

The purpose of this risk indicator is to identify systems that experience an ongoing contamination problem. The calculation for this indicator is twofold. It first identifies the contaminants with high potential exposure level by estimating the average annual concentration of delivered water for each of 19 selected contaminants and assessing whether the average annual concentration is greater than the MCL. The duration of high potential exposure is calculated by summing the number of years for which each contaminant had high potential exposure. The indicator score is based on the maximum duration of high potential exposure across all contaminants during the nine-year period to capture recurring exposure. Capturing this recurring exposure may be important, especially when such exposure involves contaminants whose health effects are associated with chronic exposure. However, the complicated nature of how this risk indicator is calculated and determined was difficult for stakeholders, water systems, and State Water Board staff to understand. Therefore, the State Water Board is recommending the removal of this indicator from the Risk Assessment. The State Water Board may develop new indicators in the future to better assess how long a water system is out of compliance.

Water Source Types

This risk indicator analyzes the diversity of water source types utilized by a water system. However, it is strongly correlated with another risk indicator in the Accessibility

[3] Systems on the Failing: HR2W list were included in the Risk Assessment analysis, however, they were excluded from the final Risk Assessment results.
[4] Wholesalers were excluded.
[5] Water systems that do not charge for water were excluded from the Affordability Assessment. This often includes water systems whose primary service area includes: Transient Areas, Recreational Facilities, Hotels, Summer Camps, Prisons, Medical Facilities, Military Complexes, etc.
[6] Military bases were excluded from the financial risk indicators: Days Cash on Hand, Operating Ratio, and Income.
[7] Include K-12 community water systems and non-transient, non-community schools.

category of the Risk Assessment: Number of Water Sources. Therefore, the State Water Board is recommending the removal of this indicator from the Risk Assessment.

Percent Shut-Offs for Non-Payment
The purpose if this risk indicator is to identify water systems that have residential customers struggling to pay their water bills due to affordability challenges. The 2021 Risk Assessment and Affordability Assessment utilized 2019 data from the Electronic Annual Report (EAR). However, Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021.[8] This information was therefore unavailable for the majority of 2020 and will not be collected in the 2021 EAR. The State Water Board is recommending the removal of this indicator from the Risk Assessment.

Number of Service Connections
This risk indicator measures the total number of customer service connections a water system serves and was utilized on the 2021 Risk Assessment as a proxy measure of a water system's financial capacity to support staff and budget. The State Water Board required new financial reporting in the 2020 EAR to collect data to better analyze the financial capacity of water systems. The addition of new financial capacity risk indicators in the Risk Assessment eliminates the need for this risk indicator. Therefore, the State Water Board recommends its removal from the Risk Assessment.

Extensive Treatment Installed
The purpose of this risk indicator was to identify water systems requiring extensive treatment due to poor source water quality and treatment complexity. The State Water Board is recommending the removal of this risk indicator because of the proposed expansion of the water systems included in the Risk Assessment. The inclusion of large water systems would result in many of these systems receiving risk points due to the calculation methodology of this risk indicator. For example, 157 (40%) of large water systems with more than 3,300 service connections would receive risk points. The inherent bias of this risk indicator, without any additional analysis of the system's technical capacity, leads to its recommended removal from the Risk Assessment.

Proposed Risk Indicators to be Added

The State Water Board is proposing adding eight new risk indicators to the Risk Assessment. Details on the new proposed risk indicator calculation methodologies, thresholds, scoring and weights can be found in Appendix A. The following provides a summary of the proposed new risk indicators:

New Water Quality Risk Indicator

The State Water Board is recommending the addition of one new risk indicator to the Water Quality category of the Risk Assessment.

[8] https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/

Constituents of Emerging Concern

The purpose of this proposed risk indicator is to identify water systems that could potentially come out of compliance if certain constituents of emerging concern (CECs) were to be regulated by a primary and/or secondary maximum contaminant level (MCL). While there are many CECs, the State Water Board is proposing a limited list of CECs for inclusion in the calculation of this risk indicator based on the likelihood that an MCL will be developed. This proposed risk indicator would only assess water systems that have water quality sample results associated with hexavalent chromium (CrVI), 1,4-Dioxane, and/or the 18 chemicals associated with per- and polyfluoroalkyl substances (PFAS). More chemicals may be included in future iterations of the Risk Assessment.

Table 6 summarizes the proposed thresholds, score, and weights for Constituents of Emerging Concern. See Appendix A for additional information. It is important to note that if an MCL limit is determined in the future, it may be different than the thresholds used for this risk indicator.

Table 6: Proposed "Constituents of Emerging Concern" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**CrVI: All** calculated RAA(s), over 5-year period, are below 80% of the former MCL (RAA < 8 µg/L); and **PFAS: Less than 2** samples, over 5-year period, are positive; and **1,4-Dioxane: 0** calculated RAA(s), over 5-year period, are at or above the notification level.	0	N/A	0
1	**CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above 80% of the former MCL and below the former MCL (8 µg/L ≤ RAA < 10 µg/L); or **PFAS: 2 or more** samples, over 5-year period, are positive; this criterion applies to all 18 chemicals.	0.5	3	1.5
2	**CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above the former MCL (10 µg/L ≤ RAA); or **PFAS: 2 or more** samples, over 5-year period, are at or above the notification level; this criterion only applies to 3 chemicals that have notification level; or **1,4-Dioxane: 1 or more** calculated RAA(s), over 5-year period, are at or	1	3	3

Threshold Number	Threshold	Score	Weight	Max Score
	above the notification level (1 µg/L ≤ RAA).			

New Accessibility Risk Indicators

The State Water Board is recommending the addition of two new risk indicators to the Accessibility category of the Risk Assessment. These new risk indicators are meant to identify water systems that may be experiencing source capacity challenges. Stakeholder feedback on the 2021 Risk Assessment called for the inclusion of additional risk indicators that better assess water system source capacity and their ability to meet customer demand.

State rules require water systems to maintain a minimum level of service during normal (non-emergency) operating conditions. Consumers have a reasonable expectation to an adequate supply of water not just during average conditions but also during high demand periods. Source capacity and reliability have a significant effect on the ability of the water system to meet future regulatory obligations and consumer expectations.

Source Capacity Violations

The purpose of this proposed risk indicator is to identify water systems that have violated source capacity standards as required in California Waterworks Standards[9] within the last three years. This violation criteria includes:

- Failure to maintain adequate source capacity (may include curtailment order and/or service connection moratorium).
- Failure to maintain adequate pressure leading to a water outage.
- Failure to complete a required source capacity planning study.

The State Water Board developed new source capacity violation codes in 2021 to better track and identify water systems failing to meet source capacity standards. This risk indicator includes water systems that have had connection moratoriums within the last three years as well because these systems failed to meet these standards prior to this new tracking system.

Table 7 summarizes the proposed thresholds, score, and weights for Source Capacity Violations. See Appendix A for additional information.

[9] California Code of Regulations Title 22 Division 4 Chapter 16: https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I437FD430D4BA11DE8879F88E8B0DAAAE&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

Table 7: Proposed "Source Capacity Violations" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0** source capacity violations within the past 3 years; and **0** service connection moratoriums within the past 3 years.	0	N/A	0
1	**1 or more** source capacity violations within the past 3 years; or **1 or more** service connection moratoriums within the past 3 years.	1	3	3

Bottled or Hauled Water Reliance

The purpose of this proposed risk indicator is to identify water systems that have had to supplement or replace their source supply to meet customer demand with bottled water, and/or hauled water at any point within the past three years. A water system that is unable to meet the demand with their available sources due to water quality issues or source capacity challenges is at-risk of failing to provide water to the customers.

Table 8 summarizes the proposed thresholds, score, and weights for Bottled or Hauled Water Reliance. See Appendix A for additional information.

Table 8: Proposed "Bottled or Hauled Water Reliance" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0** occurrences of bottled water or hauled water reliance within the last three years.	0	N/A	0
1	**1 or more** occurrences of bottled water or hauled water reliance within the last three years.	Automatically At-Risk	N/A	N/A

New Affordability Risk Indicators

The State Water Board is recommending the addition of two new risk indicators to the Affordability Capacity category of the Risk Assessment. These new risk indicators are meant to identify water systems that have a community that is experiencing household affordability challenges. The two proposed risk indicators are direct measures of household drinking water affordability.

The initial data used for the two proposed risk indicators comes from the State Water Board's 2021 Drinking Water Arrearage Payment Program. Eligible community water system applicants were able to apply for a one-time payment to cover residential

arrearages that accrued during the COVID-19 pandemic (March 4, 2020 through June 15, 2021). Additional State assistance programs and datasets may be used to supplement this dataset as they become available.

Percentage of Residential Arrearages
The purpose of this proposed risk indicator is to identify water systems that have high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due.

Table 9 summarizes the proposed thresholds, score, and weights for Percentage of Residential Arrearages. See Appendix A for additional information.

Table 9: Proposed "Percentage of Residential Arrearages" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0% to 9%** residential arrearages.	0	N/A	0
1	**10% to 29%** residential arrearages.	0.5	2	1
2	**30% to 100%** residential arrearages.	1	2	2

Residential Arrearage Burden
The purpose of this proposed risk indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

Equation 1: Residential Arrearage Burden

$$\frac{Total\ Residential\ Arrearages\ (\$)}{Total\ Number\ of\ Residential\ Accounts}$$

Table 10 summarizes the proposed thresholds, score, and weights for Residential Arrearage Burden. See Appendix A for additional information.

Table 10: Proposed "Residential Arrearage Burden" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**Below top 40%** of systems with residential arrearage burden.	0	N/A	0
1	**Top 40%** of systems with residential arrearage burden.	0.5	2	1

Threshold Number	Threshold	Score	Weight	Max Score
2	**Top 20%** of systems with residential arrearage burden.	1	2	2

New TMF Capacity Risk Indicators

The State Water Board is recommending the addition of three new risk indicators to the TMF Capacity category of the Risk Assessment. These new risk indicators are meant to assess risk related to the financial capacity of water systems. Financial capacity refers to a water system's ability to balance its budget on an annual basis, maintain cash reserves for emergencies, and maintain sufficient cash to pay its bills on a timely basis.

Operating Ratio

The purpose of this proposed risk indicator is to identify water systems that do not have sufficient revenues to cover their costs of operating and maintaining their system. Specifically, "Operating Ratio" is a ratio of annual revenues compared to annual operating expenses. To be a self-supporting, a water system should strive to have at least as much annual revenue as it has operating expenses. In general, a water system should collect revenues greater than expenses in order to accommodate for future investments.

Equation 2: Operating Ratio

$$\frac{Annual\ Revenue\ (\$)}{Annual\ Operating\ Expenses\ (\$)}$$

Table 11 summarizes the proposed thresholds, score, and weights for Operating Ratio. See Appendix A for additional information.

Table 11: Proposed "Operating Ratio" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**1 or greater**	0	N/A	0
1	**Less than 1**	1	1	1

Total Annual Income

The purpose of this proposed risk indicator is to identify water systems whose total annual revenue is unable to cover their total annual expenses. A water system should generate enough revenue to cover all incurred expenses (including operational expenses) throughout the year. Total Net Annual Income of a water system should be a positive (+) value. If more money is spent than is brought in, then the water system will have to make adjustments in order to maintain operations. If the expenditures are outpacing revenue too quickly, then the water system may have to cut costs or

decrease its level of service. Reserves or available cash savings allows for a financial cushion in times when expenses are greater than revenues.

A water system may generate enough revenue to cover their annual operating and maintenance costs (operating ratio = 1 or greater), but in some cases revenues may fall short in covering a water system's total annual expenses. These additional expenses that fall outside of general operating and maintenance costs typically include debt/loan repayments, new/upgraded infrastructure investments, unforeseen emergency costs, etc.

Table 12 summarizes the proposed thresholds, score, and weights for Income. See Appendix A for additional information.

Table 12: Proposed "Total Annual Income" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**Greater than $0** total annual income	0	N/A	0
1	**Less than $0** total annual income	1	1	1

Days Cash on Hand

The purpose of this proposed risk indicator is to approximate the number of days a water system can cover its daily operations and maintenance costs, relaying only on their current cash or liquid reserves, before running out of cash. It is a helpful measure of how long a system can operate if it has a sudden and dramatic reduction in operating income, perhaps from a large customer leaving or an environmental emergency (fire, drought restrictions, etc.).

Days cash on hand is a ratio that is calculated by dividing a water system's unrestricted cash by the system's estimated daily expenses. This calculation approach allows for the comparison of water systems of different sizes by accounting for differences in reserves and operational expenses.

Equation 3: Days Cash on Hand

$$\frac{Unrestricted\ Cash\ (\$)}{Daily\ Operating\ Expenses\ (\$)}$$

Table 13 summarizes the proposed thresholds, score, and weights for Days Cash on Hand. See Appendix A for additional information.

Table 13: Proposed "Days Cash on Hand" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**90 days or more** cash on hand.	0	N/A	0

Threshold Number	Threshold	Score	Weight	Max Score
1	**Less than 90 days** cash on hand.	0.5	1	0.5
2	**Less than 30 days** cash on hand.	1	1	1

Updates to Existing Risk Indicator Calculation Methodologies

The State Water Board will be making modifications to the calculation methodologies to the individual risk indicators in Table 14. These updates are based on stakeholder feedback and internal deliberations on possible refinement opportunities.

Table 14: Risk Indicator Calculation Updates

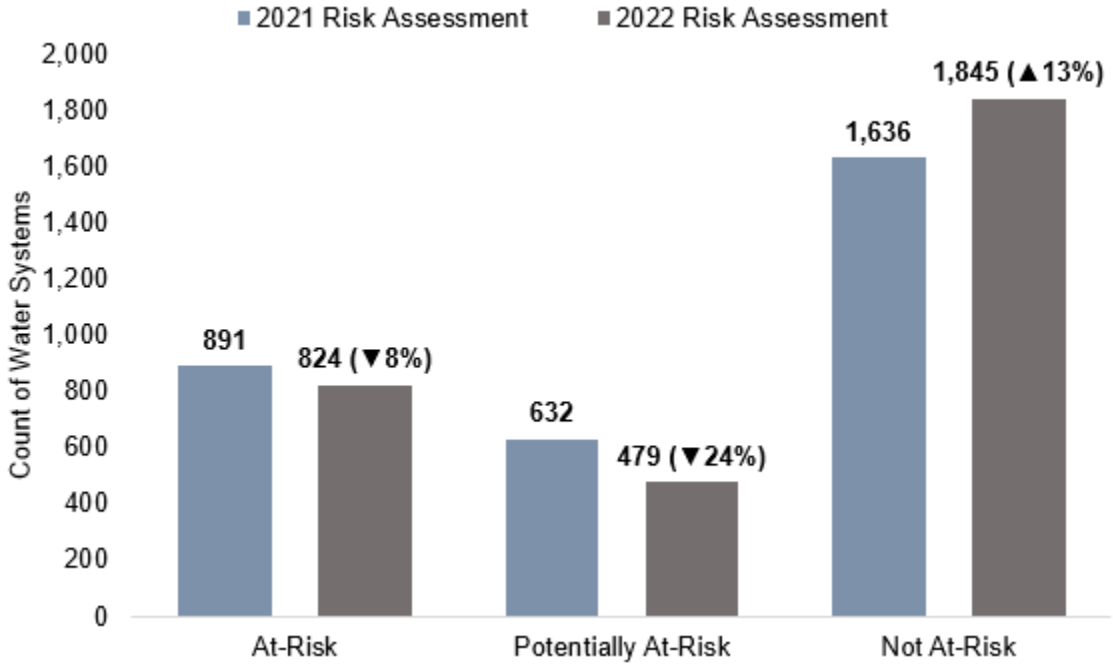
Risk Indicator	Calculation Update
Critically Overdrafted Groundwater Basin	• Remove water systems that do not have a groundwater source. • Rather than use water system boundary; utilize well location to identify water systems with sources that are within a critically overdrafted groundwater basin. • Threshold changed from 75% of water system's service area boundary within a basin, presence of at least one active groundwater well within a critically overdrafted basin.
% Median Household Income (MHI) & Extreme Water Bill	• 2020 residential customer charges will include other charges from taxes and fees to better capture charges outside of a typical water bill. • 2020 EAR, residential customer charges were reviewed and edited manually to improve data accuracy. • In 2021, statewide average water charges was calculated including systems that do not charge for water. This resulted in a lower statewide average. Moving forward, the statewide average will be calculated, excluding water systems that do not charge for water. To accommodate for data quality concerns, the min and max values for acceptable water rate charges for 6 HCF were also changed to $5 - $500 from $0 - $615 for the previous year.
Past Presence on the Failing: HR2W List	• Historical dataset was based on spreadsheets that were manually updated quarterly. State Water Board has updated the dataset using violation and enforcement data to create a more accurate historical dataset for the Failing: HR2W list.

Risk Indicator	Calculation Update
	• This dataset corrects Failing: HR2W list occurrence dates from January 2017 to December 2021.
Percentage of Sources Exceeded an MCL & Increasing Presence of Water Quality Trends Towards MCL	• Corrected gross alpha water quality results are calculated. Uranium and radon results are subtracted from the total gross alpha result if they occur on the same sample date and at the same sample point. • Corrected calculations were used to refresh and correct the 2021 Risk Assessment results.

Preliminary Results of the Risk Assessment for Public Water Systems Incorporating Proposed Changes

The State Water Board has conducted a preliminary 2022 Risk Assessment incorporating the proposed changes to the methodology summarized in the sections above. Figure 1 and Table 15 summarize the results and compares them to the 2021 Risk Assessment results.

Figure 1: Comparison of Risk Assessment Results Using 2021 and Proposed 2022 Methodologies[10]



[10] Failing: HR2W list water systems have not been excluded from the results.

Table 15: Small and Large Water System Comparison[11]

Risk Assessment Result	Small Systems (≤ 3,300 sc)	Large Systems (> 3,300 sc)	Total
2021 At-Risk	857	34	891
2022 At-Risk	**779**	**45**	**824 (↓ 8%)**
2021 Potentially At-Risk	594	38	632
2022 Potentially At-Risk	**433**	**46**	**479 (↓ 24%)**
2021 Not At-Risk	1,317	319	1,636
2022 Not At-Risk	**1,545**	**300**	**1,845 (↑ 13%)**

The State Water Board conducted an analysis comparing the "predictive power" of the 2021 and 2022 Risk Assessments in accurately identifying water systems at risk of failing. To conduct this analysis, the State Water Board compared the list of systems that met the thresholds for At-Risk and Potentially At-Risk to the list of unique water systems that were on the Failing: HR2W list in 2021 (Table 16).[12] Overall, the proposed changes to the Risk Assessment for public water systems marginally improves its predictive power by approximately 2%.

Table 16: Predictive Power of the Risk Assessment

Risk Assessment Result	Total Systems	Systems on the 2021 Failing: HR2W List	Predictive Power
2021			
At-Risk	889	306	78.87%
Potentially At-Risk	627	42	10.82%
Not At-Risk	1,632	40	
TOTAL:	**3,148**	**388**	**89.69%**
2022			
At-Risk	824	302	77.84% (↓ 1.03%)
Potentially At-Risk	479	53	13.66% (↑ 2.84%)
Not At-Risk	1,845	33	
TOTAL:	**3,148**	**388**	**92.49% (↑ 1.80%)**

[11] Failing: HR2W list water systems have not been excluded from the results.
[12] Deactivated water systems were removed from the 2021 and 2022 Risk Assessment results to facilitate the comparison. Systems that were on the Failing: HR2W list in 2021, but came off the list, are included.

Explore the results and data utilized in the preliminary 2022 Risk Assessment for public water systems here: https://bit.ly/3G5wHEo

2. Proposed Changes to the Risk Assessment for State Small Water Systems & Domestic Wells

The 2021 Needs Assessment included a Risk Assessment for state small water systems (SSWSs) and domestic wells that was solely based on the State Water Board's Aquifer Risk Map.[13] The Aquifer Risk Map identifies areas where groundwater is at high risk of containing contaminants that exceed safe drinking water standards and where groundwater is used or likely to be used as a drinking water source. State small water systems and domestic wells that are located in areas with high risk were determined to be At-Risk or Potentially At-Risk in the 2021 Needs Assessment.

After the release of the 2021 Needs Assessment, stakeholders called for the inclusion of additional risk indicators within the Risk Assessment for SSWSs and domestic wells that more closely aligns with the methodology used for public water system. In response, the State Water Board worked in partnership with the Department of Water Resources (DWR) to develop a new combined Risk Assessment for SSWSs and domestic wells that utilizes both the Aquifer Risk Map (water quality risk) and DWR's Drought Risk Vulnerability Tool[14] (drought risk).

Water Quality Risk

The Aquifer Risk Map is intended to help prioritize areas where domestic wells and state small water systems may be accessing groundwater that does not meet primary drinking water standards (maximum contaminant level or MCL). In accordance with Senate Bill 200, the Aquifer Risk Map is updated annually. The State Water Board hosted a public workshop on October 20, 2021 to solicit public feedback on proposed changes to the Aquifer Risk Map for 2022.[15] The following is a summary of the updates made to the 2022 Aquifer Risk Map after the public comment period concluded. The full 2022 Aquifer Risk Map methodology is available online.[16]

1. Re-focus Aquifer Risk Map to section level data instead of census block group risk percentile scores.

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[13] 2021 Aquifer Risk Map: https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=d11cd558dd4945729ae4f222034bd9c9

[14] https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/County-Drought-Planning

[15] https://www.waterboards.ca.gov/safer/docs/video/risk-aquifer-map-10-20-2021.mp4

[16] https://gispublic.waterboards.ca.gov/portal/home/item.html?id=62b116bb7e824df098b871cbce73ce3b

2. Change definition of “recent” results from 2 to 5 years.

3. Incorporate water quality data from cleanup monitoring sites (GeoTracker data).

The water quality risk scores for SSWSs and domestic wells is from the 2022 Aquifer Risk Map. Detailed methodology for the Aquifer Risk Map is available online.[17] In summary, the Aquifer Risk Map uses available raw source groundwater quality data to estimate the water quality risk to SSWSs and domestic wells. For the combined Risk Assessment for SSWSs and domestic wells, the 2022 Aquifer Risk Map data is normalized into four risk bins summarized in Table 17.

Table 17: Normalizing Aquifer Risk Map Results

Aquifer Risk Map Result	Normalized Risk Score	Risk Level
No nearby water quality data available for any contaminants.	N/A	Unknown Risk
Water quality estimates for all measured contaminants is below 80% of the MCL.	0	Low Risk
Water quality estimates for one or more contaminants is between 80% - 100% of the MCL.	0.25	Medium Risk
Water quality estimates for one or more contaminants is above the MCL.	1	High Risk

Drought & Water Shortage Risk

The drought and water shortage risk scores are from the DWR’s Drought Risk Vulnerability Tool. Detailed methodology for the drought risk scores is available online.[18] In summary, the DWR assessment utilizes a suite of risk factors to assess drought and water shortage risk for census block groups with self-supplied communities (reliant on domestic wells), including exposure to hazard, climate change, physical vulnerability, socioeconomic vulnerability, and record of outages.

For the combined Risk Assessment for SSWSs and domestic wells, the DWR drought and water shortage risk scores were normalized into four risk bins summarized in Table 18.

Table 18: Normalizing DWR Drought Risk Assessment Results

DWR Drought Assessment Result	Normalized Risk Score	Risk Level
No drought and water shortage risk scores are available for this area.	N/A	Unknown Risk

[17] https://gispublic.waterboards.ca.gov/portal/home/item.html?id=62b116bb7e824df098b871cbce73ce3b
[18] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/CDAG/Part-2-Appendix-1-Scoring-Method-Final.pdf

DWR Drought Assessment Result	Normalized Risk Score	Risk Level
Below top 25% of block groups most at risk for drought and water shortage.	0	Low Risk
Top 25% of block groups most at risk for drought and water shortage.	0.25	Medium Risk
Top 10% of block groups most at risk for drought and water shortage.	1	High Risk

The DWR drought and water risk assessment for self-supplied communities used census block groups as the area of analysis. In order to accurately combine this data with the Aquifer Risk Map results and overlay with the count of domestic wells and state small water systems at high risk for both variables, the drought and water shortage risk scores were converted to public land survey system (PLSS) square mile sections. To do this, the risk score for each block group was assigned to every PLSS section within the block group. For sections that overlapped one or more block groups, the highest overlapping risk score was assigned to the section.

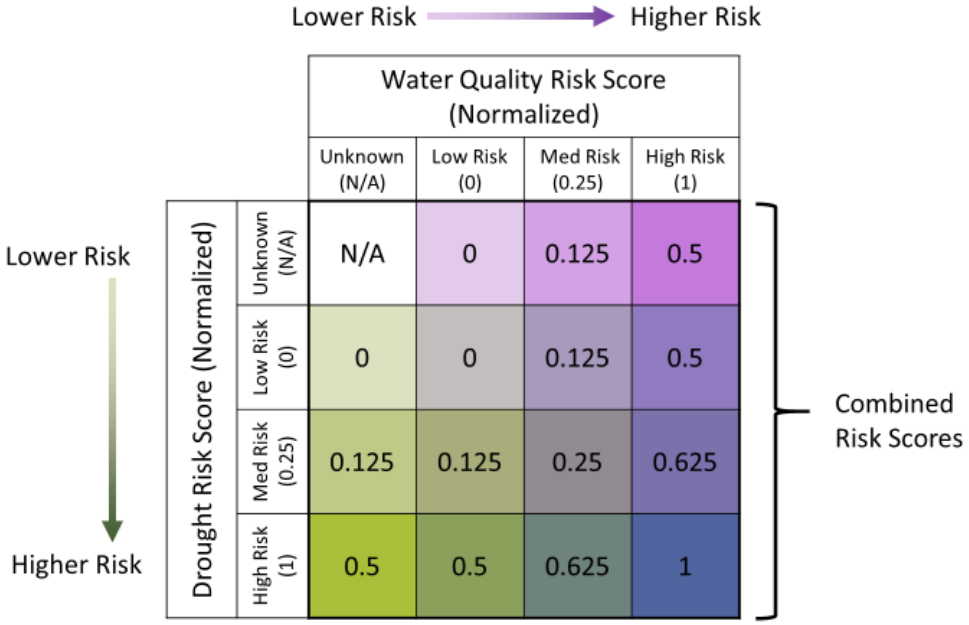
Proposed Methodology for Combined Risk Assessment Using Water Quality and Drought Risk

The two variables of drought risk and water quality risk were combined following a similar methodology as the combined Risk Assessment for public water systems. The normalized scores for water quality and drought risk for each PLSS section were added together and divided by the number of variables (two). Unlike the Risk Assessment for public water systems, the calculation does not adjust the denominator for missing data. This approach is recommended to reduce the bias (higher risk score) for locations that are missing data.

Equation 4: Combined Risk Score Calculation Method

$$\text{Combined Risk Score} = \frac{\text{Normalized Water Quality Risk Score} + \text{Normalized Drought Risk Score}}{2}$$

Figure 2: Example of Combined Risk Scores for each PLSS Section



Preliminary Results of the Combined Risk Assessment for State Small Water Systems & Domestic Wells

The 2022 combined Risk Assessment assessed 1,273 SSWSs and 312,187 domestic wells. SSWS locations were provided to the State Water Board through county reporting required through SB 200. Domestic well locations were sourced from the Online System for Well Completion Records (managed by DWR) and consist of "domestic" type well records, excluding those drilled prior to 1970 and excluding any destruction records.

Explore the combined Risk Assessment map and data here: https://bit.ly/3o2k7Qb

The tables below summarize the distribution of SSWS and domestic well counts based on their normalized water quality and drought risk scores.

Table 19: Statewide Count of SSWSs Showing Normalized Water Quality & Drought Risk Scores

		Water Quality Risk			
		N/A	Low	Med.	High
Drought Risk	N/A	2	2	0	2
	Low	55	173	44	263
	Med.	54	127	19	211
	High	30	124	12	155

Table 20: Statewide Count of Domestic Wells Showing Normalized Water Quality & Drought Risk Scores

		Water Quality Risk			
		N/A	Low	Med.	High
Drought Risk	N/A	25	49	12	78
	Low	27,592	63,813	8,925	32,379
	Med.	20,009	36,746	4,143	27,442
	High	20,566	33,674	3,998	32,736

The bivariate color display and the numeric tables above keep the two risk variables relatively separate (water quality and drought). Table 21 shows the count of SSWSs and Table 22 shows the count of domestic wells by combined risk score. For these tables, “At-Risk” contains areas with a combined risk score of 0.625 - 1, “Potentially At-Risk" contains areas with a combined risk score of 0.25 - 0.5, and “Not At-Risk" contains areas with a combined risk score of 0 – 0.125.

Table 21: Preliminary 2022 Risk Assessment Results for SSWSs

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Combined Risk Assessment	**378 (30%)**	**438 (34%)**	**455 (36%)**	**2 (0%)**
Water Quality Risk Only (all locations)	631 (50%)	75 (6%)	426 (33%)	141 (11%)
Drought Risk Only (all locations)	321 (25%)	411 (32%)	535 (42%)	6 (0%)

Table 22: Preliminary 2022 Risk Assessment Results for Domestic Wells

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
Combined Risk Assessment	**64,176 (21%)**	**90,840 (29%)**	**157,146 (50%)**	**25 (0%)**
Water Quality Risk Only (all locations)	92,635 (30%)	17,078 (5%)	134,282 (43%)	68,192 (22%)
Drought Risk Only (all locations)	90,974 (29%)	88,340 (28%)	132,709 (43%)	164 (0%)

The 2021 Risk Assessment for SSWS and domestic wells only examined water quality risk. When comparing SSWS and domestic well counts for 2021 and 2022, note that

several methodology changes were implemented in the 2022 Aquifer Risk Map update that changed the definition of "At-Risk", including the expansion of "recent" results from two years to five years, and the addition of GeoTracker (monitoring well) data. Additionally, updated location counts were used for both SSWS and domestic wells for 2022 that changed the total number of systems.[19] Table 23 summarizes the differences between the different assessments.

Table 23: Comparison of 2021 and 2022 Risk Assessment Results for State Small Water Systems and Domestic Wells

Assessment	At-Risk	Potentially At-Risk	Not At-Risk	Not Assessed
2021 SSWS (water quality only)	611 (42%)	71 (5%)	554 (38%)	227 (16%)
2022 SSWS				
Combined Assessment	378 (30%)	438 (34%)	455 (36%)	2 (0%)
Water Quality Only	631 (50%)	75 (6%)	426 (33%)	141 (11%)
2021 Domestic Wells (water quality only)	77,973 (24%)	15,791 (5%)	147,185 (43%)	84,800 (26%)
2022 Domestic Wells				
Combined Assessment	64,176 (21%)	90,840 (29%)	157,146 (50%)	25 (0%)
Water Quality Only	92,635 (30%)	17,078 (5%)	134,282 (43%)	68,192 (22%)

[19] Page 12 of the 2022 Aquifer Risk Map methodology contains more detailed breakdown of 2021/2022 comparison stats, including showing what the 2022 totals would be without any methodology changes. https://gispublic.waterboards.ca.gov/portal/home/item.html?id=62b116bb7e824df098b871cbce73ce3b

Figure 3: Map of Combined Risk Assessment Results for SSWSs & Domestic Wells (only areas with a SSWS or Domestic Well are shown)

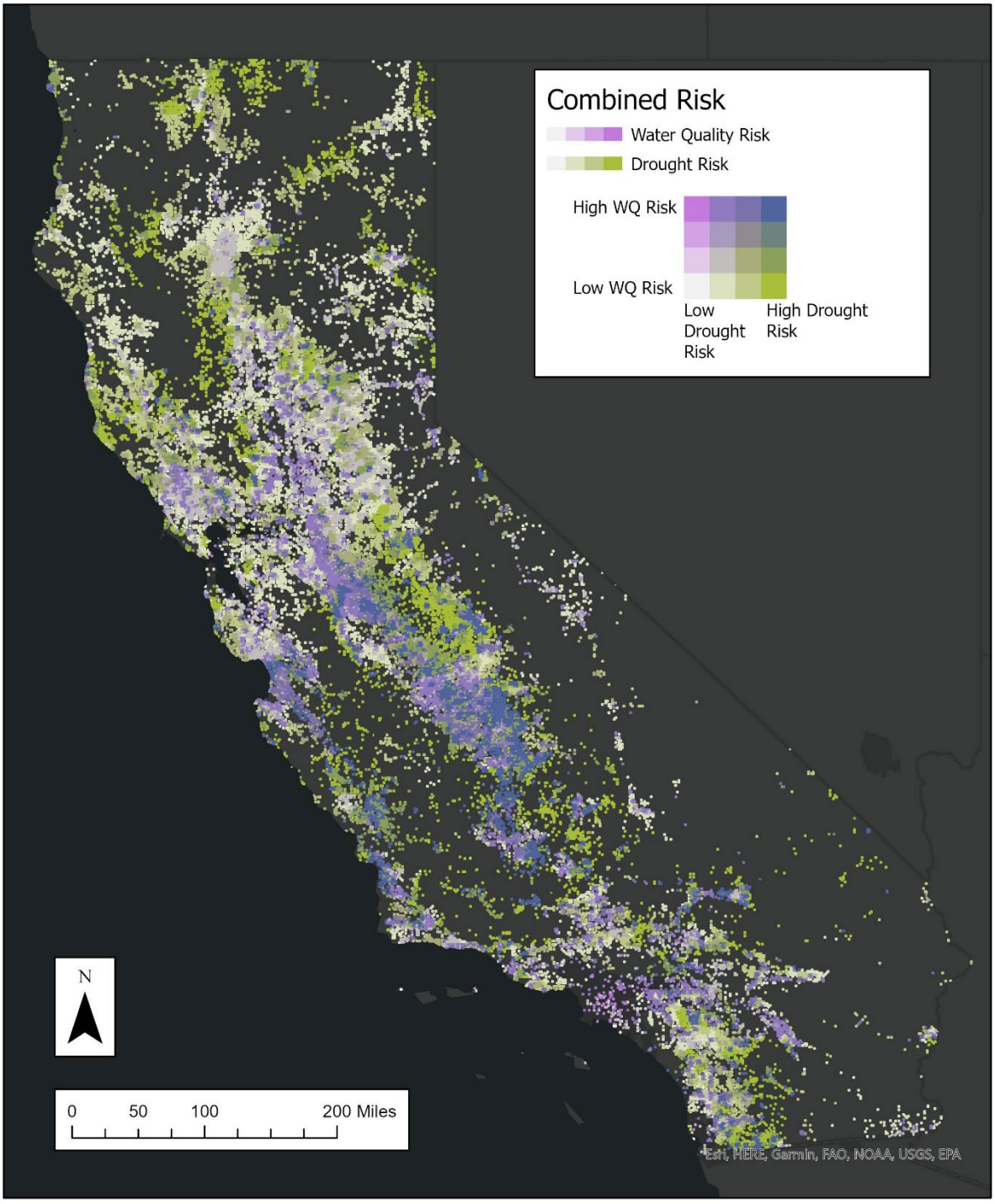


Figure 4: Water Quality Risk Map for SSWSs & Domestic Wells

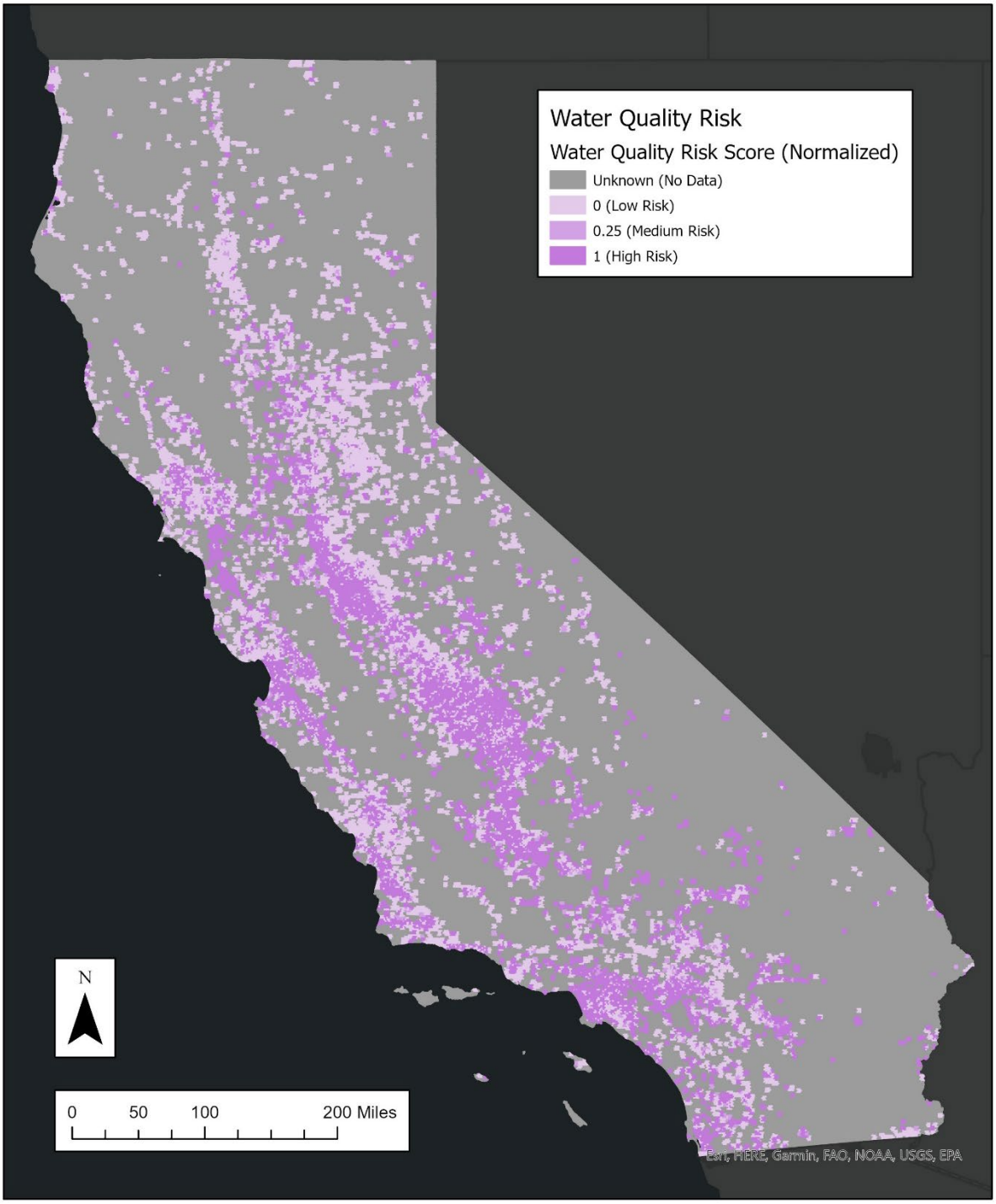
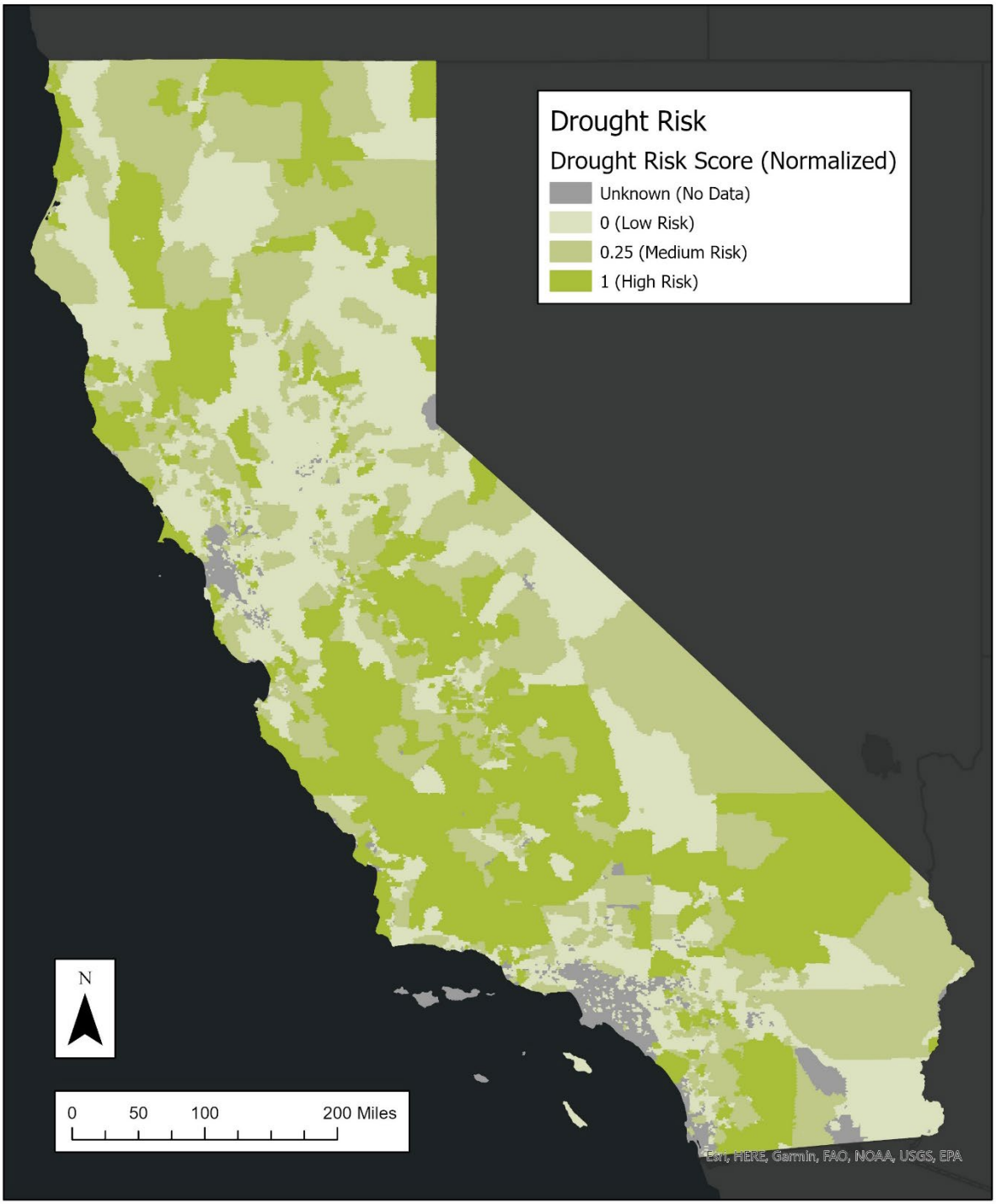


Figure 5: Drought Risk Map for SSWSs & Domestic Wells



Displaying CalEnviroScreen Data

Data from OEHHA's CalEnviroScreen 4.0 report[20] is available to view as a layer on the combined Risk Assessment map for SSWSs and domestic wells. CalEnviroScreen data is displayed for each census tract, and includes:

- CalEnviroScreen 4.0 score percentile
- Pollution burden percentile
- Population characteristics percentile
- Race/ethnicity population percentages
- Percent of the population living two times below the federal poverty level.

To display this information, users can zoom in to the map and click on census tracts when the "CalEnviroScreen 4.0" layer is displayed. All CalEnviroScreen 4.0 scores are displayed as percentiles. For example, a census tract in the 75th percentile has a higher score than 75% of all census tracts.

3. Targeted Drought Infrastructure Cost Assessment

The 2021 Needs Assessment included a comprehensive Cost Assessment for interim and long-term solutions for Failing: HR2W list systems, At-Risk public water systems, state small water systems, and domestic wells. The State Water Board is not conducting a full Cost Assessment in 2022 due to the limited changes in the 2022 Risk Assessment results.

On September 23, 2021 the California legislature passed Senate Bill 552[21] which has requirements for counties and small water systems around drought planning and mitigation activities. A key requirement of SB 522 is for small water suppliers, defined as community water system serving 15 to 2,999 service connections, to implement the following drought resiliency measures (subject to funding availability):

- No later than January 1, 2023, implement monitoring systems sufficient to detect production well groundwater levels.
- Beginning no later than January 1, 2023, maintain membership in the California Water/Wastewater Agency Response Network (CalWARN) or similar mutual aid organization.
- No later than January 1, 2024, to ensure continuous operations during power failures, provide adequate backup electrical supply.
- No later than January 1, 2027, have at least one backup source of water supply, or a water system intertie, that meets current water quality requirements and is sufficient to meet average daily demand.

[20] CalEnviroScreen 4.0 Web Viewer: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40
[21] Senate Bill No. 552, Section 10609.62, Chapter 245: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB552

- No later than January 1, 2032, meter each service connection and monitor for water loss due to leakages.
- No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet fire flow requirements.

In response to stakeholder feedback and the need to support SB 552 planning, the State Water Board has conducted a targeted Drought Infrastructure Cost Assessment for the 2022 Needs Assessment. Table 24 summarizes the important differences between the 2021 Cost Assessment and the 2022 Drought Cost Assessment. There are some overlapping cost estimates that span the two Cost Assessments; therefore, it is not advised for the 2022 Drought Cost Assessment results to be *added* to the 2021 Cost Assessment results. The 2022 Drought Infrastructure Cost Assessment results should be considered separately as a targeted cost estimate for SB 552 requirements. These estimates also do not include costs related to other non-infrastructure portions of SB 552, such as planning and technical assistance.

Table 24: Key 2021 and 2022 Cost Assessment Differences

	2021 Cost Assessment	2022 Drought Cost Assessment

Systems Included	• Failing: HR2W list systems
	• At-Risk public water systems
	• At-Risk state small water systems & domestic wells
		• All community water systems
		  ○ Small (15 to 2,999 connections)
		  ○ Large (greater than 2,999 connections)[22]
		• K-12 schools

Long-Term Cost Estimate Infrastructure/Activity	• Treatment • Physical consolidation • POU/POE • Other Essential Infrastructure (OEI): storage tanks, new wells, well replacement, upgraded electrical, backup power, distribution replacement, additional meters, etc. • Technical assistance	• Monitor static well levels • Backup electrical supply • Back-up source: new well or intertie • Meter all service connections
Interim Cost Estimate	• POU • POE	• Excluded

[22] Large systems are not required to comply with SB 552 drought infrastructure requirements.

	2021 Cost Assessment	2022 Drought Cost Assessment
	• Bottled Water	
20-Year Operation & Maintenance Costs	• Included	• Excluded

The State Water Board will be updating the full Cost Assessment results for Failing: HR2W list and At-Risk public water systems, state small water systems, and domestic wells in the 2023 Needs Assessment. The State Water Board will also be refining future iterations of the Cost Assessment model to incorporate the cost assumptions employed in the Drought Cost Assessment to better estimate interim and long-term solutions.

Overview of Drought Cost Assessment Methodology

The State Water Board utilized cost assumptions that were in the 2021 Cost Assessment and developed new cost assumptions to conduct the Drought Cost Assessment. Data and information were collected from projects funded by the State Water Board as well as cost estimates from external manufacturing venders and consulting firms. Refer to Appendix B for a more detailed overview of the Drought Cost Assessment cost assumptions and calculation methodology.

The State Water Board conducted a cost assessment for all SB 552 requirements except for the final requirement for fire flow. The State Water Board does not have authority to develop or enforce requirements regarding fire flow. Fire flow responsibility and jurisdiction falls to local fire officials. Thus, the State Water Board does not have machine-readable asset inventory, asset condition data and local fire protection requirements, which would be necessary to develop a cost estimate. The State Water Board will contact the Office of the State Fire Marshall to develop collaborative approaches for determining appropriate fire protection requirements.

Figure 6 summarizes the estimated number of small and large community water systems that may need to make investment to comply with the SB 552 requirements. The State Water Board used data collected from the 2020 Electronic Annual Report and other databased to identify these systems.

Figure 6: Estimated Number of Systems that Do Not Meet SB 552 Requirements

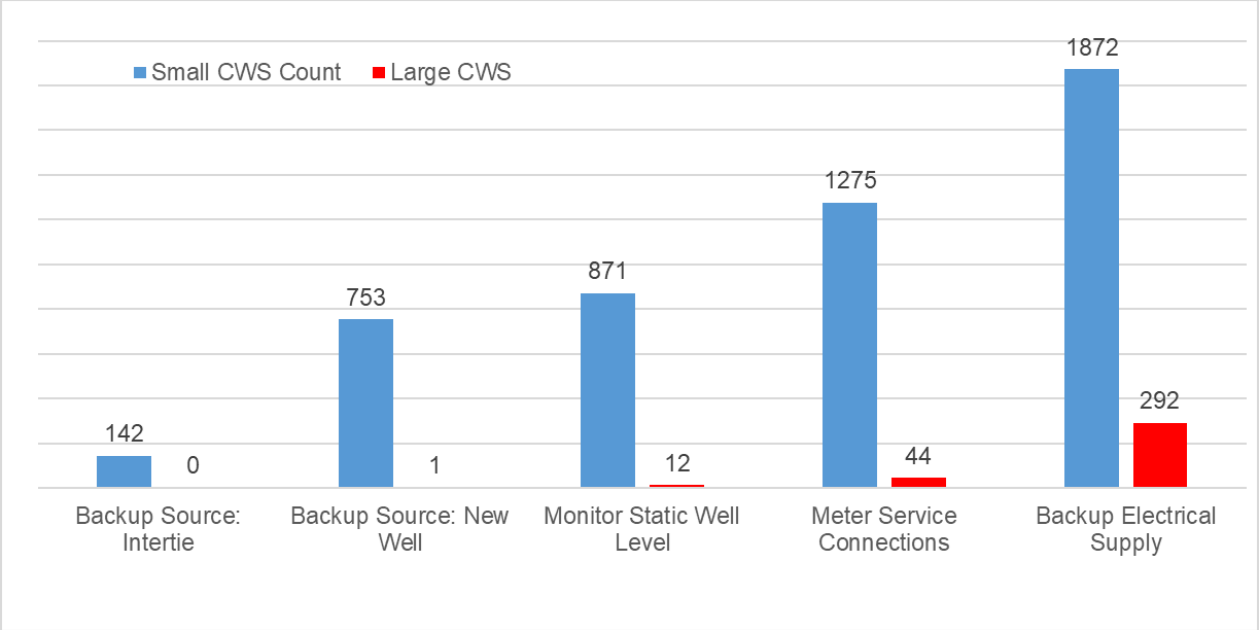


Table 25 summarizes the preliminary Drought Infrastructure Cost Assessment results. The overall estimated cost for drought measures is shown in the table below. For more information regarding cost assumptions and methodology see Appendix B.

Local solutions and actual costs will vary from system to system and will depend on site-specific details. Therefore, the Cost Assessment will not be used to inform site-specific decisions but rather give an informative estimate on a statewide basis.

Explore the preliminary data used in the Drought Infrastructure Cost Assessment by water system here: https://bit.ly/3r6IU7y

Table 25: Preliminary Drought Cost Assessment Results for Small Water Systems

Drought Requirement	# Small CWS[23]	Total Small CWS Cost Estimate
Monitor static well levels	871 (33%)	$1,680,000
Membership CalWARN / Mutual Aid	2,674 (100%)	$0
Backup electrical supply	1,872 (70%)	$224,820,000
Back-up source: new well	753 (28%)	$1,159,180,000
Back-up source: intertie	142 (5%)	$248,300,000
Meter all service connections	1,275 (48%)	$173,990,000

[23] Community water systems estimated to be out of compliance with SB 552 requirements that have 15 – 2,999 service connections.

Drought Requirement	# Small CWS[23]	Total Small CWS Cost Estimate
TOTAL:	2,674	**$1,807,970,000**

The State Water Board conducted a preliminary assessment of the potential cost range for implementing the fire flow requirements. The State Water Board does not collect asset inventory or condition data from water systems. Therefore, broad assumptions around the number of water systems that may not be meeting fire flow requirements and the extent of upgrades that would need to be made. Furthermore, the State Water Board does not have data related to city or county fire flow requirements. The State Water Board estimated costs related to source storage capacity and distribution system upgrades, which are on the order of multiple billion dollars, but need further refinement.

SB 552 does not apply to large water systems with 3,000 connections or more because they must have and implement an Urban Water Management Plan and Water Shortage Contingency Plan. However, for the purposes of the highlighting large water systems with similar infrastructure needs, the State Water Board conducted a preliminary Drought Infrastructure Cost Assessment for large water systems. These results are summarized in Table 26.

Table 26: Preliminary Drought Infrastructure Cost Assessment Results for Large Water Systems

Drought Requirement	# Large CWS[24]	Total Large CWS Cost Estimate
Monitor static well levels	12 (3%)	$20,000
Membership CalWARN / Mutual Aid	423 (100%)	$0
Backup electrical supply	54 (13%)	$443,290,000
Back-up source: new well	1 (0.2%)	$2,560,000
Back-up source: intertie	0	$0
Meter all service connections	44 (10%)	$44,800,000
TOTAL:	**423**	**$490,650,000**

[24] Community water systems estimated to be out of compliance with SB 552 requirements that have greater than 2,999 service connections.

4. Proposed Changes to the Affordability Assessment

Removing Percent Shut-Offs for Non-Payment

The purpose of this affordability indicator is to identify water systems that have residential customers struggling to pay their water bills due to affordability challenges. The 2021 Risk Assessment and Affordability Assessment utilized 2019 data from the Electronic Annual Report (EAR). However, Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021.[25] This information was therefore unavailable for the majority of 2020 and will not be collected in the 2021 EAR. The State Water Board is recommending the removal of this indicator from the Risk Assessment.

Proposed New Affordability Indicators

The State Water Board is recommending the addition of two new affordability indicators to the Affordability Assessment: Percent of Residential Arrearages and Residential Arrearage Burden.

> **Arrearage**: Debt accrued for drinking water services for residential accounts that have not fully paid their drinking water bill balance 60 days after the bill payment due date.

The initial data used for the two proposed risk indicators comes from the State Water Board's 2021 Drinking Water Arrearage Payment Program. Eligible community water system applicants were able to apply for a one-time payment to cover residential arrearages that accrued during the COVID-19 pandemic (March 4, 2020 through June 15, 2021). Additional State assistance programs and datasets may be used to supplement this dataset as they become available.

Details on the new proposed affordability indicator calculation methodologies, thresholds, scoring and weights can be found in Appendix A. The following provides a summary of the proposed new affordability indicators:

Percentage of Residential Arrearages

The purpose of this proposed risk indicator is to identify water systems that have high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due.

Table 27 summarizes the proposed thresholds, score, and weights for Percentage of Residential Arrearages. See Appendix A for additional information.

[25] https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/

Table 27: Proposed "Percentage of Residential Arrearages" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0% to 9%** residential arrearages.	0	N/A	0
1	**10% to 29%** residential arrearages.	0.5	2	1
2	**30% to 100%** residential arrearages.	1	2	2

Residential Arrearage Burden

The purpose of this proposed risk indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

Equation 5: Residential Arrearage Burden

$$\frac{Total\ Residential\ Arrearages\ (\$)}{Total\ Number\ of\ Residential\ Accounts}$$

Table 28 summarizes the proposed thresholds, score, and weights for Residential Arrearage Burden. See Appendix A for additional information.

Table 28: Proposed "Residential Arrearage Burden" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**Below top 40%** of systems with residential arrearage burden.	0	N/A	0
1	**Top 40%** of systems with residential arrearage burden.	0.5	2	1
2	**Top 20%** of systems with residential arrearage burden.	1	2	2

New Affordability Indicators Under Development

The State Water Board is partnering with OEHHA to develop a recommended approach for incorporating poverty (Poverty Prevalence Indicator [PPI]) and housing costs (Housing Burden Indicator [HBI]) into the Affordability Assessment for the 2023 Needs Assessment.[26] The State Water Board will also be hosting a series of workshops in

[26] Evaluation of Potential Indicators &Recommendations for Risk Assessment 2.0 for Public Water Systems:

2022 to solicit expert and stakeholder feedback on recommended indicators and thresholds.

Preliminary Affordability Assessment Results

The State Water Board conducted a preliminary Affordability Assessment for all community water systems utilizing the proposed changes to the affordability indicators summarized in the sections above. The results of this analysis are detailed in Table 29 and Table 30.

Table 29: Total Number of Systems that Exceeded a Minimum Risk Indicator Affordability Threshold

Community Status	Total Systems	%MHI Thresh.	Extreme Water Bill Thresh.	% Res. Arrearages	Res. Arrearage Burden
DAC	580 (20%)	88 (15%)	34 (6%)	37 (6%)	57 (10%)
SDAC	1,316 (46%)	289 (22%)	62 (5%)	58 (4%)	82 (6%)
Non-DAC	874 (30%)	122 (14%)	178 (20%)	43 (5%)	120 (14%)
Missing DAC Status	98 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
TOTAL:	**2,868**	**499 (17%)**	**274 (10%)**	**138 (5%)**	**259 (9%)**

Table 30: Preliminary 2022 Affordability Assessment Results

Community Status	Total Systems Assessed	High Affordability Burden[27]	Medium Affordability Burden[28]	Low Affordability Burden[29]
DAC	580	16 (3%)	47 (8%)	67 (12%)
SDAC	1,316	38 (3%)	83 (6%)	203 (15%)
Non-DAC	874	15 (2%)	132 (15%)	150 (17%)
Missing DAC Status	98	0 (0%)	0 (0%)	0 (0%)
TOTAL:	**2,868**	**69 (2%)**	**262 (9%)**	**420 (15%)**

https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

[27] Community water system met the minimum threshold for 3 or 4 of the affordability indicators.
[28] Community water system met the minimum threshold for 2 of the affordability indicators.
[29] Community water system met the minimum threshold for 1 of the affordability indicators.

The results of the Affordability Assessment for individual community water systems can be accessed here: https://bit.ly/3L1aBXp

5. Next Steps

Public Workshop Webinar

The State Water Board will be hosting a public webinar workshop on February 2, 2022 to solicit stakeholder feedback and recommendations on the proposed changes to the Needs Assessment methodologies summarized in this white paper.

Registration for SAFER Webinar on February 2, 2022 (9:00 – 12:00 pm pacific)[30]: https://waterboards.zoom.us/webinar/register/WN_R1GlQpWUSDWs3r9ptpYqOA

Materials on past Needs Assessment workshops can be found at SAFER website: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs

Finalizing 2022 Needs Assessment

The State Water Board will review and consider public and stakeholder feedback on the recommended changes to the Needs Assessment methodologies from February 2, 2022 through March 2, 2022 to determine the final 2022 Needs Assessment methodologies. Public feedback and recommendations should be submitted:

- In person during the February 2, 2022 webinar workshop; or
- By email: SAFER@waterboards.ca.gov

The final 2022 Needs Assessment results will be published in April 2022.

Water System Requests for Data Updates

The State Water Board is accepting inquiries related to underlying data change requests for the preliminary 2022 Needs Assessment results. The data used across the Needs Assessment are drawn from multiple sources. Data sources for the new proposed changes are detailed in Appendix A and Appendix B; data sources for unchanged risk and affordability indicators are detailed in the Appendixes of the 2021 Needs Assessment report.[31] Water systems are encouraged to reach out via the online webform below.

Water System Data Change Request Webform:
https://forms.office.com/g/sguw2zPW4Y

[30] A recording of the webinar will be available on the State Water Board's website: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs

[31] 2021 Drinking Water Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Appendix A: New Proposed Risk Indicator Calculation Methodologies

Constituents of Emerging Concern

Constituents of emerging concern (CEC) are unregulated chemicals[32] that are potentially imposing adverse health effects and are likely present (i.e., known or anticipated to occur) at public water systems or in groundwater sources. The purpose of this proposed risk indicator is to identify water systems that could potentially come out of compliance if certain constituents of emerging concern (CECs) were to be regulated by a primary and/or secondary maximum contaminant level (MCL).

While there are many CECs, the State Water Board is proposing a limited list of CECs for inclusion in the calculation of this risk indicator based on the likelihood that an MCL will be developed. This proposed risk indicator would only assess water systems that have water quality sample results associated with hexavalent chromium (CrVI), 1,4-Dioxane, and/or the 18 chemicals pertaining to per- and polyfluoroalkyl substances (PFAS) chemical group. The selection of these chemicals was influenced by monitoring data coverage and current regulatory priorities. More chemicals may be included in future iterations of the Risk Assessment.

> **Hexavalent chromium (CrVI)**: Chromium is a heavy metal that occurs throughout the environment. The Trivalent form is a required nutrient and has very low toxicity. The hexavalent form, also commonly known as Chromium-6, is more toxic and has been known to cause cancer when inhaled. In recent scientific studies in laboratory animals, CrVI has also been linked to cancer when ingested. Much of the low level CrVI found in drinking water is naturally occurring, reflecting its presence in geological formations throughout the state. However, there are areas of contamination in California from historic industrial use, such as the manufacturing of textile dyes, wood preservation, leather tanning, and anti-corrosion coatings, where CrVI contaminated waste has migrated into the underlying groundwater.
>
> **1,4-Dioxane**: 1,4-dioxane has been used as a solvent and stabilizer for other solvents in a number of industrial and commercial applications. In 1988, 1,4-dioxane was added to the list of chemicals known to the state to cause cancer[33] and is also considered to pose a cancer risk by U.S. EPA. Over the past decade, 1,4-dioxane has been found in a number of wells, mostly in southern California.

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[32] Chemicals that are not regulated by the National/State Primary & Secondary Drinking Water Regulations

[33] Office of Environmental Health Hazard Assessment - Proposition 65 (California Code of Regulations, Title 27, Section 27001): https://oehha.ca.gov/proposition-65

The drinking water notification level for 1,4-dioxane is 1 microgram per liter (µg/L). More information can be found at the State Water Board webpage.[34]

Per- and polyfluoroalkyl substances (PFAS): PFAS are a large group of synthetic fluorinated chemicals widely used in industrial processes and consumer products. These synthetic compounds are very persistent in the environment. People are exposed to these compounds through food, food packaging, textiles, electronics, personal hygiene products, consumer products, air, soils, and drinking water. PFAS contamination is typically localized and associated with an industrial facility that manufactured these chemicals or an airfield at which they were used. Studies indicate that continued exposure to low levels of PFAS may result in adverse health effects.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Water quality monitoring sample results for the following contaminants: Safe Drinking Water Information System (SDWIS)

Analyte names and codes for the contaminants of interest in SDWIS are listed in the table below.

Table 31: Analyte Names and Codes for CrVI, 1,4-Dioxane & PFAS

Analyte Name	Analyte Code
Hexavalent Chromium (CrVI)	1080
1,4-Dioxane	2049
Per- and polyfluoroalkyl substances (PFAS)	
Perfluorobutanesulfonic Acid (PFBS)	2801
Perfluoroheptanoic Acid (PFHpA)	2802
Perfluorohexane Sulfonic Acid (PFHxS)	2803
Perfluorononanoic Acid (PFNA)	2804
Perfluoroctane Sulfonic Acid (PFOS)	2805
Perfluoroctanoic Acid (PFOA)	2806
Perfluorodecanoic Acid (PFDA)	2807
Perfluorododecanoic Acid (PFDoA)	2808
Perfluorohexanoic Acid (PFHxA)	2809
Perfluorotetradecanoic Acid (PFTA)	2810
Perfluorotridecanoic Acid (PFTrDA)	2811
Perfluoroundecanoic Acid (PFUnA)	2812

[34] California State Water Resources Control Board - 1,4-Dioxane: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/14-Dioxane.html

Analyte Name	Analyte Code
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	2813
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	2814
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	2815
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	2816
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2817
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	2818

Risk Indicator Calculation Methodology:

Prepare CrVI Data:

- Identify water systems with the following criteria:
  - Water System Status – Active
  - Source Facility Status – Active
  - Sample Point Status – Active
- Exclude water quality data that was:
  - FP – False Positive
  - IV – Invalid
  - QQ – Questionable
- Calculate Running Annual Averages (RAA) at each sample point over 5-year period and select the highest value for that sample point.
- Count the total number of RAAs that are between 80% of the former MCL and the former MCL (8 µg/L ≤ RAA < 10 µg/L) within a water system.
- Count the total number of RAAs that are at or above the former MCL (10 µg/L ≤ RAA) within a water system.

Prepare PFAS Data:[35]

- Identify water systems with the following criteria:
  - Water System Status – Active
  - Source Facility Status – Active
  - Sample ID – Active
- Exclude water quality data that was:
  - FP – False Positive
  - IV – Invalid

[35] There are potentially 18 chemicals listed under PFAS chemical group in SDWIS while the actual dataset include only 12 chemicals with any positive results after all the filters were applied as dataset was prepared.

    - QQ – Questionable
- Count the total number of positive sample results that are at or above the Notification Level (NL) over a 5-year period for contaminants with a NL for each water system.

Table 32: PFAS Notification Levels

Analyte Name	Notification Level (NL)
PFOS	0.0065 µg/L
PFOA	0.0051 µg/L
PFBS	0.5 µg/L

- Count the total number of positive sample results over 5-year period within a water system.

Prepare 1,4-Dioxane Data:

- Identify water systems with the following criteria:
    - Water System Status – Active
    - Source Facility Status – Active
    - Sample ID – Active
- Exclude water quality data that was:
    - FP – False Positive
    - IV – Invalid
    - QQ – Questionable
- Calculate Running Annual Averages (RAA) at each sample point over 5-year period and select the highest value for that sample point.
- Count the total number of RAAs that are at or above the notification level (1 µg/L ≤ RAA) within a water system.

Proposed Thresholds

CrVI: On July 1, 2014, an MCL of 10 µg/L CrVI was approved by the Office of Administrative Law. On May 31, 2017, the Superior Court of Sacramento County issued a judgment invalidating the MCL on the basis that the State had not properly considered the economic feasibility of complying with the MCL. The State Water Board is currently working on the development of a new MCL for CrVI.[36] Until a new MCL is developed, the State Water Board is recommending using the previous MCL as part of a tiered threshold for this risk indicator. Water systems with one or more RAA over a 5-year

[36] https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.html

period are at or above 80% of the former MCL are considered medium risk and any RAA over a 5-year at or above the former MCL is considered high risk.

1,4-Dioxane: The State Water Board is recommending a binary threshold for 1,4-Dioxane. The drinking water notification level for 1,4-dioxane is 1 microgram per liter (ug/L).[37] In January 2019, the State Water Board requested for the Office of Environmental Health Hazard Assessment (OEHHA) to establish a public health goal for 1,4-dioxane.[38]

PFAS: Due to the ubiquitous nature of these contaminants, two positive samples are suggested as part of the tiered threshold to ensure that the water quality sample was not compromised. Since the risk related to each of the PFAS chemicals is not fully known, water quality is noted as a medium risk for any two positive samples of any PFAS contaminant. Three of the 18 PFAS chemicals have a notification level.[39] When two or more samples for these three PFAS chemicals are at or above their notification levels, they are considered to be at high risk for this indicator threshold.

Table 33: Recommended Thresholds for Constituents of Emerging Concern

Threshold Number	Threshold	Risk Level
0	**CrVI: All** calculated RAA(s), over 5-year period, are below 80% of the former MCL (RAA < 8 µg/L); and **PFAS: Less than 2** samples, over 5-year period, are positive; and **1,4-Dioxane: 0** calculated RAA(s), over 5-year period, are at or above the notification level.	Low Risk
1	**CrVI: 1 or more** calculated RAA(s) over 5-year period are at or above 80% of the former MCL and below the former MCL (8 µg/L ≤ RAA < 10 µg/L); or **PFAS: 2 or more** samples over 5-year period are positive; this criterion applies to all 18 chemicals.	Medium Risk
2	**CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above the former MCL (10 µg/L ≤ RAA); or	High Risk

[37] https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/14-Dioxane.html
[38] https://oehha.ca.gov/water/public-health-goals-phgs
[39] The State Water Board recognizes that more work is being done in this area and that the presence of any PFAS in drinking water may pose a public health risk. Notification levels are nonregulatory, health-based advisory levels established for contaminants in drinking water for which MCL have not been established. A notification level may be considered a candidate for the establishment of an MCL in the future, but it has not completed going through the regulatory standard setting process.

Threshold Number	Threshold	Risk Level
	PFAS: 2 or more samples, over 5-year period, are at or above the notification level; this criterion only applies to 3 chemicals that have notification level; or **1,4-Dioxane: 1 or more** calculated RAA(s), over 5-year period, are at or above the notification level (1 µg/L ≤ RAA).	

Proposed Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. **If a water system meets the criteria for more than one constituent: CrVI, 1,4-Dioxane, and/or PFAS, the higher risk score will be used.** Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is suggested for the "Constituents of Emerging Concern" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 3. Table 34 summarizes the proposed thresholds, score, and weights for Constituents of Emerging Concern.

Table 34: Proposed "Constituents of Emerging Concern" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**CrVI: All** calculated RAA(s), over 5-year period, are below 80% of the former MCL (RAA < 8 µg/L); and **PFAS: Less than 2** samples, over 5-year period, are positive; and **1,4-Dioxane: 0** calculated RAA(s), over 5-year period, are at or above the notification level.	0	N/A	0
1	**CrVI: 1 or more** calculated RAA(s) over 5-year period are at or above 80% of the former MCL and below the former MCL (8 µg/L ≤ RAA < 10 µg/L); or **PFAS: 2 or more** samples over 5-year period are positive; this criterion applies to all 18 chemicals.	0.5	3	1.5
2	**CrVI: 1 or more** calculated RAA(s), over 5-year period, are at or above the former MCL (10 µg/L ≤ RAA); or	1	3	3

Threshold Number	Threshold	Score	Weight	Max Score
	PFAS: 2 or more samples, over 5-year period, are at or above the notification level; this criterion only applies to 3 chemicals that have notification level; or **1,4-Dioxane: 1 or more** calculated RAA(s), over 5-year period, are at or above the notification level (1 µg/L ≤ RAA).			

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Constituents of Emerging Concern: https://tabsoft.co/3nXvusx

Source Capacity Violations

The purpose of this proposed risk indicator is to identify water systems that have violated source capacity standards as required in California Waterworks Standards[40] within the last three years. This violation criteria includes:

- Failure to maintain adequate source capacity (may include curtailment order and/or service connection moratorium).
- Failure to maintain adequate pressure leading to a water outage.
- Failure to complete a required source capacity planning study.

The State Water Board developed new source capacity violation codes in 2021 to better track and identify water systems failing to meet source capacity standards. Historically, the State Water Board has responded to source capacity violations with targeted citations, curtailment orders, and service connection moratoriums. Since the new source capacity violations only reflect recent actions, this risk indicator will also include water systems that have had active connection moratoriums within the last three years.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Service Connection Moratoriums: SDWIS

[40] California Code of Regulations Title 22 Division 4 Chapter 16

- Source Capacity Violations: Violation Type Code in SDWIS (Table 35): WW – Waterworks Standards

Table 35: Source Capacity Violation Analyte Codes

Violation Criteria	Analyte Code	Description
Failure to Maintain Adequate Source Capacity	C277 – CCR §64554 – SRC CAPACITY	If a water system fails to have adequate source capacity pursuant to CCR section 64554[41]
Failure to Maintain Adequate Source Capacity	C278 – CCR §64554 – SRC CAPACITY (CURTAILMENT)	If a water system fails to have adequate source capacity pursuant to CCR section 64554 AND a curtailment order has been issued (i.e., the failure is directly related to curtailments)
Failure to Maintain Adequate Pressure Leading to a Water Outage[42]	C279 – CCR §64602 – WATER OUTAGE	If a water system fails to maintain adequate pressure, which leads to a water outage
Failure to Complete A Source Capacity Planning Study	C280 – CCR §64558 – SRC CAPACITY STUDY FAILURE	If a water system fails to complete a source capacity planning study required as part of an enforcement action

Risk Indicator Calculation Methodology:

- Source capacity violations - Identify systems that have had one or more source capacity violations within the past three years using the violation type code and analyte codes listed in Table 35.
- Service connection moratoriums - Identify water systems that have had one or more SCMs within the past three years.
    - Start Date & End Date
        - Historical SCM – have both the Start Date & End Date
        - Current (Active) SCM – have only Start Date

Proposed Threshold

The State Water Board is recommending a binary threshold for the Source Capacity

[41] At all times, public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD).

- ≥ 1,000 service connections – source capacity, storage capacity, and/or emergency source connections must meet 4 hours of peak hourly demand (PHD)
- < 1,000 service connections – storage capacity ≥ MDD

[42] This violation criterion is used for repeated, long-term water outages, consistent, repeated low-pressure event. This is not for routine main breaks or short-term outages

Violations risk indicator. Any water systems that has not been able to meet source capacity water works standards within the last three years should receive risk points.

Table 36: Recommended Thresholds for Source Capacity Violations

Threshold Number	Threshold	Risk Level
0	**0** source capacity violations within the past 3 years; and **0** service connection moratoriums within the past 3 years.	Low Risk
1	**1 or more** source capacity violations within the past 3 years; or **1 or more** service connection moratoriums within the past 3 years.	High Risk

Proposed Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the maximum weight of 3 is suggested for the "Source Capacity Violations" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 3. Table 37 summarizes the proposed thresholds, score, and weights for Source Capacity Violations.

Table 37: Proposed "Source Capacity Violations" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0** source capacity violations within the past 3 years; and **0** service connection moratoriums within the past 3 years.	0	N/A	0
1	**1 or more** source capacity violations within the past 3 years; or **1 or more** service connection moratoriums within the past 3 years.	1	3	3

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Source Capacity Violations: https://tabsoft.co/3tQDQWC

Bottled or Hauled Water Reliance

The purpose of this proposed risk indicator is to identify water systems that have had to supplement or replace their source supply to meet customer demand with bottled water, and/or hauled water at any point within the past three years. A water system that is unable to meet the demand with their available sources due to water quality issues or source capacity challenges is at-risk of failing to provide water to the customers.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

To identify water systems that have had reliance on bottled water and/or hauled water at any point within the past 3 years, the following data points from multiple sources were used.

- Internal State Water Board Interim Solution Data Spreadsheet: Division of Financial Assistance (DFA)
    - Type of Assistance in "Regional Project" tab
        - Bottled Water
        - Hauled Water
    - Category in "All other funding" tab
        - Bottled Water
        - Hauled Water
- Water Source Facility: SDWIS
    - Water Source Facility Name – any facility names containing "Hauled"; or
    - Water Source Facility Type Code
        - NN – Non-Piped, Non-Purchased
        - NP – Non-Piped, Purchased
- Drought Report Data Spreadsheet: Division of Drinking Water (DDW)
    - Actions taken in response to water outage or shortage
        - Bottled Water
        - Hauling Water
- Drought Projects Funding Commitments Data Spreadsheet[43]: Department of Water Resources (DWR)
    - Project Type - any project types containing "Bottled" and/or "Hauled"

Risk Indicator Calculation Methodology:

[43] DWR's funding commitments up to December 2021 were provided to the State Water Board. Any projects with a county applicant were excluded from the analysis because these projects are typically designed to support private domestic wells, not public water systems. It is important to note that after applying this filter only one applicant appeared to be a public water system; however, confirmation of its identity was not available because the applicant name did not closely align with any public water system in the State Water Board's databases. DWR does not track public water system applicants by PWSID, which is a unique identifier used by the State Water Board.

- Prepare DFA data – Identify water systems that have had one or more enrollments for receiving assistance of bottled water and/or hauled water. Some water systems may have multiple enrollments across different assistance types, funding sources and communities served.
- Prepare SDWIS data
    - Availability Codes reflect the availability for NN and NP facilities.
        - P – Permanent (the source is used all year round)
        - I – Interim (the source is used partly during the year)
        - E - Emergency (the source is used only during emergencies)

Table 38: Preparation of SDWIS Hauled Water Data

Availability Code	Rely on hauled water only?	Include in the dataset?
P – Permanent	Yes	Include
P – Permanent	No	Include if system has been under hauled water reliance within the past 3 years.
I – Interim	Yes	Include
I – Interim	No	Include if system has been under hauled water reliance within the past 3 years.
E – Emergency	Yes or No	Include if system is listed in DFA Interim Solution Data and DDW Drought Report

- Prepare DDW Drought Report Data – Identify water systems that have had bottled/hauled water in response to water outage or shortage due to drought.
- Combine two DFA spreadsheet tabs, SDWIS data and DDW Drought Report data.
- Remove any duplicate of the water systems to identify unique systems.

Proposed Threshold

The State Water Board analyzed how water systems performed for this risk indicator by SAFER status: Failing: HR2W, At-Risk, Potentially At-Risk, and Not At-Risk. This analysis concluded that the majority of water systems that have relied on bottled water or hauled water over the late three years are either currently failing or at risk of failing (Table 39). Since there is a strong correlation between this risk indicator and failing, the State Water Board is recommending a binary threshold of at least one or more occurrences.

Table 39: 2021 SAFER Status of Systems that Have Bottled Water or Hauled Water Reliance

TOTAL	Failing: HR2W List[44]	At-Risk	Potentially At-Risk	Not At-Risk
88	57 (65%)	18 (20%)	9 (10%)	4 (5%)

Table 40: Recommended Thresholds for Bottled or Hauled Water Reliance

Threshold Number	Threshold	Risk Level
0	**0** occurrences of bottled water or hauled water reliance within the last three years.	Low Risk
1	**1 or more** occurrences of bottled water or hauled water reliance within the last three years.	High Risk

Proposed Risk Indicator Scoring & Weighting

Due the strong correlation between this risk indicator and failing, the State Water Board is recommending that any water systems that has relied on bottled or hauled water over the last three years to supplement their sources should automatically be classified as At-Risk, if they are not currently on the Failing: HR2W list.

Table 41: Proposed "Bottled or Hauled Water Reliance" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0** occurrences of bottled water or hauled water reliance within the last three years.	0	N/A	0
1	**1 or more** occurrences of bottled water or hauled water reliance within the last three years.	Automatically At-Risk	N/A	N/A

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

[44] Failing: HR2W List retrieved from the State Water Board SAFER Clearinghouse database on January 3, 2022

Bottled or Hauled Water Reliance: https://tabsoft.co/3HkKAjd

Percentage of Residential Arrearages

The purpose of this proposed risk indicator is to identify water systems that have high percentage of their residential customers that have not paid their water bill and are at least 60 days or more past due. The higher the percentage of residential customers, the more vulnerable the community is to affordability challenges.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- Total number of residential accounts in arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Risk Indicator Calculation Methodology:

Equation 6: Percentage of Residential Arrearages

$$\frac{\textit{Total Number of Residential Accounts in Arrears}}{\textit{Total Number of Residential Accounts}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program, for example investor owned utilities with multiple water systems, were excluded from the calculation of this risk indicator because the State Water Board is unable to disaggregate the number of residential accounts in arrears by individual public water system ID (PWSID).

Proposed Threshold

An indicator threshold for the percent of residential arrearages, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board utilized a 10% threshold for the risk indicator "% Shut-Offs for Non-Payment" in the 2021 Risk Assessment.[45] This risk indicator is similar in that it measured residential customers that were unable to pay their water bills and had their water shut-off. Therefore, the State Water Board is recommending a tiered threshold for this indicator, drawing upon the threshold developed for "% Shut-Offs for Non-Payment."

[45] The State Water Board is recommending the removal of the risk indicator "% Shut-Offs for Non-Payment" because there was an Executive Order that prohibited water shut-offs beginning March 4, 2020 through December 31, 2021. This information was therefore unavailable for the majority of 2020 and will not be collected by the State Water Board for 2021 annual reporting.

Table 42: Recommended Thresholds for Percentage of Residential Arrearages

Threshold Number	Threshold	Risk Level
0	**0% to 9%** residential arrearages.	Low Risk
1	**10% to 29%** residential arrearages.	Medium Risk
2	**30% to 100%** residential arrearages.	High Risk

Proposed Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from an internal State Water Board, Division of Drinking Water workgroup, the weight of 2 is suggested for the "Percentage of Residential Arrearages" risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 2. Table 43 summarizes the proposed thresholds, score, and weights for Percentage of Residential Arrearages.

Table 43: Proposed "Percentage of Residential Arrearages" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**0% to 9%** residential arrearages.	0	N/A	0
1	**10% to 29%** residential arrearages.	0.5	2	1
2	**30% to 100%** residential arrearages.	1	2	2

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Percentage of Residential Arrearages: https://tabsoft.co/3IPKCQH

Residential Arrearage Burden

The purpose of this proposed risk indicator is to identify water systems that would have a high residential arrearage burden if they were to distribute their residential arrearages accrued during the COVID-19 pandemic period (March 4, 2020 through June 15, 2021) across their total residential rate base. This indicator measures how large of a burden non-payment is across the water system's residential customers.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- Total outstanding residential arrears: Drinking Water Arrearage Payment Program applicants (October through December 2021).
- Total number of residential accounts: SDWIS

Risk Indicator Calculation Methodology:

Equation 7: Residential Arrearage Burden

$$\frac{\textbf{\textit{Total Residential Arrearages}}\ (\$)}{\textbf{\textit{Total Number of Residential Accounts}}}$$

Water systems that were included in an aggregated application for the Drinking Water Arrearage Payment Program were excluded from the calculation of this risk indicator because the State Water Board is unable to disaggregates total residential arrearages by individual PWSID.

Proposed Threshold
An indicator threshold for residential arrearage burden, as defined here or a similar measure, has not to the State Water Board's knowledge been assessed in other previous studies as related to water system failure. However, the State Water Board is recommending a similar tiered threshold utilized for the "Extreme Water Bill" affordability risk indicator, which utilizes an approach that compares how individual water systems are scoring to their peers, where data is available.

Table 44: Recommended Thresholds for Residential Arrearage Burden

Threshold Number	Threshold	Risk Level
0	**Below top 40%** of systems with residential arrearage burden.	Low Risk
1	**Top 40%** of systems with residential arrearage burden.	Medium Risk
2	**Top 20%** of systems with residential arrearage burden.	High Risk

Proposed Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from an internal State Water Board, Division of Drinking Water workgroup,

the weight of 2 is suggested for the “Residential Arrearage Burden” risk indicator. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 2. **Error! Reference source not found.** summarizes the proposed thresholds, score, and weights for Residential Arrearage Burden.

Table 45: Proposed “Residential Arrearage Burden” Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**Below top 40%** of systems with residential arrearage burden.	0	N/A	0
1	**Top 40%** of systems with residential arrearage burden.	0.5	2	1
2	**Top 20%** of systems with residential arrearage burden.	1	2	2

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Residential Arrearage Burden: https://tabsoft.co/34nB0gU

Operating Ratio

Operating Ratio is a measure of whether a water system’s revenues are sufficient to cover the costs of operating the water system. Specifically, “Operating Ratio” is a ratio of the water system’s annual revenues compared to annual operating expenses. To be a self-supporting, a water system should have at least as much annual revenue as it has operating expenses, e.g. an operating ratio equal to or greater than 1.0. The operating ratio does not include planned investments in future years. Therefore, a water system should collect revenues greater than expenses to accommodate for future investments by building up their financial reserves.

> **Annual Revenue** includes total annual revenues generated from customer charges and fees (meter fees, base service charges, fixed charges, late fees, penalties, shutoff fees, reconnection fees, etc.); intergovernmental fund transfers (i.e. city or county tax revenues etc.); revenues generated through rent, land lease, or other revenue-generating activities.
>
> **Operations and Maintenance Expenses:** expenses incurred during the system’s normal operation during the reporting year. It may include salaries, benefits for employees, utility bills, system repair and maintenance, supplies (e.g., treatment chemicals), insurance, water purchased for resale etc.

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Total Annual Revenue – Section 8B1.8
- Total Annual Revenue for the Reporting Year = Residential Water Rate Revenue (B1.1) + Non-Residential Water Rate Revenue (B1.2) + Residential Fees and Charges Revenue (B1.3) + Non-Residential Fees and Charges Revenue (B1.4) + Interfund or Governmental Revenue (B1.5.2) – Interfund or Government Revenue Lost (B1.6) + Other Revenue (B1.7)
- 2020 Electronic Annual Report, Total Annual Operating Costs – Section 8B2.1

Risk Indicator Calculation Methodology:

Equation 8: Operating Ratio

$$\frac{Annual\ Revenue\ (\$)}{Annual\ Operating\ Expenses\ (\$)}$$

Proposed Threshold

The proposed threshold for this risk indicator was developed through an analysis of industry, academic, and state publications (Table 46). Feedback was also solicited from the Division of Drinking Water's internal stakeholder group. Many have suggested that a viable water system should have a current ratio of at least 1 or greater. An operating ratio of 1 is the lowest level for a self-supporting water system. A ratio below one means expenses are higher than revenues. If a water system has outstanding debt, an operating ratio above one is required. Usually, the higher the debt/equity ratio, the higher the operating ratio required.

Table 46: Industry Recommended Operating Ratio

Organization	Recommended Operating Ratio	Resources
Community Resource Group, Inc.	1	Small System Guide: Understanding Utility Financial Statements[46]
University of North Carolina Environmental Finance Center	≥ 1.2	California Small Water Systems Rates Dashboard[47]

[46] See Small System Guide: Understanding Utility Financial Statements (2011). Community Resource Group, Inc. https://www.in.gov/iurc/files/small_system_guide_to_understanding_financial_statments.pdf

[47] See California Small Water Systems Rates Dashboard (2021). Environmental Finance Center at the University of North Carolina, Chapel Hill. https://dashboards.efc.sog.unc.edu/ca

Organization	Recommended Operating Ratio	Resources
Rural Community Assistance Partnership (RCAP)	≥ 1	Financial Management Guide[48]
University of Georgia	≥ 1.2	Evaluating Water System Financial Performance and Financing Options[49]
Brookings	> 1	Appendix B: Investing in water: Comparing utility finances and economic concerns across U.S. cities[50]
Arizona Department of Environmental Quality	≥ 1	Capacity Development Application for a New Public Water System[51]
State of Florida Public Service Commission	≥ 1.25	Docket No. 20 180141-WS - Proposed adoption of Rule 25-30.4575, F.A.C., Operating Ratio Methodology[52]

Based on the industry standards summarized above, the State Water Board recommends a binary threshold for "Operating Ratio" as summarized in Table 47.

Table 47: Recommended Thresholds for Operating Ratio

Threshold Number	Threshold	Risk Level
0	**1 or greater** operating ratio.	Low
1	**Less than 1** operating ratio.	High Risk

Proposed Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale

[48] http://www.rcapsolutions.org/wp-content/uploads/2013/06/RCAP-Financial-Management-Guide.pdf
[49] See Jeffrey L. Jordan. Issue 3: Evaluating Water System Financial Performance and Financing Options. University of Georgia Department of Agricultural & Applied Economics. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.195.4657&rep=rep1&type=pdf
[50] See Joseph W. Kane (2016). Investing in water: Comparing utility finances and economic concerns across U.S. cities. Brookings. https://www.brookings.edu/research/investing-in-water-comparing-utility-finances-and-economic-concerns-across-u-s-cities/
[51] See Capacity Development Application for a New Public Water System. Arizona Department of Environmental Quality. https://legacy.azdeq.gov/environ/water/dw/download/appe.pdf
[52] See Office of the General Counsel (Harper), Division of Accounting and Finance (Galloway), Division of Economics (Guffey) (2018). Docket No. 20 180141-WS - Proposed adoption of Rule 25-30.4575, F.A.C., Operating Ratio Methodology. State of Florida Public Service Commission http://www.psc.state.fl.us/library/filings/2018/06300-2018/06300-2018.pdf

between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the minimum weight of 1 is suggested for the "Operating Ratio" risk indicator due to data quality concerns. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 1. Table 48 summarizes the proposed thresholds, score, and weights for Operating Ratio.

Table 48: Proposed "Operating Ratio" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**1 or greater**	0	N/A	0
1	**Less than 1**	1	1	1

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Operating Ratio: https://tabsoft.co/3GhCoiv

Total Annual Income

The purpose of this proposed risk indicator is to identify water systems whose total annual revenue is unable to cover their total annual expenses. A water system should generate enough revenue to cover all incurred expenses (including operational expenses) throughout the year. Total Net Annual Income of a water system should be a positive (+) value. If more money is spent than is brought in, then the water system will have to make adjustments in order to maintain operations. If the expenditures are outpacing revenue too quickly, then the water system may have to cut costs or decrease its level of service. Reserves or available cash savings allows for a financial cushion in times when expenses are greater than revenues.

A water system may generate enough revenue to cover their annual operating and maintenance costs (operating ratio = 1 or greater), but in some cases revenues may fall short in covering a water system's total annual expenses. These additional expenses that fall outside of general operating and maintenance costs typically include debt/loan repayments, new/upgraded infrastructure investments, unforeseen emergency costs, etc.

Calculation Methodology
Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Total Annual Revenue - 8B1.8
- 2020 Electronic Annual Report, Total Annual Expenses - 8B2.5

Risk Indicator Calculation Methodology:

Equation 9: Total Annual Income

$$\textit{Total Annual Income} = \textit{Total Annual Revenue} - \textit{Total Annual Expenses}$$

Proposed Threshold
Water systems may have emergencies they must respond to or a large capital investment that occurs within a year which may lead to negative total annual income. Based on industry standards and recommendations for State Water Board engineers, the recommended tiered thresholds in Table 49 are proposed for Total Annual Income.

Table 49: Recommended Thresholds for Total Annual Income

Threshold Number	Threshold	Risk Level
0	**Greater than $0** total annual income	Low
1	**$0** total annual income	Medium Risk
2	**Less than $0** total annual income	High Risk

Proposed Risk Indicator Scoring & Weighting
To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's engineers, the minimum weight of 1 is suggested for the "Total Annual Income" risk indicator due to data quality concerns. Therefore, the minimum risk score for this indicator is 0 and the maximum risk score is 1. Table 50 summarizes the proposed thresholds, score, and weights for Total Annual Income.

Table 50: Proposed "Total Annual Income" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**Greater than $0** total annual income	0	N/A	0
1	**$0** total annual income	0.5	1	0.5
2	**Less than $0** total annual income	1	1	1

Explore Water System Risk Indicator Performance
The distribution of how water systems have performed for this risk indicator is

accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Total Annual Income: https://tabsoft.co/33AYv6g

Days Cash on Hand

Days cash on hand is the estimated number of days a water system can cover its daily operations and maintenance costs, relying only on their current cash or liquid reserves, before running out of cash. This metric measures a system's financial capacity and is an estimate of how long a system can operate *without* new revenues or additional funding. It is a helpful measure of how long a system can operate if it has a sudden and dramatic reduction in operating income, perhaps from a large customer leaving or an environmental emergency (fire, drought restrictions, etc.).[53]

According to Moody's definition, "Cash is the most important resource utilities have to meet expenses, deal with emergencies, and survive temporary disruptions to cash flow without missing required payments."[54] Days cash on hand is a ratio that is calculated by dividing a water system's unrestricted cash by the system's estimated daily expenses. This calculation approach allows for the comparison of water systems of different sizes by accounting for differences in operational expenses (Table 51). The higher the number, the more days an organization can sustain its operations without any additional cash inflows.

Table 51: Comparison Example Between Large and Small Water System

Large Water System	Small Water System
$\frac{Unrestricted\ Cash: \$\mathbf{5,000,000}}{Average\ Daily\ Operation\ Expenses: \$\mathbf{100,000}}$	$\frac{Unrestricted\ Cash: \$\mathbf{20,000}}{Average\ Daily\ Operation\ Expenses: \$\mathbf{400}}$
Days Cash on Hand = **50 Days**	Days Cash on Hand = **50 Days**

Calculation Methodology

Required Risk Indicator Data Points & Sources:

- 2020 Electronic Annual Report, Section 8B.10

[53] See Glenn Barnes (2015). Key Financial Indicators for Water and Wastewater Systems: Days of Cash on Hand. Environmental Finance Center at the University of North Carolina. https://efc.web.unc.edu/2015/06/24/days-cash-on-hand/

[54] See Edward Damutz, Leonard Jones, (2017). Moody's Utility Revenue Bond Rating Methodology. Moody's Investors Services. https://www.moodys.com/research/Moodys-updates-its-methodology-for-rating-US-municipal-utility-revenue--PR_373942

Risk Indicator Calculation Methodology:

- Risk indicator calculation formula (water system calculated and reported in 2020 Electronic Annual Report):
  - Calculate water system's **daily operating expenses**: [Annual Operating Expenses] / [365]
  - Calculate **days cash on hand**: [Total Unrestricted Cash] / [Daily Operating Expenses]

Equation 10: Days Cash on Hand

$$\frac{Unrestricted\ Cash\ (\$)}{Daily\ Operating\ Expenses\ (\$)}$$

Proposed Threshold

The proposed thresholds for "Days Cash on Hand" risk indicator were developed by assessing peer-reviewed publications and soliciting feedback from the State Water Board's Division of Drinking Water internal stakeholder group. Table 52 and Table 53 summarize recommendations made by industry groups and rating agencies for minimum days cash on hand.

Table 52: Industry Recommended Days Cash on Hand

Organization	Recommended Days Cash on Hand	Resources
University of North Carolina Environmental Finance Center	90+ days	California Small Water Systems Rates Dashboard[55]
Utility Financial Solutions, LLC	90+ days; Higher bond rating 200+ days	Managing Your Community's Stimulus Money[56]
International City/County Management Association (ICMA)	30 - 60 days	Capital Budgeting and Finance: A Guide for Local Governments[57]
Government Finance Officers Association	45+ days	Overview of GFOA's Best Practices in Budgeting[58]

[55] See California Small Water Systems Rates Dashboard (2021). Environmental Finance Center at the University of North Carolina, Chapel Hill. https://dashboards.efc.sog.unc.edu/ca

[56] See Sally Duffy, P.E., Ian Robinson, Dawn Lund (2021). Managing Your Community's Stimulus Money. MI-AWWA, MWEA, and MRWA. https://cdn.ymaws.com/www.mi-water.org/resource/resmgr/docs/Managing_Stimulus_webinar_07.pdf

[57] See Robert L. (Bob) Bland, Michael R. Overton, (2019). A Budgeting Guide for Local Government, Fourth Edition. ICMA. https://icma.org/publications/budgeting-guide-local-government-fourth-edition

[58] See John Fishbein (2019). Overview of GFOA's Best Practices in Budgeting. Technical Services Center, Government Finance Officers Association (GFOA). https://nesgfoa.org/wp-content/uploads/2019/05/overview_of_gfoas_best_practices_in_budgeting_april_4_2019.pdf

Organization	Recommended Days Cash on Hand	Resources
American Water Works Association	270 - 365 days	Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector[59]

Table 53: Financial Scoring Criteria for Major Rating Agencies

Moody's[60]					
Aaa	**Aa**	**A**	**Baa**	**Ba**	**B & Below**
> 250 days	250 ≥ n > 150 days	250 ≥ n > 150 days	150 ≥ n > 35 days	35 ≥ n > 15 days	≤ 7 days

S&P Global[61]					
1: Extremely Strong	**2: Very Strong**	**3: Strong**	**4: Adequate**	**5: Vulnerable**	**6: Highly Vulnerable**
> 150 days	150 ≥ n > 90 days	90 ≥ n > 60 days	60 ≥ n > 30 days	15 ≥ n > 30 days	≤ 15 days

Fitch[62] Liquidity Cushion		
Stronger	**Neutral**	**Weaker**
> 120 days	120 ≥ n > 90 days	< 90 days

Based on the industry standards summarized above, the State Water Board recommends a tiered threshold for "Days Cash on Hand" as summarized in Table 54.

[59] See R. Raucher, E. Rothstein, J. Mastracchio (2017): Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector. The American Water Works Association (AWWA).https://www.awwa.org/Portals/0/AWWA/Government/DevelopingNewFrameworkForAffordabilityReport.pdf

[60] See Moody's Investors Service, US Municipal Utility Revenue Debt. October 19, 2017. https://www.moodys.com/researchdocumentcontentpage.aspx?docid=PBM_1095545

[61] S&P Global, Criteria | Governments | U.S. Public Finance: U.S. Public Finance Waterworks, Sanitary Sewer, And Drainage Utility Systems: Rating Methodology and Assumptions. January 19, 2016; last update October 11, 2021; Accessed December 30, 2021 at https://disclosure.spglobal.com/ratings/en/regulatory/article/-/view/type/HTML/id/2735324

[62] Fitch Ratings, U.S. Water and Sewer Rating Criteria, March 18, 2021. https://www.fitchratings.com/research/us-public-finance/us-water-sewer-rating-criteria-18-03-2021

Table 54: Recommended Thresholds for Days Cash on Hand

Threshold Number	Threshold	Risk Level
0	**90 days or more** cash on hand.	Low
1	**Less than 90 days** cash on hand.	Medium
2	**Less than 30 days** cash on hand.	High

Proposed Risk Indicator Scoring & Weighting

To enable the evaluation and comparison of risk indicators, a standardized scale between 0 and 1 for risk scores has been applied to each proposed threshold. Risk indicator weights between 1 and 3 are also applied to individual risk indicators. Based on feedback from the State Water Board's Division of Drinking Water internal stakeholder group, the minimum weight of 1 is suggested for the "Days Cash on Hand" risk indicator. Table 55 summarizes the proposed thresholds, score, and weights for Days Cash on Hand.

Table 55: Proposed "Days Cash on Hand" Thresholds & Scores

Threshold Number	Threshold	Score	Weight	Max Score
0	**90 days or more** cash on hand.	0	N/A	0
1	**Less than 90 days** cash on hand.	0.5	1	0.5
2	**Less than 30 days** cash on hand.	1	1	1

Explore Water System Risk Indicator Performance

The distribution of how water systems have performed for this risk indicator is accessible using the hyperlink below. The results can be filtered by water system size (i.e. number of service connections).

Day Cash on Hand: https://tabsoft.co/35bB9Vl

Appendix B: Drought Cost Assessment Methodology

On September 23, 2021 the California legislature passed Senate Bill 552[63] which has requirements for counties and small water systems around drought planning activities. A key requirement of SB 522 is for small water suppliers, defined as community water system (CWS) serving 15 to 2,999 service connections and non-transient, non-community water systems that are k-12 schools, to implement the following drought resiliency measures (subject to funding availability):

- No later than January 1, 2023, implement **monitoring systems** sufficient to detect **production well groundwater levels**.
- Beginning no later than January 1, 2023, **maintain membership in the California Water/Wastewater Agency Response Network (CalWARN)** or similar mutual aid organization.
- No later than January 1, 2024, to ensure continuous operations during power failures, provide adequate **backup electrical supply**.
- No later than January 1, 2027, have at least **one backup source** of water supply, **or a water system intertie**, that meets current water quality requirements and is sufficient to meet average daily demand.
- No later than January 1, 2032, **meter each service connection** and monitor for water loss due to leakages.
- No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet **fire flow** requirements.

In response to stakeholder feedback and the need to support SB 552 planning, the State Water Board has conducted a targeted Drought Cost Assessment for the 2022 Needs Assessment. The following sections detail the assessment's underlying assumptions and calculation methods. For the purpose of this Cost Assessment small water systems are CWSs with 15 – 2,999 service connections and large systems are CWSs with 3,000 or more service connections.

Explore the data used to identify CWSs not meeting SB 552 requirements here: https://bit.ly/3r6IU7y

Regional Cost Adjustment

The cost estimates were adjusted for regional cost variance using RSMeans City Cost Index (CCI)[64]. The CCI was used to compare and adjust costs between locations. The California CCI shown in Table 56 were applied based on each system's location.

[63] Senate Bill No. 552, Section 10609.62, Chapter 245: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB552
[64] RSMeans City Cost Index: https://www.rsmeans.com/rsmeans-city-cost-index

Table 56: RSMeans City Cost Index for Locational Cost Estimating

Location	RSMeans CCI	Percent Adjustment
Rural	+3.0	0%
Urban	+3.97	+32%
Suburban	+3.89	+30%

The categorization of counties by the generalized location for applying the CCI is shown in **Error! Reference source not found.**.

Table 57: California Counties Categorized by Generalized Location

Location	Counties
Rural	Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Madera, Mariposa, Mendocino, Merced, Modoc, Mono, Nevada, Placer, Plumas, San Joaquin, Shasta, Sierra, Siskiyou, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, Yuba
Suburban	Alameda, Contra Costa, El Dorado, Marin, Monterey, Napa, Orange, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Cruz, Solano, Sonoma
Urban	Los Angeles, Riverside, Sacramento, San Diego, San Francisco, San Mateo, Santa Clara, Ventura

Static Well Level Monitoring

It is very important to measure and monitor static well levels on a regular basis to diagnose well production or capacity issues before problems occur. The estimated inventory of systems that may require a sounder, which is a device that measures water levels without wellhead modifications, was identified based on water system responses to EAR Section 5 (Source Inventory) regarding monitoring water level in wells.

Cost Assumptions:

- Sounder cost estimate = $1,700[65]
- No well modification costs are assumed to be needed; the device uses sound waves to detect water level.[66]

[65] The base price is $1,245, the additional cost is shipping, handling and warranty. https://www.fondriest.com/eno-scientific-2010p.htm

[66] Sounder 2010 Pro: https://www.geotechenv.com/Manuals/Eno_Scientific_Manuals/Eno_Scientific_Well_Sounder_2010_User_Manual.pdf

Table 58: Small CWS Sounder Cost

Service Connection Range	Small CWS Count	Estimated Cost ($)
< 500	848	$1,640,000
500 - 1,000	9	$20,000
1,000 - 2,999	14	$30,000
TOTAL:	**871**	**$1,680,000**

Table 59: Large CWS Sounder Cost

Service Connection Range	Large CWS Count	Estimated Cost ($)
3,000-5,000	2	$4,000
5,001-7,000	3	$6,000
7,001-10,000	0	$0
> 10,000	7	$15,000
TOTAL:	**12**	**$26,000**

Membership with CalWARN or other Mutual Aid

Membership for CalWARN is currently free, therefore no cost estimate was developed for this SB 552 requirement.

Backup Electrical Supply

To sustain operations during possible power outages, an onsite backup generator is necessary. The estimated inventory of systems requiring backup power was identified by analyzing Electronic Annual Report (EAR) responses to a non-mandatory question in section 16.A about source auxiliary power supply. Since responses to this question are limited, the State Water Board utilized all (none), (blank), (some) and (null) responses within this analysis. Table 60 summarizes the reported EAR responses by system size.

Table 60: Backup Power EAR Response by CWS Count

Response	Small CWS Count	Large CWS Count
None	1018	42

Response	Small CWS Count	Large CWS Count
Some[67]	402	238[68]
Blank	392	11
NULL	60	1
TOTAL:	**1,872**	**292**

Cost Assumptions:

- The cost for each system was identified based on their Maximum daily demand (MDD), which is based on estimated average daily demand (ADD) of 150 gallon per day, served population, and a peaking factor of 2.25.
- The calculated MDD is then used in the equation below to calculate the cost per system.
    - Total Cost Estimate ($)[69] = $30,134 + ($341 x MDD)

Table 61 and Table 62 shows the cost of generators per systems size and the count of systems falling under each range size:

Table 61: Generators Cost Per Service Connection Range for Small CWS

Connection Range	Small CWS Count	Estimated Cost ($)
< 500	1,639	$101,200,000
500 - 1,000	72	$17,870,000
1,000 - 2,999	161	$105,750,000
TOTAL:	**1,872**	**$224,820,000**

Table 62: Generators Cost Per Service Connection Range for Large CWS

Connection Range	Large CWS Count	Estimated Cost ($)
3,000 - 5,000	52	$8,040,000
5,001 - 7,000	33	$15,820,000

[67] The State Water Board is considering reducing the cost estimate for these systems to 50% of the full estimate. Currently the Assessment assumes 100% need for these systems.
[68] Large CWSs that responded to the 2020 EAR question on source auxiliary power supply with "some" were excluded from the cost estimate.
[69] This equation was developed by Corona Environmental to estimate backup power cost in the 2021 Needs Assessment. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

Connection Range	Large CWS Count	Estimated Cost ($)
7,001 - 10,000	37	$32,860,000
> 10,000	170	$509,910,000
TOTAL:	**292**	**$565,630,000**

Backup Source: New Well or Intertie

The estimated inventory of systems was determined by analyzing SDWIS data for the number of active sources per CWS. Any CWS with a single groundwater (well) water source was included in the cost estimate.

- Identified water systems with one active source.
- If a system's one active source is a well, then they were included in the analysis.
- If the one active source is an intertie, the water system was excluded from the analysis due to lack of information on whether a new well is feasible in their area.
- If a system's one active source is surface water, they were excluded from this cost estimate because no information is available to estimate water rights costs and availability.

The analysis first looked at the potential feasibility of an intertie. If an intertie is not potentially feasible, then a cost estimate for a new well was calculated.

Estimating New Intertie Costs

A spatial analysis was conducted to identify water systems where an intertie with a nearby water system may be feasible:

1. Joining systems:[70] using the service area boundaries, a GIS layer was created based on the criteria: any CWS with a single source.
2. Receiving systems: using the service area boundaries, a GIS layer was created based on the criteria: any CWS with 3,000 or more service connections.
3. Identify joining systems that intersect a receiving system.
4. Exclude any joining systems that already have an intertie as their only water source.

Cost Assumptions[71]:

- Buffer for intersects (added pipeline) = 1,000 ft
- Pipeline Cost per ft = $155

[70] Not all joining and/or receiving systems have boundaries, so the number of mapped systems is less than the actual number.

[71] The cost assumptions are based on Corona Environmental physical consolidation estimates used in the 2021 Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf

- Service line (System connection) =$5,000
- Connection fee ($/connection) = $6,600
- Admin/Legal $200,000
- Apply a 20% contingency = 20% of total cost estimate
- Apply 25% of total cost estimate for planning costs
- Total Cost Estimate = Pipeline cost + Service line cost + Connection fees + Admin/legal fees + 20% Contingency + 25% Planning

Table 63: Estimated Small CWS Intertie Costs

Service Connection Range	Small CWS Count	Estimated Cost ($)
< 500	139	$204,590,000
500 - 1,000	1	$6,650,000
1,000 - 2,999	2	$37,060,000
TOTAL:	**142**	**$248,300,000**

Table 64: Estimated Large CWS Intertie Costs

Service Connection Range	Large CWS Count	Estimated Cost ($)
3,000 - 5,000	0	$0
5,001 - 7,000	0	$0
7,001 - 10,000	0	$0
> 10,000	0	$0
TOTAL:	**0**	**$0**

Estimating New Well Costs

If the construction of an intertie was not determined to be feasible using the methodology described above, the State Water Board estimated the cost of constructing a new well.

Cost Assumptions:

- Well drilling assumed to be for 1,000 ft depth at $790,000.[72]

[72] This cost estimate was developed by Corona Environmental and used in the 2021 Needs Assessment 2021 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

- Required well production equals the Maximum Daily Demand (MDD), which is calculated based on an average daily demand of 150 gpm and peaking factor of 2.25.
- $85,000 for CEQA[73]
- $100,000 for SCADA[74]
- Apply 25% of total cost estimate for planning costs.
- Well development Cost =[75] ($145.01 x Well Production (MDD)) + $32,268
- Well Pump and Motor Cost[76] = ($136.73 x Well Production (MDD)) + $116,448
- Based on public feedback, an additional cost for backup generator may be added to this cost estimate.

As illustrated in Table 65 and Table 66, most systems that rely on a single source are systems with 500 service connections or less.

Table 65: Estimated Small CWS New Well Costs

Service Connection Range	Small CWS Count	Estimated Cost ($)
< 500	752	$1,157,770,000
500 – 1,000	0	$0
1,000 – 2,999	1	$1,410,000
TOTAL:	**753**	**$1,159,180,000**

Table 66: Estimated Large CWS New Well Costs

Service Connection Range	Large CWS Count	Estimated Cost ($)
3,000 - 5,000	1	$2,560,000
5,001 - 7,000	0	$0
7,001 - 10,000	0	$0
> 10,000	0	$0
TOTAL:	**1**	**$2,560,000**

[73] This cost was developed by Corona Environmental and used in the 2021 Needs Assessment 2021 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515
[74] Based on vendors recommendations and pricing.
[75]This equation was developed by Corona Environmental and used in the 2021 Needs Assessment 2021 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515
68: This equation was developed by Corona Environmental and used in the 2021 Needs Assessment 2021 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515

Meter All Service Connections

Metering service connections at individual households is an important drought mitigation measure because it allows a water system to monitor water usage, identify potential water loss, and may also help customers reduce demand when needed. The inventory of systems lacking meters for some or all their service connections was identified by analyzing EAR responses to a Section 4, specifically the question about the count of un-metered service connections. The highest number of un-metered service connection is attributed to smaller systems with less than 500 service connections.

Table 67 details the cost estimates for new meters. Table 68 and Table 69 summarize the costs estimates for residential water meters by system size.

Table 67: Residential Meters Cost Assumptions

Equipment and Software (drive by[77])	1" Meters (drive by)
$29,000[78]	$825[79]

Table 68: Small CWS Residential Meters Cost Per Service Connection Range

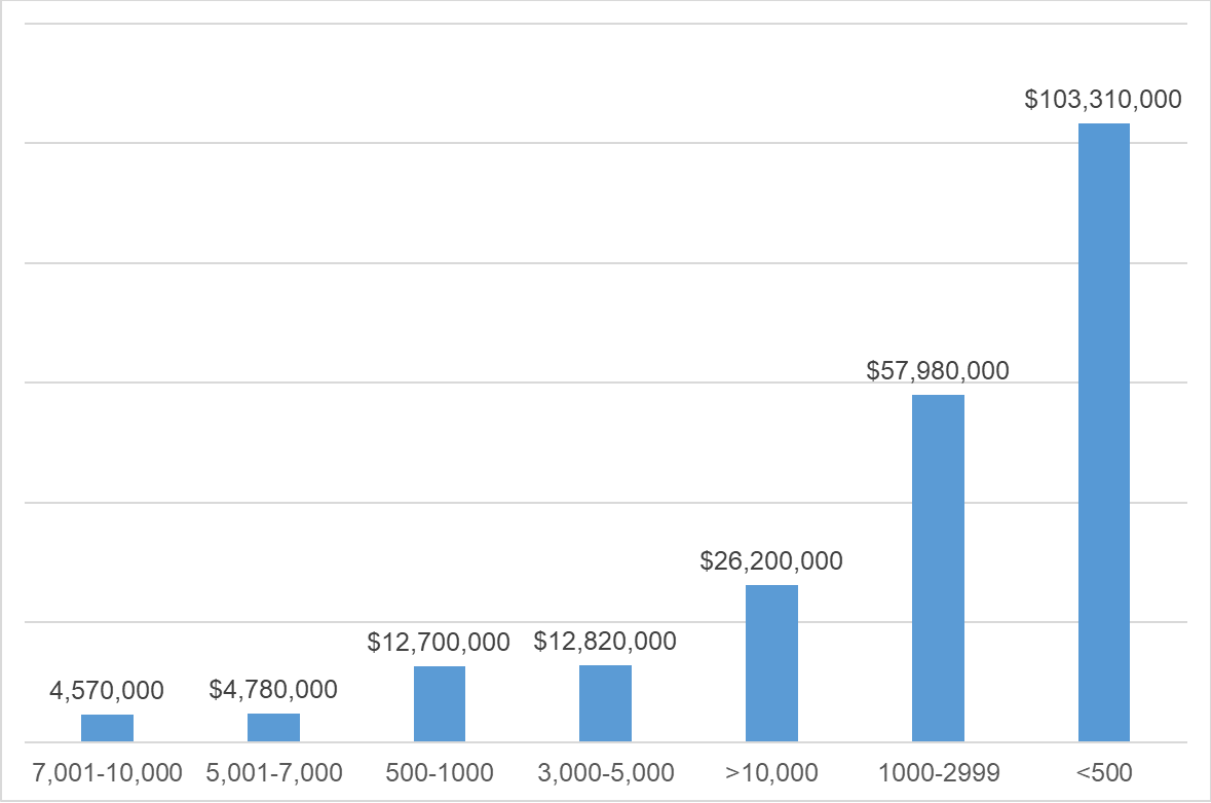
Service Connection Range	System Count	Un-Metered Connections Count	Estimated Cost ($)
< 500	1,189	70,457	$103,310,000
500 – 1,000	31	13,022	$12,700,000
1,000 – 2,999	55	60,525	$57,980,000
TOTAL:	**1,275**	**144,004**	**$173,990,000**

[77] This type of meter allows the meter reader to drive by and take an automated reading, as opposed to a manual reading.
[78] This cost was used by Corona Environmental and utilized in the 2021 Needs Assessment 2021 https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf#page=253&zoom=100,69,515
[79] Based on vendors recommendations and pricing.

Table 69: Large CWS Residential Meters Cost Per Service Connection Range

Service Connection Range	System Count	Un-Metered Connections Count	Estimated Cost ($)
3,000 - 5,000	10	13,318	$12,820,000
5,001 - 7,000	8	5,490	$4,780,000
7,001 - 10,000	3	5,418	$4,570,000
> 10,000	23	28,499	$26,200,000
TOTAL:	**44**	**52,725**	**$48,370,000**

Figure 7: Estimated Cost of Metering All Service Connections by System Size



Fire Flow

The State Water Board does not have authority to develop or enforce requirements regarding fire flow. Fire flow responsibility and jurisdiction falls to local fire officials. Thus, the State Water Board does not generally collect extensive information regarding fire flow in its standard data collection processes, such as the electronic annual report. However, the State Water Board recognizes the significant need for adequate fire flow

for the protection of communities and public safety, particularly considering climate change impacts.

Due to the lack of available and machine-readable asset inventory, asset condition data and local fire protection requirements, the State Water Board is unable to develop a cost estimate for this SB 552 requirement at this time. The State Water Board will contact the Office of the State Fire Marshall to develop collaborative approaches for determining appropriate fire protection requirements. The State Water Board will explore strategies to collect this information in the future to better identify systems unable to meet fire flow requirements. It is important to note that cost sharing may be appropriate to consider for the fire flow costs given that they are not directly related to drinking water but may still benefit the water system's day to day operations.