CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

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

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[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.

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[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

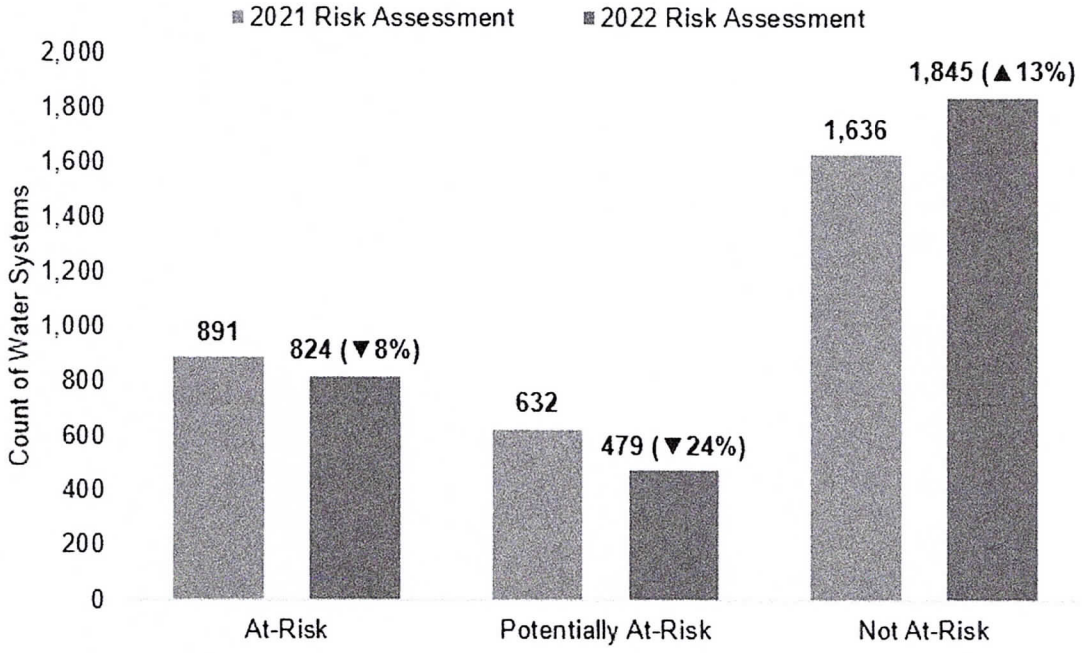
Risk Indicator	Calculation Update
Critically Overdrafted Groundwater Basin	• Remove water systems that do not have a groundwater source. • Rather than use water system boundary; utilize well location to identify water systems with sources that are within a critically overdrafted groundwater basin. • 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.

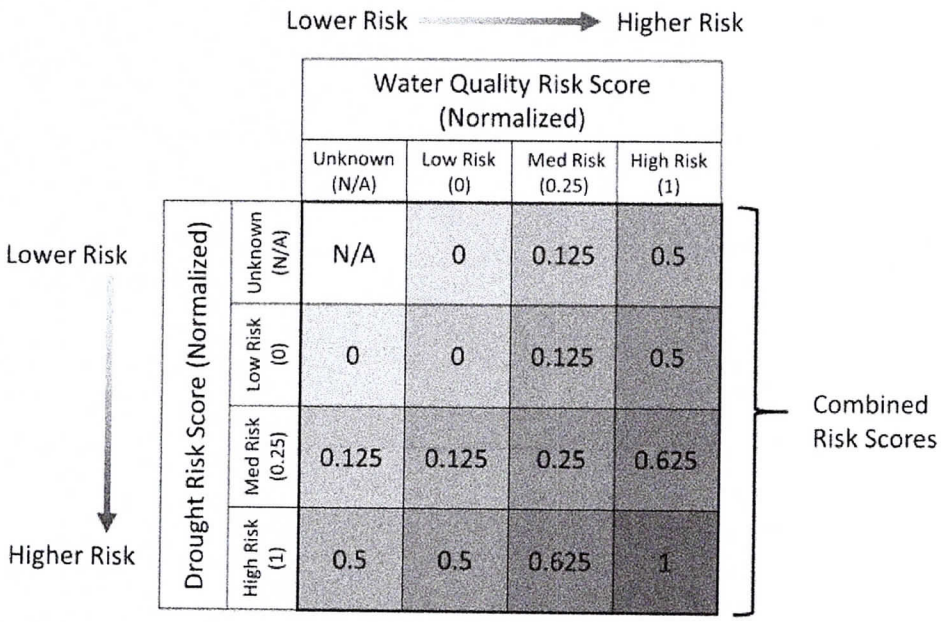
Proposed Methodology for Combined Risk Assessment Using Water Quality and Drought Risk

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)

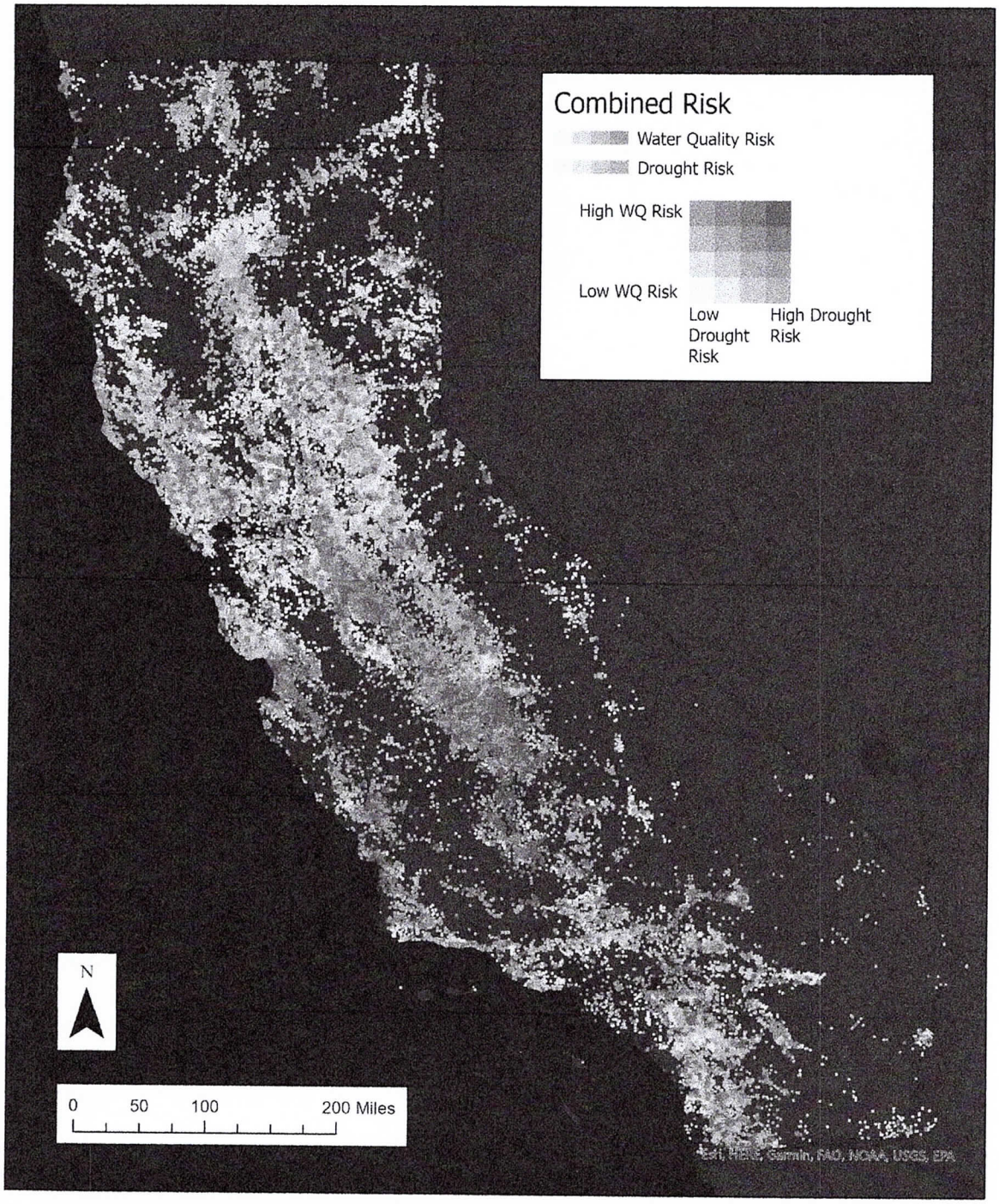


Figure 4: Water Quality Risk Map for SSWSs & Domestic Wells

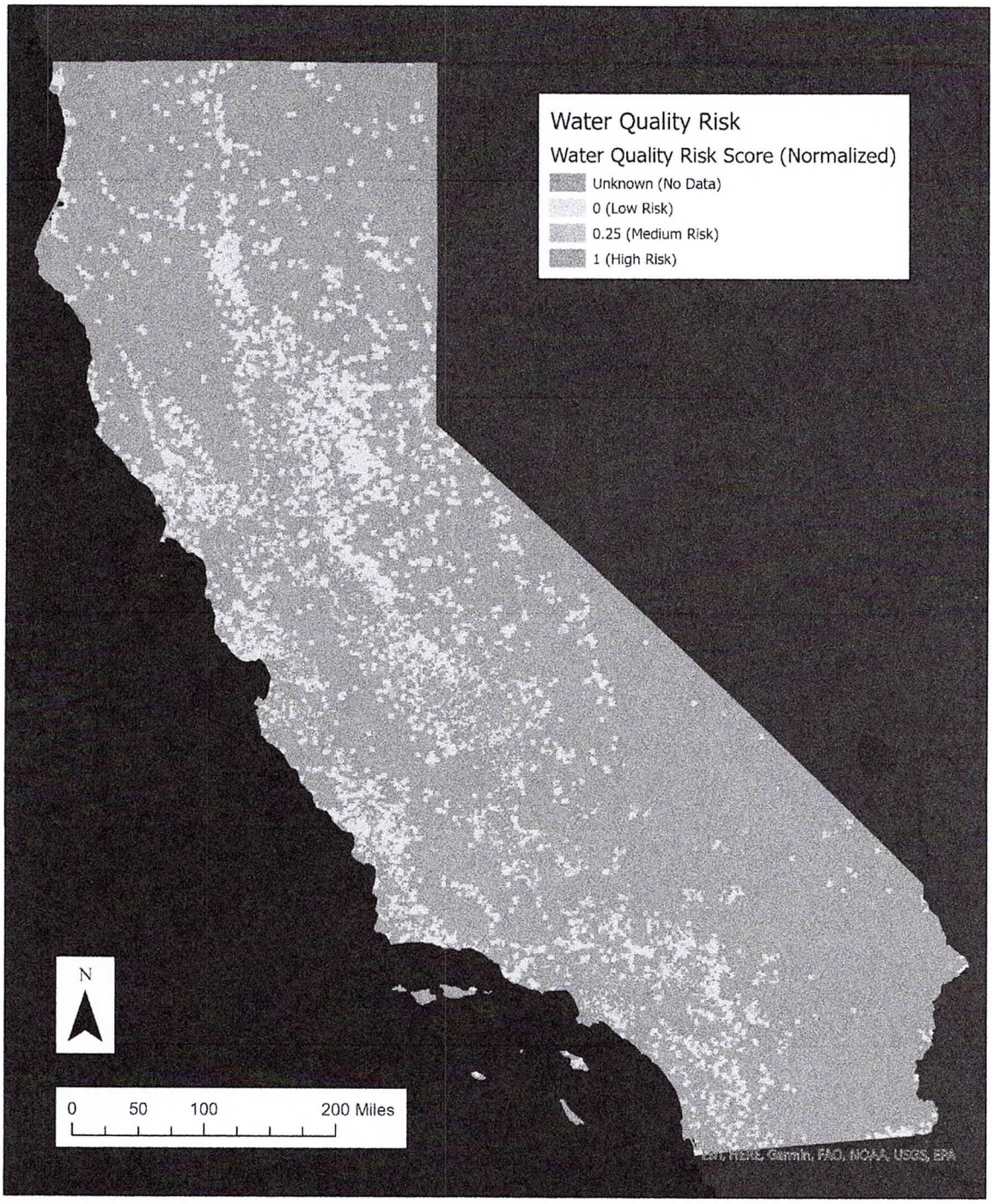
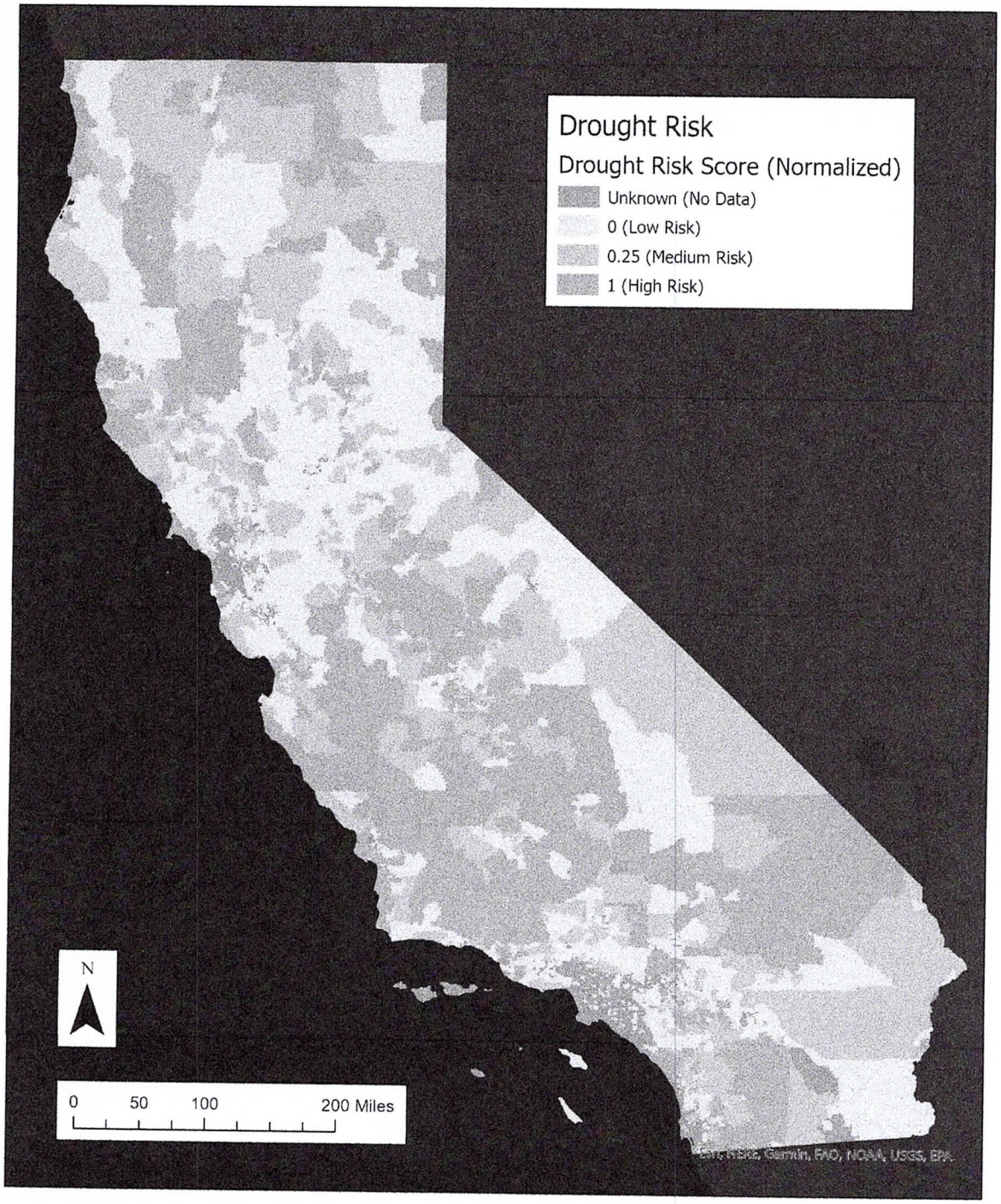


Figure 5: Drought Risk Map for SSWSs & Domestic Wells



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.

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[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

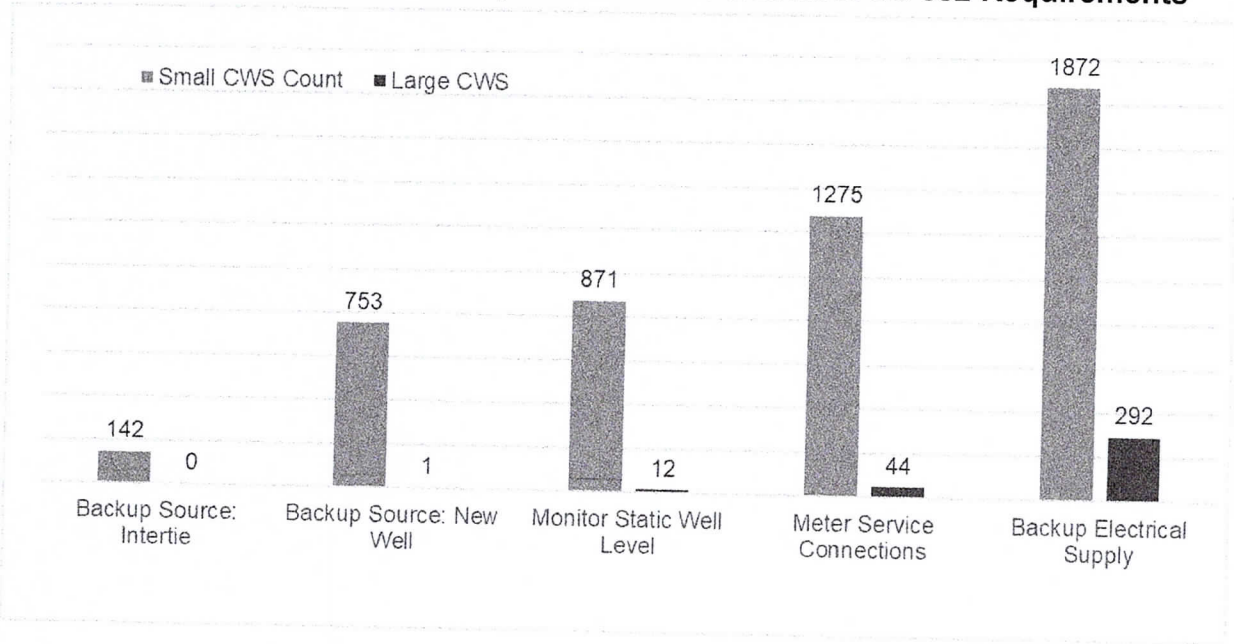

Table 25 summarizes the preliminary Drought Infrastructure Cost Assessment results. The overall estimated cost for drought measures is shown in the table below. For more information regarding cost assumptions and methodology see Appendix B.

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.