

2023

DRINKING WATER NEEDS ASSESSMENT AFFORDABILITY ASSESSMENT RESULTS



Full Report:

[HTTPS://WWW.WATERBOARDS.CA.GOV/DRINKING WATER/CERTLIC/DRINKINGWATER/DOCUMENTS/NEEDS/2023NEEDSASSESSMENT.PDF](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023needsassessment.pdf)

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AFFORDABILITY ASSESSMENT RESULTS

OVERVIEW

Ensuring drinking water is affordable is key to meeting California’s Human Right to Water mandate.¹ The COVID-related economic crisis has served to further highlight the need to address affordability, both to ensure that households can afford the water that they drink as well as to support drinking water systems in maintaining enough financial viability to provide safe reliable drinking water.²

The purpose of the Affordability Assessment is to identify disadvantaged community water systems that have instituted customer charges that exceed the “Affordability Threshold” established by the State Water Board to provide drinking water that meets state and federal standards.³ Legislation does not define what the Affordability Threshold should be. Nor is there specific guidance on the perspective in which the State Water Board should be assessing the Affordability Threshold.

WHY MEASURING AFFORDABILITY MATTERS

Drinking water affordability is a difficult challenge to measure. Different terms and metrics have been used to describe and measure affordability in the water sector for decades, and they have been used to influence important decisions. For instance, affordability metrics are used to determine which water systems are eligible for state and federal assistance. Water systems meeting certain affordability thresholds qualify for more grant vs. loan funding for infrastructure projects and are frequently prioritized for state and federal technical assistance as well.

Affordability metrics are often used by water systems when exploring possible rate changes. Systems serving communities with affordability challenges often struggle to raise their rates,

¹ [State Water Board Resolution No. 2016-0010](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf)

https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0010.pdf

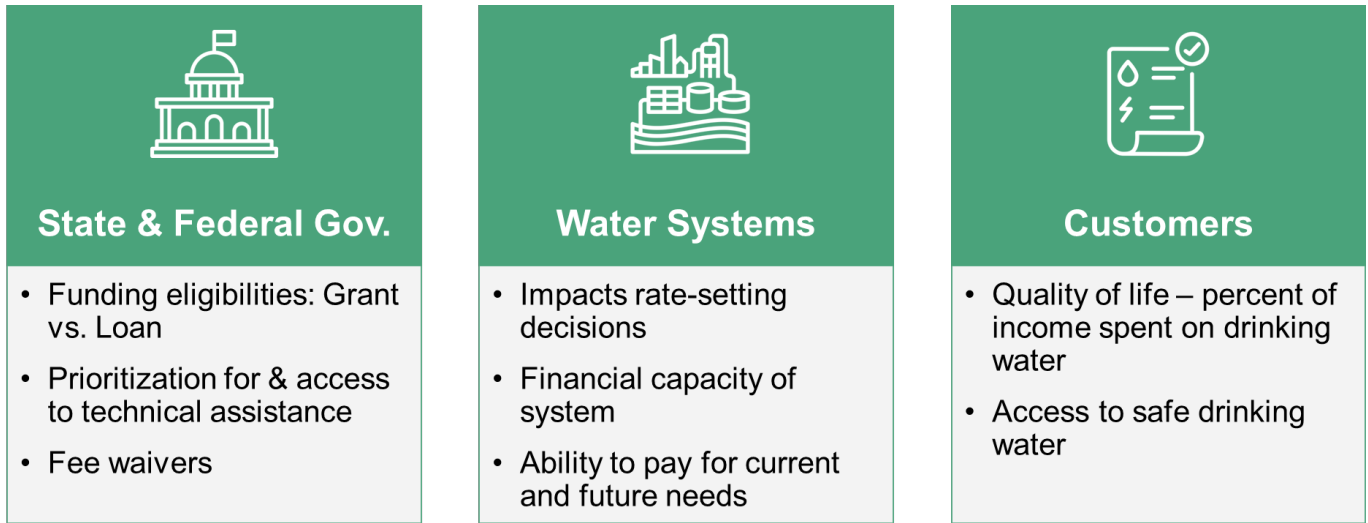
² [Drinking Water COVID-19 Financial Impacts Survey | California State Water Resources Control Board](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/covid-19watersystemsurvey.html)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/covid-19watersystemsurvey.html

³ California Health and Safety Code, section 116769, subd. (a)(2)(B)

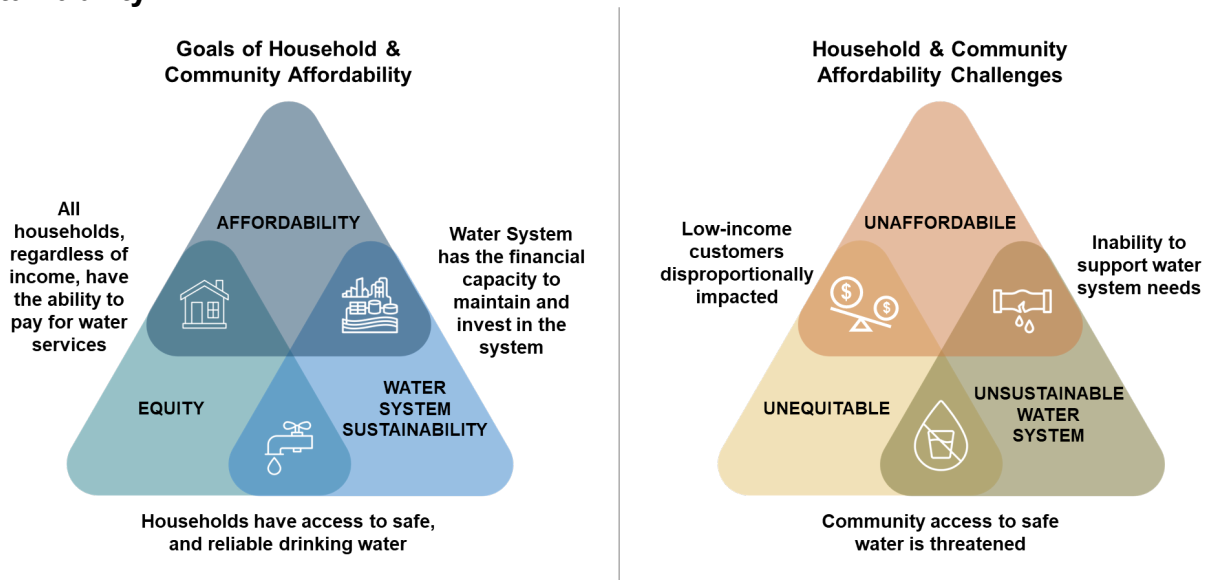
thus affecting their long-term financial capacity. Customers unable to pay for water services may then experience challenges in accessing a reliable source of safe drinking water.

Figure 1: Why Measuring Affordability Matters



Affordability of drinking water services is an important challenge to assess because issues surrounding equity and water system sustainability overlap in numerous aspects of addressing affordability challenges and ensuring that all Californians have safe drinking water. Figure 2 illustrates this relationship and the potential consequences of inaction.

Figure 2: The Relationship Between Affordability, Equity and Water System Sustainability



DEFINING AFFORDABILITY

To better navigate the different metrics and approaches used to measure affordability, the State Water Board developed Figure 3 to illustrate the nexus of affordability definitions.

Figure 3: Nexus of Affordability Definitions



- (1) Household Affordability:** The ability of individual households to pay for an adequate supply of water. Metrics measuring household level affordability have been included in both the Affordability Assessment and Risk Assessment.
- (2) Community Affordability:** The ability of households within a community to pay for water services to financially support a resilient water system. Metrics measuring community level affordability are included in both the Affordability Assessment and Risk Assessment.
- (3) & (4) Water System Financial Capacity:** The ability of the water system to financially meet current and future operation and infrastructure needs to deliver safe drinking water. The financial capacity of water systems affects future rate impacts on households. The inability to provide adequate services may lead households served by the system to rely on expensive alternatives such as bottled water. Metrics measuring the financial capacity of water systems are included in the Risk Assessment only.

DRINKING WATER CUSTOMER CHARGES

Measuring affordability includes an analysis of the ability of households and communities to pay for current and future water service charges. Therefore, it is important to consider the average monthly customer charges for the same volume of water (6 hundred cubic feet [HCF]).

The State water Board began requiring the submission of average monthly residential customer charges for 6 HCF in the 2019 eAR. Figure 4 illustrates the trends in customer charges. It's important to note, that many water systems struggled to submit customer charges data for 2020 reporting year, which may have contributed to the difference between average charges data from 2019 to 2020.

Table 1 summarizes 2021 average residential customer charges by system size. On average

smaller community water systems charge more for the same volume of water compared to larger community water systems.

Figure 4: Average Monthly Residential Customer Charges for 6 HCF Over Time

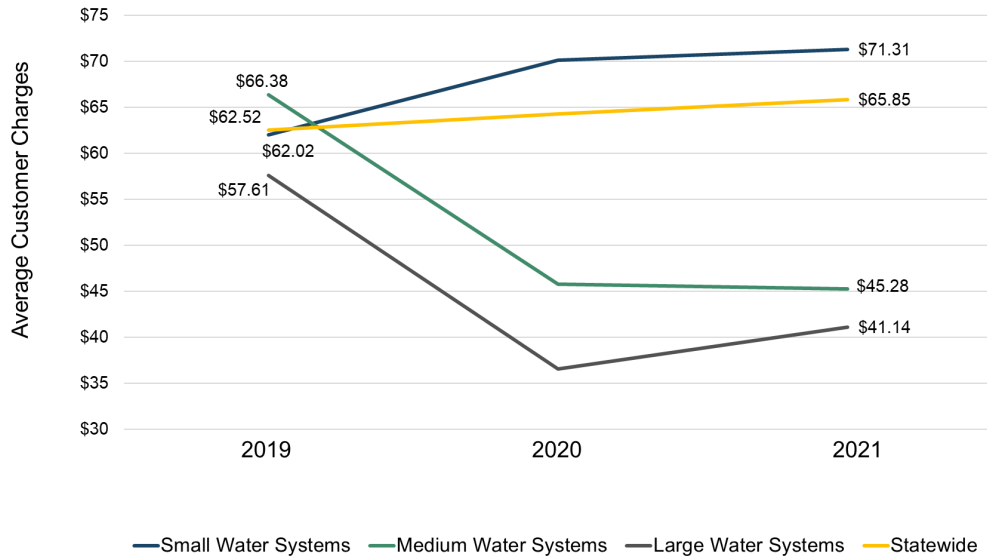


Table 1: 2021 Average Monthly Residential Customer Charges for 6 HCF by System Size

System Size	Total Systems	Average Customer Charges for 6 HCF
Large Community Water Systems ⁴	91	\$41.14
Medium Community Water Systems ⁵	332	\$45.28
Small Community Water Systems ⁶	1,739	\$71.31
STATEWIDE:	2,162	\$65.85
<i>Systems that Do Not Charge for Water or Missing Charge Data</i>	683	

Table 2 and Table 3 summarize the 2021 average customer charges collected from water systems statewide in 2022. On average DAC/SDAC water systems charge residential customers \$13 more a month for the delivery of 6 HCF. Furthermore, Failing (\$73) and At-Risk (\$86) water systems on average have higher customer charges for 6 HCF than Not At-Risk (\$59) water systems.⁷

⁴ Greater than 30,000 service connects or those that serve a population of 100,000 or more.

⁵ 3,001 - 30,000 service connections or those that serve a population of less than 100,000.

⁶ 3,000 service connections or less.

⁷ [Attachment D1: Affordability Assessment Data and Results](#)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx

Table 2: 2021 Average Monthly Residential Customer Charges for 6 HCF by DAC/SDAC Status

Community Status	Total Systems	Average Customer Charges for 6 HCF
DAC/SDAC	1,027	\$58.93
Non-DAC	1,130	\$71.95
Missing DAC Status⁸	5	\$105.73
STATEWIDE:	2,162	\$65.85
<i>Systems that Do Not Charge for Water or Missing Charge Data</i>	683	

Table 3: 2021 Average Monthly Residential Customer Charges for 6 HCF by SAFER Status

SAFER Program Status⁹	Total Systems	Average Customer Charges for 6 HCF
Failing Systems	236	\$72.67
Failing DAC/SDAC	143	\$60.01
At-Risk Systems	331	\$86.48
At-Risk DAC/SDAC	228	\$77.84
Potentially At-Risk Systems	283	\$75.74
Potentially At-Risk DAC/SDAC	161	\$61.62
Not At-Risk System	1,183	\$58.97
Not At-Risk System DAC/SDAC	460	\$50.30
Not Assessed	129	\$43.98
Not Assessed System DAC/SDAC	35	\$45.30
STATEWIDE:	2,162	\$67.06
<i>Systems that Do Not Charge for Water or Missing Charge Data</i>	683	

⁸ Missing DAC Status refers to the list of systems that were included in the affordability assessment but lacked data necessary to calculate their MHI to determine their DAC status.

⁹ Water systems that are not DAC/SDAC or are missing DAC status designations are excluded from sub-categories within this table.

AFFORDABILITY ASSESSMENT METHODOLOGY

KEY 2023 AFFORDABILITY ASSESSMENT METHODOLOGY UPDATES

The State Water Board, in partnership with the Office of Environmental Health Hazard Assessment (OEHHA), hosted three public Affordability Workshops in 2022 to re-evaluate previously utilized affordability indicators, research new affordability indicators, and explore how to incorporate a new affordability indicator that measures disposable income limitations into the 2023 Needs Assessment and beyond.¹⁰ These workshops also analyzed different approaches for determining DACs and establishing an “affordability threshold.”

Remove Two Affordability Indicators

The State Water Board removed two affordability indicators from 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 these two risk indicators came from the State Water Board’s 2021 Drinking Water Arrearage Payment Program.¹¹ 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). This dataset is not up-to-date and does not reflect current affordability challenges. Therefore, these two indicators were removed from the Assessment until updated data becomes available.

Add New Affordability Indicator: Household Socioeconomic Burden

The State Water Board and OEHHA developed a new affordability indicator, incorporating stakeholder feedback from the three Affordability Workshops, “Household Socioeconomic Burden,” a composite indicator that is a combined measure of Housing Burden and Poverty Prevalence that measures the extent at which low-income customers may have affordability challenges now or in the future because their disposable income is constrained by high housing costs. This allows for the inclusion of water systems that do not charge customers directly for water in the assessment.¹² See Appendix D for more information.

WATER SYSTEMS ASSESSED

The Affordability Assessment is conducted annually for all community water systems. It is worth noting that, while there is some overlap, the systems included in the Affordability

¹⁰ Workshop 1 (August 8, 2022); [Presentation](https://bit.ly/3jsl4k8): <https://bit.ly/3jsl4k8>

Workshop 2 (September 20, 2022); [Presentation](https://bit.ly/3juZwEI): <https://bit.ly/3juZwEI>; [White Paper](https://bit.ly/3HXrliS): <https://bit.ly/3HXrliS>

Workshop 3 (November 1, 2022); [Presentation](https://bit.ly/3CKoBiG): <https://bit.ly/3CKoBiG>; [White Paper](https://bit.ly/3HVIslI): <https://bit.ly/3HVIslI>

¹¹ [California Water and Wastewater Arrearage Payment Program](https://www.waterboards.ca.gov/arrearage_payment_program/)

https://www.waterboards.ca.gov/arrearage_payment_program/

¹² Since 2020, all affordability indicators have relied on the water systems charging for water. In 2022, nearly 40% of DAC water systems were excluded from the Assessment because they do not charge for water (i.e., mobile home parks that include their water bill in rental charge).

Assessment differ from the list of water systems analyzed in the Risk Assessment for public water systems. The Affordability Assessment includes all large and small community water systems (including above 30,000 service connections) and excludes non-transient, non-community water systems, like schools. The Risk Assessment, on the other hand, analyzed small and medium-size public water systems with less than 30,000 service connections or those that serve a population of less than 100,000 people and non-transient, non-community K-12 schools were included. Table 4 provides an overview of the systems included in the Affordability Assessment.

Table 4: Systems Included in the Affordability Assessment

SAFER Program Status	Risk Assessment	Affordability Assessment
Large Community Water Systems ¹³	0	92
Medium Community Water Systems ¹⁴	311	334
Small Community Water Systems ¹⁵	2,384	2,419
Non-Community K-12 Schools	358	0
TOTAL:	3,053	2,845

AFFORDABILITY ASSESSMENT METHODOLOGY

The Affordability Assessment methodology has developed through a phased public process since January 2019. Public workshops have been hosted to solicit public feedback to help refine the Assessment over time. The Affordability Assessment methodology relies on two core elements which are utilized to identify water systems serving communities that may be experiencing drinking water affordability challenges:

Affordability Indicators: quantifiable measurements of key data points that allow the State Water Board to assess drinking water affordability challenges.

Affordability Indicator Thresholds: the levels, points, or values associated with an individual affordability indicator that delineates when a water system’s customers may be experiencing affordability challenges.

The Affordability Assessment identifies “High,” “Medium,” “Low” Affordability Burden communities. The designation is based on the number of Affordability Indicator thresholds met by each water system. The higher the count, the higher the Affordability Burden designation. See Appendix D for more information.

¹³ Greater than 30,000 service connects or those that serve a population of 100,000 or more.

¹⁴ 3,001 - 30,000 service connections or those that serve a population of less than 100,000.

¹⁵ 3,000 service connections or less.

Figure 5: Illustration of the Affordability Assessment Methodology



AFFORDABILITY INDICATORS

In 2020, 23 Affordability indicators were identified and evaluated through public workshops for potential inclusion in both the Affordability Assessment and Risk Assessment.¹⁶ Through these workshops, stakeholders identified a series of indicators that could be incorporated into the Assessment immediately and some that needed to be further developed and refined. Since 2020, the State Water Board and its partners have hosted workshops to further refine and update the Affordability indicators used in the Assessment as data becomes available or not available. Affordability indicators can be categorized based on the following attributes:

Household vs. Community Affordability Indicators

- **Household** affordability indicators measure the ability of individual households to pay for an adequate supply of water. Indicators measuring affordability at this scale often include a count or measurement of the number of customers within a service area of a water system that may be struggling now or in the future to pay for water services. *Currently, the Affordability Assessment has no household affordability indicators.*
- **Community** affordability indicators measure the ability of a water system's entire service area to pay for water services to financially support a resilient water system. Metrics measuring community level affordability often include data that spans all customers served by the water system.

Where there may be some households struggling to pay for water services, if the whole community is not struggling, then community level affordability may not be a concern. It is important to consider both household and community level affordability together.

Rates-Based vs. Non-Rates-Based Affordability Indicators

- **Rates-based** affordability indicators rely on data that is either directly or indirectly related to a water system directly charging for water. Rates-based indicators typically assess the proportion of a customer's income spent on water services or non-payment of water bills.
- **Non-rates-based** affordability indicators do not rely on a water system directly charging their customers for water services. These indicators may include income-based data or other data points that can assess ability to access drinking water services. These types

¹⁶ [Supplemental Appendix D.3. Potential Affordability Risk Indicator Evaluations.](https://www.waterboards.ca.gov/safer/docs/safer_supp_appxd3_101320.pdf)
https://www.waterboards.ca.gov/safer/docs/safer_supp_appxd3_101320.pdf

of indicators are important for measuring affordability challenges for customers who do not receive a water bill. Examples include mobile home park residents who pay for services in their rent.

Table 5: Affordability Indicators 2020 – 2023

Indicators	Household / Community	Rates-Based?	2021	2022	2023
Percent of Median Household Income (%MHI)	Community	Yes	✓	✓	✓
Extreme Water Bill	Community	Yes	✓	✓	✓
% Shut-Offs (Removed 2022)¹⁷	Household	Yes	✓		
Percentage of Residential Arrearages (Removed 2023)¹⁸	Household	Yes		✓	
Residential Arrearage Burden (Removed 2023)¹⁹	Community	Yes		✓	
NEW: Household Socioeconomic Burden	Community	No			✓

The following are brief descriptions of the affordability indicators utilized in the 2023 Affordability Assessment. Additional details on data sources, calculation methodologies, and thresholds are detailed in Appendix D.

% MHI: This indicator measures annual system-wide average residential customer charges for six Hundred Cubic Feet (HCF) per month relative to the annual Median Household Income (MHI) within a water system’s service area. Six HCF indoor water usage per month is roughly equivalent to 50 gallons per person per day for a three-person household for 30 days.

Percent median household income (%MHI) is commonly used by state and federal regulatory agencies and by water industry stakeholders for assessing community-wide water charges affordability for decades. The State Water Board uses MHI to determine DAC status²⁰ and has for some time used the 1.5% MHI threshold in the Drinking Water State Revolving Fund (DWSRF) program as a metric for determining whether a small DAC will receive repayable (loan) or non-repayable (e.g., grant or non-repayable) funding.

Extreme Water Bill: This indicator measures drinking water customer charges that meet or exceed 150% and 200% of statewide average drinking water customer charges at the six HCF

¹⁷ Data not collected.

¹⁸ Data not collected.

¹⁹ Data not collected.

²⁰ It is important to note that the estimated designation of community economic status is for the purposes of the Affordability Assessment only and will not be used by the State Water Board’s Division of Financial Assistance (DFA) to make funding decisions. Further MHI analysis on a per system basis will be conducted by DFA when a system seeks State Water Board assistance.

[AB 401 Final Report](#)

https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

level of consumption. The State Water Board’s AB 401 report²¹ recommended statewide low-income rate assistance program elements which utilize the two recommended tiered indicator thresholds of 150% and 200% of the state average drinking water bill for six HCF.

NEW: Household Socioeconomic Burden: The purpose of this risk indicator is to identify water systems that serve communities that have both high levels of poverty and high housing costs for low-income households. These communities may be struggling to pay their current water bill and may have a difficult time shouldering future customer charge increases when their limited disposable income is constrained by high housing costs. This indicator is a composite indicator of two data points: Poverty Prevalence and Housing Burden.

- **Poverty Prevalence** measures the percent of the population living below two times the federal poverty level and can be represented reliably at the census block group, tract, and county level.
- **Housing Burden Indicator** measures the percent of households in a census tract that are both low income (making less than 80% of the Housing and Urban Development (HUD) Area Median Family Income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs).

AFFORDABILITY ASSESSMENT RESULTS

AFFORDABILITY RESULTS BY COMMUNITY ECONOMIC STATUS

For the 2023 Affordability Assessment, State Water Board staff analyzed 2,845 community water systems, of which approximately 9 water systems lacked the data necessary to calculate any of the three affordability indicators.²² Water systems that had partial data for some, but not all, of the affordability indicators were included in the analysis and are summarized in Table 6.

Overall, comparing the three indicators in cases where data was available, more community water systems exceed the affordability threshold for ‘Household Socioeconomic Burden’ (52%) than the affordability threshold for ‘%MHI’ (17%). Of those that exceeded the affordability threshold for ‘Household Socioeconomic Burden,’ most of them are DAC and SDAC systems (77%). Table 6 summarizes the number of water systems, by their community economic status, that exceeded the minimum affordability threshold for each indicator assessed.

Table 6: Total Number of Systems Meeting Affordability Threshold

Community Status	Total Systems	%MHI	Extreme Water Bill	Household Socioeconomic Burden
DAC/SDAC	1,483	368 (25%)	103 (7%)	1,138 (77%)
Non-DAC	1,347	118 (9%)	214 (16%)	334 (25%)

²¹ AB 401 Final Report:

[Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program](https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf)

https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

²² [Attachment D1: Affordability Assessment Data and Results](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx

Community Status	Total Systems	%MHI	Extreme Water Bill	Household Socioeconomic Burden
Missing DAC Status ²³	15	0 (0%)	2 (13%)	8 (53%)
TOTAL:	2,845	486 (17%)	319 (1%)	1,480 (52%)
Missing Data ²⁴		251 (9%)	248 (9%)	34 (1%)
Not Applicable ²⁵		669 (24%)	669 (24%)	0 (0%)

To assess which systems may be facing the greatest affordability burden, the State Water Board further analyzed how many water systems exceeded thresholds for multiple affordability indicators. Affordability burden is ranked from low (only one affordability indicator threshold exceeded), medium (two affordability indicator thresholds exceeded), or high (three affordability indicator thresholds exceeded) (Table 7). Of the 2,845 community water systems analyzed, most resulted in a low affordability burden (45%) followed by a medium affordability burden (12%) and a high affordability burden (3%). Overall, there is a higher proportion of DAC/SDAC systems that have a high or medium affordability burden compared to non-DAC and missing DAC status systems.

Table 7: Affordability Assessment Results

Community Status	Total Systems Assessed	High Affordability Burden ²⁶	Medium Affordability Burden ²⁷	Low Affordability Burden ²⁸	None
DAC/SDAC	1,483	75 (5%)	246 (17%)	889 (60%)	272 (18%)
Non-DAC	1,347	19 (1%)	107 (8%)	394 (29%)	828 (61%)
Missing DAC Status	15	0 (0%)	1 (7%)	8 (53%)	6 (40%)
TOTAL:	2,845	94 (3%)	354 (12%)	1,291 (45%)	1,106 (39%)

²³ Missing DAC Status refers to the list of systems that were included in the affordability assessment but lacked data necessary to calculate their MHI to determine their DAC status.

²⁴ Missing data: %MHI; lacked water rates data, lacked data to calculate MHI; Extreme Water Rates, lacked data on water rate charges, water rate was outside of \$5-\$500 range; Percent of Residential Arrearages/Residential Arrearage Burden, no arrearage survey data was submitted.

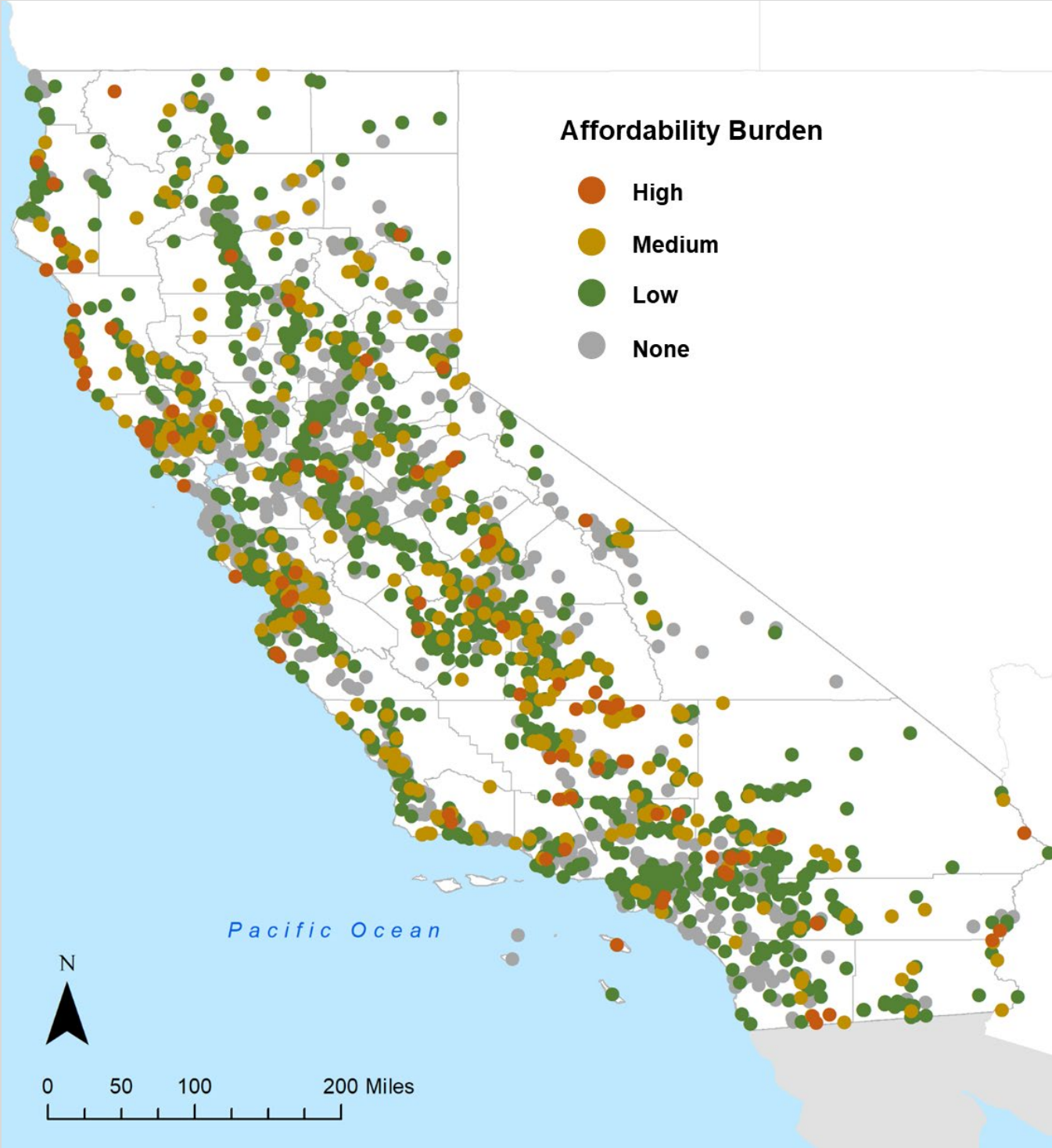
²⁵ Not applicable refers to systems who did not qualify to meet an indicator threshold: % MHI, systems who did not charge for water; Extreme Water Bill, systems that did not charge for water; % Residential Arrearages/Residential Arrearage Burden, systems that did not charge for water, claimed no arrearages, or did not have residential arrearages.

²⁶ Community water system met the minimum threshold for 3 of the affordability indicators.

²⁷ Community water system met the minimum threshold for 2 of the affordability indicators.

²⁸ Community water system met the minimum threshold for 1 of the affordability indicators.

Figure 6: Affordability Assessment Results (n=2,845)



AFFORDABILITY RESULTS BY WATER SYSTEM SAFER PROGRAM STATUS

While SB 200 only mandates the identification of DAC/SDAC water systems that have customer charges that exceed affordability thresholds, the 2023 Affordability Assessment also identified the number of Failing and At-Risk public water systems exceeding affordability thresholds as well. Table 8 and the section below summarizes the number of Failing and At-Risk water systems, by their community economic status, that exceeded the minimum affordability threshold for each affordability indicator assessed.

According to the analysis, Failing and At-Risk systems exceeded the affordability thresholds for more affordability indicators when compared to Potentially At-Risk and Not At-Risk systems. The full results of this analysis, by affordability indicator, are detailed in Appendix D.

Table 8: Aggregated Affordability Assessment Results by Water System SAFER Program Status

SAFER Program Status ²⁹	Total Systems	%MHI	Extreme Water Bill	Household Socioeconomic Burden
Failing Systems	323	83 (26%)	49 (15%)	203 (63%)
DAC/SDAC	203	66 (33%)	16 (8%)	177 (87%)
At-Risk Systems	468	155 (33%)	81 (17%)	330 (71%)
DAC/SDAC	324	121 (37%)	41 (13%)	275 (85%)
Potentially At-Risk Systems	408	92 (23%)	56 (14%)	268 (66%)
DAC/SDAC	257	65 (25%)	19 (7%)	222 (86%)
Not At-Risk System	1,485	151 (10%)	132 (9%)	611 (41%)
DAC/SDAC	656	113 (17%)	27 (4%)	437 (67%)
Not Assessed	161	4 (3%)	1 (1%)	68 (42%)
DAC/SDAC	43	3 (7%)	0 (0%)	27 (63%)
TOTAL:	2,845	485 (17%)	319 (11%)	1,480 (52%)
Missing Data		15 (1%)	248 (9%)	34 (1%)
Not Applicable		669 (24%)	669 (24%)	0 (0%)

To assess which systems may be facing the greatest affordability burden, the State Water Board further analyzed how water systems, by SAFER status, exceeded thresholds for multiple affordability indicators. Affordability burden is ranked from low (only one affordability indicator threshold exceeded), medium, (two affordability indicator thresholds exceeded), or high (three affordability indicator thresholds exceeded). As summarized in Table 9, a relatively higher percentage of Failing and At-Risk water systems had higher affordability burden when compared to Potentially At-Risk and Not At-Risk water systems.

²⁹ Water systems that are not DAC/SDAC or are missing DAC status designations are excluded from sub-categories within this table.

Table 9: Affordability Assessment Results by SAFER Program Status

SAFER Program Status	Total Systems Assessed	High Affordability Burden ³⁰	Medium Affordability Burden ³¹	Low Affordability Burden ³²	None
Failing Systems	323	16 (5%)	67 (21%)	153 (47%)	87 (27%)
DAC/SDAC	203	13 (6%)	50 (25%)	120 (59%)	20 (10%)
At-Risk Systems	468	42 (9%)	107 (23%)	226 (48%)	93 (20%)
DAC/SDAC	324	30 (9%)	85 (26%)	177 (55%)	32 (10%)
Potentially At-Risk Systems	408	16 (4%)	70 (17%)	228 (56%)	94 (23%)
DAC/SDAC	257	15 (6%)	45 (18%)	171 (67%)	26 (10%)
Not At-Risk System	1,485	21 (1%)	107 (7%)	617 (42%)	740 (50%)
DAC/SDAC	656	18 (3%)	64 (10%)	395 (60%)	179 (27%)
Not Assessed System	161	0 (0%)	3 (2%)	67 (42%)	91 (57%)
DAC/SDAC	43	0 (0%)	2 (5%)	26 (60%)	15 (35%)
TOTAL:	2,845	95 (3%)	354 (12%)	1,291 (45%)	1,105 (39%)

NEW WATER SYSTEM FINANCIAL CAPACITY & COMMUNITY AFFORDABILITY DASHBOARD

In 2022-2023, the State Water Board developed a new Water System Financial Capacity & Community Affordability Dashboard.³³ The purpose of this dashboard is to allow users to explore the relationships between water system financial capacity and affordability. The dashboard displays and auto-calculates averages of the financial capacity and affordability risk indicators for community water systems used in the Risk Assessment and Affordability Assessment. Users can filter the water systems and data displayed in the dashboard to better understand how water system characteristics, customer affordability challenges, and water system financial capacity are related. Learn more in Appendix G.

DEMOGRAPHIC ANALYSIS OF COMMUNITY WATER SYSTEMS

Results for the 2023 Affordability Assessment for community water systems can be combined with demographic data to better understand the populations most at-risk. However, there are several limitations to this demographic analysis. Demographic data is collected at the census block group or census tract level, and current census surveys do not indicate household

³⁰ Community water system met the affordability threshold for 3 affordability indicators.

³¹ Community water system met the affordability threshold for 2 of the affordability indicators.

³² Community water system met the affordability threshold for 1 of the affordability indicators.

³³ [Water System Financial Capacity & Community Affordability Dashboard](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/afforddashboard.html)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/afforddashboard.html

drinking water source type. Therefore, the demographic information presented in the tables below may not represent the actual population served by public water systems. Any interpretation of these results should keep in mind the limitations of the analysis.

Demographic data (household size, linguistic isolation, poverty, median household income, and race/ethnicity) was taken from the 2021 American Community Survey. CalEnviroScreen 4.0 data is from OEHHA.³⁴ The CalEnviroScreen 4.0 data is displayed as percentiles, with higher percentiles indicating areas that are most affected by pollution and where people are especially vulnerable to the effects of pollution. The socioeconomic analysis was calculated using water service area boundaries, area-weighted census tract data where appropriate, and calculating weighted averages. This methodology means that there may be a bias towards demographic data from larger, rural tracts/block groups as these areas are often larger than smaller, urban tracts/block groups.

When compared with Non-DAC/SDAC water systems, DAC/SDAC water system service areas tend to have higher CalEnviroScreen scores, a higher percentage of households in poverty, a higher percentage of limited English-speaking households, non-white communities. Systems with high affordability burden have higher CalEnviroScreen scores, percentages of households that are less than two times the federal poverty level, and greater linguistic isolation than medium and low affordability burden systems (Table 10).

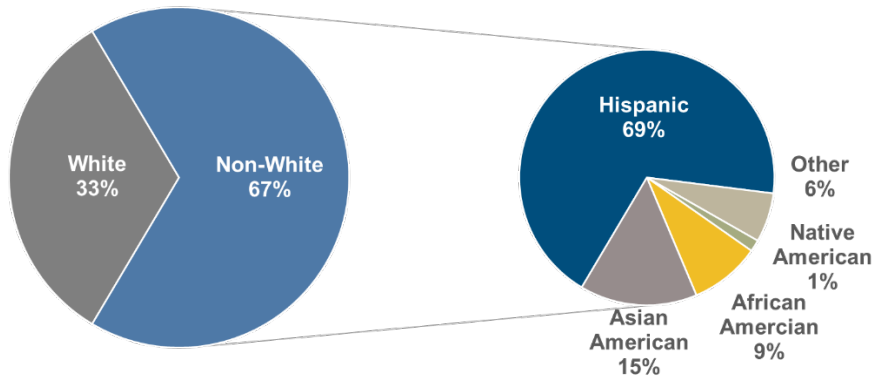
³⁴ [OEHA CalEnviroScreen](https://oehha.ca.gov/calenviroscreen)
<https://oehha.ca.gov/calenviroscreen>

Table 10: Socioeconomic Analysis for Community Water Systems (CWSs)³⁵

	Statewide (all CWS)	Non- DAC/SDAC CWSs	DAC/SDAC CWSs	No Afford. Burden CWSs	Low Afford. Burden CWSs	Medium Afford. Burden CWSs	High Afford. Burden CWSs
Total Count of Systems	2,845	1,347	1,483	1,105	1,291	354	95
Average CalEnviroScreen 4.0 Percentile	42.3	32.9	51	32.6	49.6	46	43.3
Average CalEnviroScreen 4.0 Population Characteristics Percentile	43.7	30.9	55.4	31.7	52.1	49.8	46.4
Average CalEnviroScreen 4.0 Pollution Burden Percentile	42.8	41.4	44.1	39.9	45.8	42	40.2
Average percentage of households 2x below federal poverty	30.2%	18.4%	40.4%	16.9%	38.1%	38.2%	41.4%
Average percentage of households with limited English speaking	6%	3.3%	8.2%	3%	8%	7.2%	6.3%
Average household size	2.8	2.8	2.7	2.7	2.8	2.7	2.7
Percent of non-white customers served	43.1%	38.7%	46.9%	36.2%	49.4%	41.6%	39.2%

³⁵ CalEnviroScreen 4.0 data is available per census tract. Combined risk status for domestic wells is available per square mile section. To determine the CalEnviroScreen 4.0 percentile score average per combined risk category, each section was assigned the CalEnviroScreen 4.0 percentile score based on the tract that contains the centroid of the section. Some census tracts do not contain any section centroid and therefore do not contribute to the averages even if they overlap a section with a domestic well. The square mile sections are grouped by their combined risk status to determine the average score percentile using a weighted average approach. It is important to factor in the geographic relationship between tracts and sections. Without considering a weighting approach for averaging scores within each combined risk categories, scores of large census tracts would contribute more to the risk category average compared to small census tracts. For example, a tract with 600 sections contributes 600 of the same percentile scores while a tract with 20 sections only contributes 20 percentile scores. Instead, to reduce bias towards large rural areas, each section was assigned a weight of the inverse number of sections in the census tract. For example, a tract with 10 sections would be given a weight of 0.10. A one-way analysis of variance (ANOVA) showed a statistically significant difference in average scores between combined risk categories for CalEnviroScreen 4.0 percentile, Population Characteristics, Pollution Burden, Poverty, Average percentage of households with limited English speaking, and Household Size ($p < 0.0001$).

Figure 7: Distribution of High Affordability Burden Community Water Systems by Majority Race/Ethnicity Census Tract



AFFORDABILITY ASSESSMENT LIMITATIONS

The 2023 Affordability Assessment makes progress in identifying communities that may be struggling with water affordability challenges; however, the State Water Board has identified the following limitations that are worth noting:

Affordability Assessment Scope

As described above, there are multiple lenses through which to assess water “affordability.” SB 200 does not define how the State Water Board should measure affordability. Nor does it specify if the “Affordability Threshold” is meant to assess household affordability, community affordability, and/or a water system’s financial capacity. All three aspects of affordability are interrelated, but metrics or indicators that measure each can differ greatly. More engagement with the public, water systems, and stakeholders is needed to better define the scope of the Affordability Assessment and how its results will be utilized.

Affordability Indicator Data

The State Water Board acknowledges that there are some data coverage issues and data quality uncertainties for all the affordability indicators utilized in the Affordability Assessment. Customer charges, MHI, and/or residential arrearage data are not available for some water systems included in this assessment. Water system customer charge and residential arrearage data is self-reported and is difficult to verify its quality. Finally, water system boundaries, which are used to calculate MHI, may not be accurate. In some cases, they reflect a water system’s jurisdiction boundary rather than their service area boundary.

An additional consideration that may be impacting the results of the Affordability Assessment is that water system customer charges may not reflect the full cost water systems face in order to meet current and future operations and infrastructure needs to deliver safe drinking water. For example, many small water systems lack asset management plans, capital improvement plans, and financial plans to assist them in setting customer charges appropriately. This may result in customer charges that are lower than what is needed to support resilient water

systems. If more systems were to implement full-cost pricing of their customer charges, the Affordability Assessment results may be different.

Affordability Indicators

There has been criticism of %MHI by academics, water system associations, and the broader water sector mostly around its accuracy in measuring household affordability for those truly in need and the setting of arbitrary %MHI thresholds, limitations which the U.S. EPA has recently acknowledged. Furthermore, some affordability indicators may be more applicable to some governance types of systems than others. For instance, some of the feedback received on the affordability indicators from the Risk Assessment public engagement was that using rates-based indicators, like %MHI and Extreme Water Bill, does not capture the ways in which some systems' finance the full cost of service provision. Another point raised was that some individual water systems are connected to larger utility structures that help mitigate affordability challenges in ways that are not currently represented in the Affordability Assessment.

Currently, many other state agencies are developing and utilizing affordability indicators in similar complementary efforts. The selection of affordability indicators for the Needs Assessment fully considered affordability indicators used by the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Water Resources (DWR), and the California Public Utilities Commission (CPUC). However, many of the indicators selected for the Needs Assessment differ from those used by these other efforts. The use of different indicators, and corresponding thresholds, across state and federal agencies can lead to some confusion for water systems and communities. The State Water Board will continue to collaborate with other state agencies and work towards better alignment.

AFFORDABILITY ASSESSMENT REFINEMENT OPPORTUNITIES

The State Water Board will be conducting the Affordability Assessment on an annual basis as part of the Needs Assessment. To begin addressing the limitations highlighted above, the State Water Board will begin exploring new opportunities to refine the next iteration of the Affordability Assessment:

Improved Data Collection Efforts

The State Water Board has already begun taking necessary steps to improve data coverage and accuracy for the Affordability Assessment. Improvements to the 2020 reporting year eAR include new requirements for completing survey questions focused on customer charges and affordability.³⁶ eAR functionality has been developed that will help auto-calculate average customer charges for six HCF, which will help reduce data errors. Furthermore, the eAR will be able to better distinguish between water systems that do not charge for water compared to those that do. The 2021 eAR includes enhancements to customer charges validations to ensure better data quality.

Refinement of Affordability Indicators and Thresholds

In 2022, the State Water Board hosted three public workshops to solicit feedback on current and future affordability indicators. Based on public feedback during these workshops, the State

³⁶ [Electronic Annual Report \(EAR\) | California State Water Resources Control Board](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/ear.html

Water Board will begin developing a strategy to collect arrearage (customer debt), shut-off, and customer assistance program data from water systems to further enhance the data used in the Affordability Assessment. The State Water Board will conduct proper research and stakeholder engagement to develop new affordability indicators and the appropriate affordability thresholds necessary for inclusion in the Risk and Affordability Assessment.

Improved Aggregated Assessment

Further consideration will be given to how systems that have extremely low customer charges or have not raised their rates within a certain time period should be assessed for affordability and more broadly for risk. These systems may be more at-risk for falling out of water quality compliance or may be imposing affordability burdens on their customers through other means other than customer charges.

APPENDIX D: AFFORDABILITY ASSESSMENT METHODOLOGY

INTRODUCTION

The purpose of the Affordability Assessment is to identify disadvantaged community (DAC) and severely disadvantaged community (SDAC) water systems, that have instituted customer charges that exceed the “Affordability Threshold” established by the State Water Board in order to provide drinking water that meets state and federal standards.³⁷

WATER SYSTEMS ASSESSED

The Affordability Assessment is conducted annually for all California community water systems. It is worth noting that, while there is some overlap, the systems included in the Affordability Assessment differ from the list of water systems analyzed in the Risk Assessment for public water systems. The Affordability Assessment includes large and small community water systems but excludes non-transient, non-community water systems, like schools. The Risk Assessment, on the other hand, analyzed smaller public water systems with less than 30,000 service connections or that served a population of less than 100,000 people and non-transient non-community K-12 schools were included. Both assessments exclude all community water system wholesalers, transient water systems, state small water systems and domestic wells. Table D1 provides an overview of the systems included in the Affordability Assessment.

Table D1: Systems Included in the Affordability Assessment

SAFER Program Status	Risk Assessment	Affordability Assessment
Failing Systems	381	323
At-Risk Systems	512	468
Potentially At-Risk	453	408
Not At-Risk	1,707	1,485
Not Assessed	N/A	161
TOTAL:	3,053	2,845

³⁷ California Health and Safety Code, section 116769, subd. (a)(2)(B)

The difference in the number of Failing systems and At-Risk systems between the Risk Assessment and Affordability Assessment in Table D1 can be attributed to the exclusion of non-transient, non-community K-12 schools in the Affordability Assessment.

AFFORDABILITY ASSESSMENT METHODOLOGY DEVELOPMENT PROCESS

The State Water Board, in partnership with UCLA, began developing the initial Affordability Assessment in 2019. The State Water Board and UCLA hosted four public webinar workshops in 2020 to solicit feedback and recommendations on the development of the Affordability Assessment. Approximately 683 individuals³⁸ participated in these workshops through either Zoom or CalEPA’s live webcast. Since the initial launch of the Affordability Assessment in 2021, the methodology has been refined through additional public workshops. The State Water Board encourages public and stakeholder participation in the Affordability Assessment refinement process and strives to provide opportunities for feedback and recommendations. Proposed Affordability Assessment methodology updates are detailed in publicly available white papers, presented at public webinars, and public feedback is often incorporated into the final methodology and results. These materials are hosted on the Needs Assessment webpage.³⁹

In 2022, the State Water Board partnered with the Office of Environmental Health Hazard Assessment (OEHHA) to host three public Affordability Workshops to re-evaluate previously utilized affordability indicators, research new affordability indicators, and explore how to incorporate a new affordability indicator that measures disposable income limitations into the 2023 Needs Assessment and beyond.⁴⁰ These workshops also analyzed different approaches for determining DACs and establishing an “affordability threshold.”

AFFORDABILITY ASSESSMENT METHODOLOGY

SB 200 calls for the identification of “any community water system that serves a disadvantaged community that must charge fees that exceed the affordability threshold established by the board in order to supply, treat, and distribute potable water that complies with federal and state drinking water standards.”⁴¹ Based on the legislative requirements, the Affordability Assessment is conducted following a two-step process summarized below:

STEP 1: Identify DAC water systems that have instituted customer charges.

³⁸ Individuals that participated in more than webinar workshop are double counted in this figure.

³⁹ [State Water Board Needs Assessment Webpage](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html#affordability-assessment)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/needs.html#affordability-assessment

⁴⁰ Workshop 1 (August 8, 2022); [Presentation](https://bit.ly/3jsl4k8): <https://bit.ly/3jsl4k8>

Workshop 2 (September 20, 2022); [Presentation](https://bit.ly/3juZwEI): <https://bit.ly/3juZwEI>; [White Paper](https://bit.ly/3HXrliS): <https://bit.ly/3HXrliS>

Workshop 3 (November 1, 2022); [Presentation](https://bit.ly/3CKoBIG): <https://bit.ly/3CKoBIG>; [White Paper](https://bit.ly/3HVlslI): <https://bit.ly/3HVlslI>

⁴¹ California Health and Safety Code section 116769 (2) (B).

STEP 2: Of these DAC water systems, the State Water Board must identify those that exceed an “Affordability Threshold” in order to provide drinking water that meets State and Federal standards.

STEP 1: DAC & SDAC DETERMINATION

SB 200 requires the identification of DAC and SDAC systems that meet the Affordability Threshold. For the purposes of the Affordability Assessment, the State Water Board determined DAC and SDAC economic status for water systems using available data.

Disadvantaged Community or DAC means the entire service area of a community water system, or a community therein, in which the MHI is less than 80% of the statewide annual MHI level.

Severely Disadvantaged Community or SDAC means the entire service area of a community water system in which the MHI is less than 60% of the statewide MHI.

The State Water Board used the methodology detailed below to estimate MHI. **It is important to note that the estimated designation of community economic status is for the purposes of the Affordability Assessment only and will not be used by the State Water Board’s Division of Financial Assistance (DFA) to make funding decisions.** Further MHI analysis on a per system basis will be conducted by DFA when a system seeks State Water Board assistance.

Table D2: Water System Community Economic Status for the Affordability Assessment

Community Economic Status	Total Systems	Failing Systems	At-Risk Systems
DAC	542	45	96
SDAC	941	158	228
Non-DAC	1,347	119	138
Missing DAC Status	15	1	6
TOTAL:	2,845	323	468

STEP 2: CONDUCT AFFORDABILITY ASSESSMENT

OVERVIEW OF AFFORDABILITY ASSESSMENT METHODOLOGY

The Affordability Assessment methodology relies on two core elements which are utilized to identify water systems serving communities that may be experiencing drinking water affordability challenges affordability indicators and thresholds. The methodology employed by the current Affordability Assessment utilizes the same affordability indicators and minimum thresholds used in the Risk Assessment.

Affordability Indicators: quantifiable measurements of key data points that allow the State Water Board to assess drinking water affordability challenges.

Affordability Indicator Thresholds: the levels, points, or values associated with an individual affordability indicator that delineates when a water system's customers may be experiencing affordability challenges.

The Affordability Assessment identifies "High," "Medium," "Low" Affordability Burden communities. The designation is based on the number of Affordability Indicator thresholds met by each water system. The higher the count, the higher the Affordability Burden designation. See Appendix D for more information.

AFFORDABILITY INDICATORS

Since 2020, the State Water Board and its partners have hosted workshops to feather refine and update the Affordability indicators used in the Risk and Affordability Assessments as data becomes available or is no longer available. Affordability indicators can be categorized based on the following attributes:

Household vs. Community Affordability Indicators

- **Household** affordability indicators measure the ability of individual households to pay for an adequate supply of water. Indicators measuring affordability at this scale often include a count or measurement of the number of customers within a service area of a water system that may be struggling now or in the future to pay for water services. *Currently, the Affordability Assessment has no household affordability indicators.*
- **Community** affordability indicators measure the ability of a water system's entire service area to pay for water services to financially support a resilient water system. Metrics measuring community level affordability often include data that spans all customers served by the water system.

Where there may be some households struggling to pay for water services, if the whole community is not struggling, then community level affordability may not be a concern. It is important to consider both household and community level affordability together.

Rates-Based vs. Non-Rates-Based Affordability Indicators

- **Rates-based** affordability indicators rely on data that is either directly or indirectly related to a water system directly charging for water. Rates-based indicators typically assess the proportion of a customer's income spent on water services or non-payment of water bills.
- **Non-rates-based** affordability indicators do not rely on a water system directly charging their customers for water services. These indicators may include income-based data or other data points that can assess ability to access drinking water services. These types of indicators are important for measuring affordability challenges for customers who don't receive a water bill. Examples include mobile home park residents who pay for services in their rent.

2021 Affordability Indicators

In 2020, the State Water Board conducted an Affordability Assessment for community water systems, which analyzed one affordability indicator, water charges as a percent of median household income (%MHI), for the FY 2020-21 Safe and Affordable Drinking Water Fund Expenditure Plan.⁴² From April through October 2020, the State Water Board and UCLA conducted extensive research and public engagement to identify potential affordability indicators for the Needs Assessment.⁴³ This effort identified 23 potential affordability indicators (white paper, Table 10).⁴⁴ In 2021, the State Water Board selected two new affordability indicators from the list of 23 to incorporate into the 2021 Risk Assessment and 2021 Affordability Assessment. These two indicators were: ‘Extreme Water Bill’ and ‘% Shut-offs.’

2022 Added and Removed Affordability Indicators

In 2020, Governor Newsom issued an Executive Order that prohibited water shut-offs beginning March 4, 2020, through December 31, 2021.⁴⁵ Therefore, data for ‘% Shut-offs’ was unavailable for the majority of 2020 and was not collected from water systems in the 2020 Electronic Annual Report (EAR). Thus, the State Water Board removed this affordability indicator from the 2022 Needs Assessment.

The State Water Board has replaced ‘% Shut-offs’ with two new affordability indicators: ‘Percentage of Residential Arrearages’ and ‘Residential Arrearage Burden.’ These indicators were used to identify water systems that have a community that is experiencing household affordability challenges and are a direct measure of household drinking water affordability.

2023 Added and Removed Affordability Indicators

Remove Two Affordability Indicators

The State Water Board removed two affordability indicators from the Affordability Assessment: ‘Percent of Residential Arrearages’ and ‘Residential Arrearage Burden.’

⁴² The Fund Expenditure Plan used an affordability threshold of 1.5% MHI to identify DAC water systems that may have customer charges that are unaffordable: [FY 2020-21 Fund Expenditure Plan](https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf)
https://www.waterboards.ca.gov/water_issues/programs/grants_loans/sustainable_water_solutions/docs/sadwfep_2020_07_07.pdf

⁴³ The identification of additional affordability indicators was undertaken in conjunction with the identification of possible affordability risk indicators for the Risk Assessment. A full list of potential affordability indicators considered can be found in the white paper *Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems*: October 7, 2020 White Paper: [Evaluation of Potential Indicators & Recommendations for Risk Assessment 2.0 for Public Water Systems](https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf)
https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

⁴⁴ October 7, 2020 White Paper: [Evaluation of Potential Indicators and Recommendations for Risk Assessment 2.0 for Public Water Systems](https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf)
https://www.waterboards.ca.gov/safer/docs/e_p_i_recommendations_risk_assessment_2_public_water_systems.pdf

⁴⁵ [Governor Newsom Executive Order](https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/)
<https://www.gov.ca.gov/2020/04/02/governor-newsom-issues-executive-order-protecting-homes-small-businesses-from-water-shutoffs/>

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 these two risk indicators came from the State Water Board’s 2021 Drinking Water Arrearage Payment Program.⁴⁶ 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). This dataset is not up-to-date and does not reflect current affordability challenges. Therefore, these two indicators were removed from the Assessment until updated data becomes available.

Add New Affordability Indicator: Household Socioeconomic Burden

The State Water Board and OEHHA developed a new affordability indicator, incorporating stakeholder feedback from the three Affordability Workshops, ‘Household Socioeconomic Burden,’ a composite indicator that is a combined measure of Housing Burden and Poverty Prevalence that measures the extent at which low-income customers may have affordability challenges now or in the future because their disposable income is constrained by high housing costs. This allows for the inclusion of water systems that do not charge customers directly for water in the assessment.⁴⁷

Table D3: Affordability Indicators Over Time

Indicators	Household / Community	Rates-Based?	2021	2022	2023
Percent of Median Household Income (%MHI)	Community	Yes	✓	✓	✓
Extreme Water Bill	Community	Yes	✓	✓	✓
% Shut-Offs (Removed 2022)⁴⁸	Household	Yes	✓		
Percentage of Residential Arrearages (Removed 2023)⁴⁹	Household	Yes		✓	
Residential Arrearage Burden (Removed 2023)⁵⁰	Community	Yes		✓	
NEW: Household Socioeconomic Burden	Community	No			✓

AFFORDABILITY INDICATOR THRESHOLDS

To develop thresholds for the affordability indicators in the Affordability Assessment and Risk Assessment, the State Water Board reviewed multiple available types of evidence, looking

⁴⁶ [California Water and Wastewater Arrearage Payment Program](https://www.waterboards.ca.gov/arrearage_payment_program/)
https://www.waterboards.ca.gov/arrearage_payment_program/

⁴⁷ Since 2020, all affordability indicators have relied on the water systems charging for water. In 2022, nearly 40% of DAC water systems were excluded from the Assessment because they do not charge for water (i.e., mobile home parks that include their water bill in rental charge).

⁴⁸ Data not collected.

⁴⁹ Data not collected.

⁵⁰ Data not collected.

both within California, across other state agencies nation-wide, and at the U.S. EPA's standards. Sections below provide more details about the rationale for the thresholds developed for each indicator. The minimum thresholds developed for the affordability indicators in the Risk Assessment are the same thresholds used in the Affordability Assessment.

Moving forward, the State Water Board will continue to refine the affordability indicator thresholds as data availability improves and the SAFER Program matures. The process may include refining thresholds by analyzing historical data trends such as looking at the relationship between historical thresholds and debt and shut-off data once it becomes available.

Table D4: Affordability Indicator Thresholds

Indicators	Affordability Threshold
Percent of Median Household Income (%MHI)	1.5% MHI or greater
Extreme Water Bill	Greater than 150% of the statewide average.
Household Socioeconomic Burden	Combined Poverty Prevalence and Housing Burden score of 0.25 – 1

AGGREGATED AFFORDABILITY ASSESSMENT & THRESHOLD BURDENS

The Affordability Assessment utilizes the count of affordability thresholds met across all three affordability indicators. The current approach does not include scoring or weighting of the individual affordability indicators, like they are in the Risk Assessment, they are all assessed equally in Affordability Assessment analysis.

Table 11: Current Aggregated Affordability Assessment Thresholds

Current Affordability Assessment Thresholds	Total Affordability Burden
0 Affordability Indicator Thresholds Exceeded	None
1 Affordability Indicator Thresholds Exceeded	Low
2 Affordability Indicator Thresholds Exceeded	Medium
3 Affordability Indicator Thresholds Exceeded	High

AFFORDABILITY INDICATOR DETAILS

PERCENT OF MEDIAN HOUSEHOLD INCOME (%MHI)

This indicator measures the annual system-wide average residential water bill for six hundred cubic feet (HCF) per month relative to the annual Median Household Income (MHI) within a water system's service area.

Calculation Methodology

Required Data Points & Sources:

- Water system service area boundaries: SABL⁵¹
- Block group-Income in the Past 12 Months: 2021 U.S. Census Bureau's American Community Survey³⁰⁹
- Drinking Water Customer Charges: 2021 electronic Annual Report (eAR)
- Other Customer Charges: 2021 eAR

Average monthly drinking water customer charges are collected through the eAR. Historically this data has not been required for reporting leading to poor data coverage and accuracy issues. Extensive changes have been made to the 2021 electronic Annual Report making reporting customer charges mandatory with checks in place to improve the data quality.

Calculation Methodology:

Median household income (MHI) is determined for a water system using American Community Survey data for household income. Community water system boundaries typically do not align with census boundaries where per capita income data is regularly collected. To assign an average median household income to a community water system spatially weighted income data is aggregated by census block group within the water system service area.

The methodology for this indicator was based on the Division of Financial Assistance (DFA) MHI methodology. While the MHI calculation methodology for the Affordability Assessment generally aligns with DFA's MHI determination methodologies, there are slight differences. The differences found in the calculation of MHI's for cities and census designated places and in the application of the Margin of Error (MOE).

The DFA methodology dictates that when it is determined that a system boundary exactly matches city boundaries or closely matches a census designated place boundary, the MHI for the entire city or census designated place should be directly applied to the system rather than using areally-interpolated block group data. This likely leads to more accurate MHI estimation in these cases. However, this method was not used in the Needs Assessment given that a case-by-case determination of matching of cities and census designated places to system

⁵¹ [California Drinking Water System Boundaries](https://gispublic.waterboards.ca.gov/portal/home/item.html?id=fbba842bf134497c9d611ad506ec48cc)

<https://gispublic.waterboards.ca.gov/portal/home/item.html?id=fbba842bf134497c9d611ad506ec48cc>

³⁰⁹ [2021 American Community Survey 5 Year estimate Median Household Income](https://data.census.gov/table?t=Income+(Households,+Families,+Individuals)&y=2021&d=ACS+5-Year+Estimates+Detailed+Tables&tid=ACSDT5Y2021.B19013)

[https://data.census.gov/table?t=Income+\(Households,+Families,+Individuals\)&y=2021&d=ACS+5-Year+Estimates+Detailed+Tables&tid=ACSDT5Y2021.B19013](https://data.census.gov/table?t=Income+(Households,+Families,+Individuals)&y=2021&d=ACS+5-Year+Estimates+Detailed+Tables&tid=ACSDT5Y2021.B19013)

boundaries was not feasible for the entire state. The MHI for each water system is a population weighted MHI, using census block group area and population data. A population factor is generated based on the area of each census block group that falls within the water system boundary. The water system MHI is then calculated using population adjusted MHIs for each census block group that falls within the water system boundary using the formula below:

Equation D1: MHI Calculation

$$\sum \frac{(Block\ Group\ MHI) \times (Adjusted\ Block\ Group\ Population)}{(Total\ Adjusted\ Block\ Groups\ Population)}$$

MOE for MHI American Community Survey data is also included in the MHI calculation. A service area adjusted MOE is found using the same methodology described for MHI. The lower range of the MOE will be applied to a community's estimated MHI up to a maximum MOE value of \$7,500 for communities with more than 500 people and \$15,000 for communities with 500 or fewer people. The MOE will be subtracted from the estimated MHI.

The DFA methodology uses a lower bound MHI by subtracting the block group MOE from the block group MHI, with limits based on community size prior to applying the population factor to MHI and MOE. The methodology applied in the Needs Assessment set margin of error limits and then applied them to population adjusted MHI figures, resulting in slightly different community water system MHI calculations than the DFA methodology.

As a result of these slight variations and the changing nature of household income, all funding related financial assessments must be completed by the DFA as their assessments are water system specific as opposed to the aggregated analysis done for the purposes of the Needs Assessment.

Average monthly drinking water customer charges are calculated using:

- Drinking water service costs estimated at six HCF Feet per month. This level of consumption is in line with statewide conservation goals of 55 gallons per capita per day, in an average 3-person household.
- When data becomes available, additional approximated customer charges (not collected through a customer's bill) will be added to this figure to calculate Total Drinking Water Customer Charges.

Equation D2: %MHI Calculation

$$\%MHI = [Average\ Monthly\ Drinking\ Water\ Changes] / [MHI]$$

Threshold Determination

%MHI is commonly used by state and federal regulatory agencies and by water industry stakeholders for assessing community-wide water charges affordability for decades. %MHI is utilized by the State Water Board (at 1.5% threshold) and the U.S. EPA (at 2.5% threshold) for assessing affordability. The State Water Board and DWR use %MHI to determine Disadvantaged Community (DAC) status, among other income-related metrics. DAC status is

often used to inform funding eligibilities for different financial programs offered by the State and other agencies. OEHHA’s Human Right to Water (HR2W) Tool also utilizes⁵² the thresholds determined by the State Water Board for this indicator.⁵³ Other states, including North Carolina,⁵⁴ presently or have recently used 1.5% of MHI spent on water and sewer costs as a threshold for water system funding decisions. For purposes of the Affordability Assessment, the threshold used is 1.5%.

Table D5: %MHI Affordability Thresholds

Threshold Number	Threshold	Affordability Burden
0	Below 1.5% MHI	No
1	1.5% MHI or greater	Yes

Indicator Analysis

State Water Board staff analyzed 2,845 community water systems, of which approximately 251 systems lacked the data necessary to calculate %MHI. Overall, 486 (19%) of water systems exceeded the 1.5% MHI affordability threshold. Of those, 368 systems were identified that serve DAC/SDACs. Table D6 and Table D7 summarize the full results of this indicator analysis. The full results from the affordability threshold calculations are included in Attachment D1.⁵⁵

Table D6: %MHI Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold Met
DAC/SDAC	1,483	134 (9%)	446 (30%)	981 (66%)	368 (25%)
Non-DAC	1,347	112 (8%)	213 (16%)	1,117 (83%)	118 (9%)
TOTAL:	2,845	246 (9%)	659 (23%)	2,098 (74%)	486 (17%)
Missing DAC Status	15				

⁵² There has been criticism of this metric by academics, water system associations, and the broader water sector mostly around its accuracy in measuring household affordability for those truly in need and the setting of arbitrary %MHI thresholds, limitations which the U.S. EPA has recently acknowledged.

⁵³ Arkansas Natural Resources Commission (2020). [Safe Drinking Water Fund Intended Use Plan SFY 2019](https://www.agriculture.arkansas.gov/wp-content/uploads/2020/05/0_-_2019_DWSRF_IUP_-_AMENDED_January_2019_01082019_1156hrs.pdf): https://www.agriculture.arkansas.gov/wp-content/uploads/2020/05/0_-_2019_DWSRF_IUP_-_AMENDED_January_2019_01082019_1156hrs.pdf

⁵⁴ North Carolina Department of Environmental Quality, [Joint Legislative Economic Development and Global Engagement Oversight Committee \(March 17, 2016\)](https://www.ncleg.gov/DocumentSites/Committees/JLEDGEOC/2015-2016/Meeting%20Documents/3%20-%20March%2017,%202016/2%20%20DEQ_Kim%20Colson%20Water%20Infrastructure%20JLOC%20EDGE%2020160317.pdf): https://www.ncleg.gov/DocumentSites/Committees/JLEDGEOC/2015-2016/Meeting%20Documents/3%20-%20March%2017,%202016/2%20%20DEQ_Kim%20Colson%20Water%20Infrastructure%20JLOC%20EDGE%2020160317.pdf

⁵⁵ [Attachment D1: Affordability Assessment Data and Results](#)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx

Table D7: %MHI Assessment Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold Met
Failing Systems	323	26 (8%)	84 (26%)	214 (66%)	83 (26%)
DAC/SDAC	203	16	59	121	66
At-Risk Systems	468	52 (11%)	135 (29%)	261 (56%)	155 (33%)
DAC/SDAC	324	44	94	159	121
Potentially At-Risk Systems	408	39 (10%)	124 (30%)	277 (68%)	92 (23%)
DAC/SDAC	257	25	95	167	65
Not Failing or At-Risk System	1,485	106 (7%)	294 (20%)	1,227 (83%)	152 (10%)
DAC/SDAC	656	38	190	505	113
TOTAL:	2,845	223 (8%)	637 (22%)	1,979 (70%)	482 (17%)
Missing SAFER Status:	161				

EXTREME WATER BILL

This indicator measures drinking water customer charges that meet or exceed 150% of statewide average drinking water customer charges at the six hundred cubic feet (HCF) level of consumption.

Calculation Methodology

Required Data Points & Sources:

- Drinking Water Customer Charges: 2021 eAR
- Other Customer Charges: 2021 eAR

Calculation Methodology:

Extreme Water Bill for a water system is determined using Average Monthly six HCF Drinking Water Customer Charges and Other Customer Charges divided by the State's Monthly Average Drinking Water Charges. Due to data quality concerns, water systems that reported less than \$5 or greater than \$500 in monthly customer charges for six HCF were excluded from the analysis and the calculated statewide average.

Threshold Determination

The State Water Board's AB 401 report⁵⁶ recommended statewide low-income rate assistance

⁵⁶ AB 401 Final Report:

[Recommendations for Implementation of a Statewide Low-Income Water Rate Assistance Program](https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf)

https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/ab401_report.pdf

program elements utilize a minimum affordability indicator threshold of 150% of the state average drinking water bill for six HCF.

Table D8: Extreme Water Bill Affordability Thresholds

Threshold Number	Threshold	Affordability Burden
0	Below 150% of the statewide average.	No
1	Greater than 150% of the statewide average.	Yes

Indicator Analysis

State Water Board staff analyzed 2,845 community water systems, of which approximately 248 water systems lacked the data necessary to estimate water rates. Overall, 317 (12%) of systems exceeded the 150% extreme water bill affordability threshold. Of those that exceeded the extreme water bill affordability threshold, 103 systems serve DAC/SDACs. Table D9 and Table D10 summarize the full results of this indicator analysis. The tables of the full results from the affordability threshold calculations are included in Attachment D1.⁵⁷

Table D9: Extreme Water Bill Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold Met
DAC/SDAC	1,483	124 (8%)	0 (0%)	800 (54%)	103 (7%)
Non-DAC	1,347	108 (8%)	0 (0%)	808 (60%)	214 (16%)
TOTAL:	2,845	232 (8%)	0 (0%)	1,608 (57%)	317 (11%)
Missing DAC Status	15				

Table D10: Extreme Water Bill Assessment Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	N/A	Missing	Threshold Not Met	Threshold Met
Failing Systems	323	0 (0%)	23 (7%)	164 (51%)	49 (15%)
DAC/SDAC	203	0	15	112	16
At-Risk Systems	468	0 (0%)	50 (11%)	200 (43%)	81 (17%)
DAC/SDAC	324	0	42	145	41
Potentially At-Risk Systems	408	0 (0%)	37 (9%)	190 (47%)	56 (14%)
DAC/SDAC	257	0	24	118	19

⁵⁷ [Attachment D1: Affordability Assessment Results and Data](#)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx

SAFER Program Status	Total Systems	N/A	Missing	Threshold Not Met	Threshold Met
Not Failing or At-Risk System	1,485	0 (0%)	96 (6%)	955 (64%)	132 (9%)
DAC/SDAC	656	0	32	401	27
TOTAL:	2,845	0 (0%)	206 (7%)	1,509 (53%)	318 (11%)
Missing SAFER Status:	161				

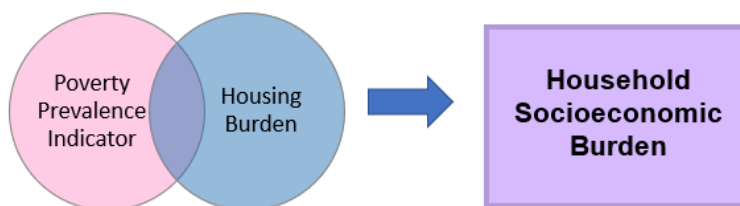
HOUSEHOLD SOCIOECONOMIC BURDEN

The purpose of this indicator is to identify water systems that serve communities that have both high levels of poverty and high housing costs for low-income households. These communities may be struggling to pay their current water bill and may have a difficult time shouldering future customer charge increases when their limited disposable income is constrained by high housing costs. This indicator is a composite indicator of two data points: Poverty Prevalence and Housing Burden.

- **Poverty Prevalence Indicator (PPI)** measures the percent of the population living below two times the federal poverty level and can be represented reliably at the census block group, tract, and county level.
- **Housing Burden Indicator** measures the percent of households in a census tract that are both low income (making less than 80% of the Housing and Urban Development (HUD) Area Median Family Income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs).

The combination of these two variables creates a more comprehensive picture of socioeconomic vulnerability while accounting for the varying levels of income and cost burdens throughout California.

Figure D1: PPI and Housing Burden Components Combined to Create Household Socioeconomic Burden Indicator



Calculation Methodology

Required Data Points & Sources:

- Poverty Prevalence Indicator: From the 2017-2021 American Community Survey (ACS),⁵⁸ a dataset containing the number of individuals above 200 percent of the federal poverty level (FPL) was downloaded by block groups for the state of California (25,607 in the state).
- Housing Burden Indicator data: From the 2015-2019 U.S. Department of Housing and Urban Development (HUD) Comprehensive Housing Affordability Strategy (CHAS),⁵⁹ a dataset containing cost burdens for households by HUD-adjusted median family income (HAMFI) category was downloaded by census tract for the state of California (8,057 in the state).

Calculation Methodology:

Prepare Poverty Prevalence Indicator data: The number of individuals below 200 percent of the FPL was calculated by subtracting the reported estimate of individuals in poverty (2x FPL) by the total estimate. The number of individuals below 200% of the poverty level was divided by the total population for whom poverty status was determined.

Prepare Housing Burden Indicator data: CHAS— a special analysis of census data specific to housing— is only available at the census tract and other larger geographies. For each census tract, the data were analyzed to estimate the number of households with household incomes less than 80% of the county median and renter or homeowner costs that exceed 50% of household income. The percentage of the total households in each tract that are both low-income and housing-burdened was then calculated. Each census tract was associated with the block groups within it to maintain consistency with the PPI indicator, which is at the block group level.

PPI and Housing Burden at the block group level were area-weighted to CWS boundaries. These boundaries were downloaded from the System Area Boundary Layer (SABL).⁶⁰ using the Intersect Tool in ArcPro, the area was determined for each portion of a water system boundary that intersected with a block group boundary. A weighted average, using area as the weight, was calculated for both PPI and Housing Burden for all water systems in the assessment.

The ACS and CHAS estimates come from a sample of the population and suppression criteria were assessed to flag estimates considered statistically unreliable.

⁵⁸ [American Community Survey](https://data.census.gov/cedsci/)

<https://data.census.gov/cedsci/>

⁵⁹ [HUD CHAS Data](https://www.huduser.gov/portal/datasets/cp.html)

<https://www.huduser.gov/portal/datasets/cp.html>

⁶⁰ [California Drinking Water System Boundaries](https://gispublic.waterboards.ca.gov/portal/home/item.html?id=fbba842bf134497c9d611ad506ec48cc)

<https://gispublic.waterboards.ca.gov/portal/home/item.html?id=fbba842bf134497c9d611ad506ec48cc>

Suppression Criteria for PPI

- Unlike the U.S. Census, ACS estimates come from a sample of the population and may be unreliable if they are based on a small sample or population size. The standard error (SE) and relative standard error (RSE) were used to evaluate the reliability of each estimate.
- The SE was calculated for each block group using the formula for approximating the SE of proportions provided by the ACS.⁶¹ When this approximation could not be used, the formula⁶² for approximating the SE of ratios was used instead.
- The RSE is calculated by dividing a tract's SE by its estimate of the percentage of the population living below twice the federal poverty level and taking the absolute value of the result.
- Block group estimates that met either of the following criteria were considered reliable and included in the analysis:
 - RSE less than 50 (meaning the SE was less than half of the estimate); or
 - SE was less than the mean SE of all California block group estimates for poverty.
- Block groups with unreliable estimates were flagged as potentially unreliable. All block group with scores were included in the indicator.

Suppression Criteria for Housing Burden

- Like ACS estimates, CHAS data come from a sample of the population and may be unreliable if they are based on a small sample or population size. The standard error (SE) and relative standard error (RSE) were used to evaluate the reliability of each estimate.
- The SE was calculated for each census tract using the formula for approximating the SE of proportions provided by the ACS.⁶³ When this approximation could not be used, the formula⁶⁴ for approximating the SE of ratios was used instead.
- The RSE was calculated by dividing a tract's SE by its estimate of the percentage of housing-burdened low-income households and taking the absolute value of the result.
- Census tract estimates that met either of the following criteria were considered reliable and included in the analysis:
 - RSE less than 50 (meaning the SE was less than half of the estimate); or
 - SE was less than the mean SE of all California census tract estimates for housing burdened low-income households.
- All census tract level Housing Burden scores were associated with the block groups within them.
- Block groups with unreliable estimates were flagged as potentially unreliable. All block group with scores were included in the indicator. Block groups that met the inclusion

⁶¹ [American Community Survey Office, 2013, equation 4](https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf)

https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf

⁶² [American Community Survey Office, 2013, equation 3](https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf)

https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf

⁶³ [American Community Survey Office, 2013, equation 4](https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf)

https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf

⁶⁴ [American Community Survey Office, 2013, equation 3](https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf)

https://www2.census.gov/programs-surveys/acs/tech_docs/accuracy/MultiyearACSAccuracyofData2011.pdf

criteria were sorted and assigned percentiles based on their position in the distribution.

Component Thresholds

Poverty Prevalence (PPI): For PPI, various thresholds have been explored by other organizations and researchers including the use of 30%⁶⁵ or multiple categories such as less than 10%, 10% to 30%, 30% to 50%, and greater than 50%.⁶⁶ However, the most widely used PPI thresholds by organizations and researchers was first suggested by Raucher et al. in a report prepared for the American Water Works Association^{67,68,69,70}. In the Raucher et al. report entitled ‘Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector,’ the following PPI thresholds are recommended: low risk less than 20%, medium risk between 20% to 35%, and high risk greater than 35%. The State Water Board and OEHHA evaluated these thresholds as it relates to California data and propose to use these thresholds for the PPI component of the Household Socioeconomic Burden indicator.

Table D11: PPI Component Threshold Scores

Component	Threshold	Score
PPI	Threshold N/A = Missing or not reliable PPI data	N/A
	Threshold 0 = < 20%	0
	Threshold 1 = 20% - 35%	0.25
	Threshold 2 = > 35%	1

Housing Burden: Based on a nationwide literature review, consistent thresholds for Housing Burden have not yet been established by other organizations or identified in the scientific literature. A report by the University of North Carolina on housing conditions in North Carolina

⁶⁵ Lauren Patterson (2021): [Water Affordability](https://internetofwater.org/wp-content/uploads/2021/12/Blog010_WaterAffordability_Patterson.pdf)

https://internetofwater.org/wp-content/uploads/2021/12/Blog010_WaterAffordability_Patterson.pdf

⁶⁶ David Mitchell, and Elizabeth Stryjewski (2020): [Technical Memorandum on Water/Sewer Service Affordability Analysis](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

<https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248>

⁶⁷ [Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248) (2019)

<https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248>

⁶⁸ American Water Works Association: [Measuring Water Affordability and the Financial Capability of Utilities](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

<https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248>

⁶⁹ Alliance for Water Efficiency (2020): [An Assessment of Water Affordability and Conservation Potential in Detroit, Michigan](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

[https://www.allianceforwaterefficiency.org/sites/www.allianceforwaterefficiency.org/files/highlight_documents/AWE_Water_Affordability_Detroit_Final_2020_0.pdf](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

⁷⁰ Duke University, Nicholas Institute: [Exploring the Affordability of Water Services within and across Utilities](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

[https://nicholasinstitute.duke.edu/water-affordability/affordability/Affordability_Preprint.pdf](https://www.cityofsantacruz.com/home/showpublisheddocument/83950/637553072866376248)

identified census tracts in the top 20% of state as severely burdened.⁷¹ Additionally, a recently published Master’s Thesis about housing challenges in California identified census tracts in the top quartile of the state as being the “most impacted.”⁷² Lastly, one study showed that 16% of children in Los Angeles County live in severe housing-cost burdened households, but this was based on survey data.⁷³ Given the lack of peer-reviewed literature, consistency and relevance among these limited examples, the census tracts were grouped into three categories (or tertiles), based on the overall distribution of 2019 housing burden data in the state to identify three levels of risk. The three categories were rounded to the nearest whole number.

Based on this statewide data, low risk corresponds with fewer than 14% of total households experiencing housing burden. Medium risk is between 14% and 21%, and high risk is greater than 21%, respectively. Using a matrix scoring approach, first each bin was assigned a score of 0 for “low vulnerability,” 0.25 for “medium vulnerability” and 1 for “high vulnerability.” The State Water Board will analyze water system arrearage, shut-off, and other affordability indicators over time to determine if the recommended Housing Burden thresholds should be adjusted in the future.

Table D12: Housing Burden Component Threshold Scores

Component	Threshold	Score
	Threshold N/A = Missing or not reliable Housing Burden data	N/A
Housing Burden	Threshold 0 = <14%	0
	Threshold 1 = 14% - 21%	0.25
	Threshold 2 = >21%	1

Threshold Determination

The two components of Household Socioeconomic Burden were combined using a matrix approach and following the same methodology as the Risk Assessment for state small water systems and domestic wells.⁷⁴ The normalized scores for PPI and Housing Burden components were added together and divided by the number of components (two). Below is the calculation used for each water system’s Household Socioeconomic Burden score and Figure D2 shows how much each calculated score represents a degree of PPI and Housing Burden within the matrix.

⁷¹ William Rohe, Todd Owen, and Sarah Kerns; The University of North Carolina at Chapel Hill, Center for Urban and Regional Studies (2017): [Extreme Housing Conditions in North Carolina](https://curs.unc.edu/wp-content/uploads/sites/400/2017/02/Extreme-Housing-Conditions-in-North-Carolina.pdf)
<https://curs.unc.edu/wp-content/uploads/sites/400/2017/02/Extreme-Housing-Conditions-in-North-Carolina.pdf>

⁷² Lucrecia Graham(2021): [A Cartographic Exploration of Census Data on Select Housing Challenges Among California Residents](https://spatial.usc.edu/wp-content/uploads/formidable/12/Lucrecia-Graham-thesis-compressed.pdf)
<https://spatial.usc.edu/wp-content/uploads/formidable/12/Lucrecia-Graham-thesis-compressed.pdf>

⁷³ Tabashir Z. Nobari, Shannon E. Whaley, Evelyn Blumenberg, Michael L. Prelip, and May C. Wanga (2018): [Severe Housing-Cost Burden and Obesity Among Preschools-aged Low-Income Children in Lost Angeles County](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6305808/)
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6305808/>

⁷⁴ [2022 Needs Assessment](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf)
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

Equation D3: Calculating Household Socioeconomic Burden Score

$$\text{Household Socioeconomic Burden} = \frac{\text{PPI Score} + \text{Housing Burden Score}}{2}$$

Figure D2: Household Socioeconomic Burden Scores Within the Matrix Represents Varying Degrees of PPI and Housing Burden

Poverty (PPI)	High Risk ≥ 35%	Score = 1	Missing	0.5	0.625	1
	Med Risk 20% - 35%	Score = 0.25	Missing	0.125	0.25	0.625
	None < 20%	Score = 0	Missing	0	0.125	0.5
	Unknown	Score = Missing	Missing	Missing	Missing	Missing
			Score = Missing	Score = 0	Score = 0.25	Score = 1
			Unknown	None < 14%	Med Risk 14% - 21%	High Risk ≥ 21%
Housing Burden						

These combined scores are converted into threshold Affordability Burden designations, as shown in Table D13.

Table D13: Thresholds for Household Socioeconomic Burden

Threshold Number	Threshold	Affordability Burden
0	Combined score of 0 – 0.125	No
1	Combined score of 0.25 – 1	Yes

Indicator Analysis

State Water Board staff analyzed 2,845 community water systems, of which approximately 34 water systems lacked necessary data. Of the 2,811 water systems with sufficient data, 1,812 (64%) systems exceeded the Household Socioeconomic Burden affordability threshold. Of those that exceeded the threshold, 1,138 are DAC/SDAC systems. Table D14 and Table D15 summarize the full results of this indicator analysis. The tables of the full results from the affordability threshold calculations are included in Attachment D1.⁷⁵

⁷⁵ [Attachment D1: Affordability Assessment Data and Results](#)

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2023affordability.xlsx

Table D14: Household Socioeconomic Burden Assessment Results by Community Status

Community Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold Met
DAC/SDAC	1,483	13 (1%)	0 (0%)	333 (22%)	1,138 (77%)
Non-DAC	1,347	19 (1%)	0 (0%)	994 (74%)	674 (50%)
TOTAL:	2,845	32 (1%)	0 (0%)	1,327 (47%)	1,812 (64%)
Missing DAC Status	15				

Table D15: Household Socioeconomic Burden Results by Water System SAFER Program Status

SAFER Program Status	Total Systems	Missing	N/A	Threshold Not Met	Threshold Met
Failing Systems	323	2 (1%)	0 (0%)	118 (37%)	203 (63%)
DAC/SDAC	203	1	0	25	177
At-Risk Systems	468	1 (1%)	0 (0%)	137 (29%)	330 (71%)
DAC/SDAC	324	0	0	49	275
Potentially At-Risk Systems	408	2 (1%)	0 (0%)	138 (34%)	268 (66%)
DAC/SDAC	257	0	0	35	222
Not Failing or At-Risk System	1,485	5 (1%)	0 (0%)	869 (59%)	611 (41%)
DAC/SDAC	656	2	0	217	437
TOTAL:	2,845	10 (1%)	0 (0%)	1,262 (44%)	1,412 (50%)
Missing SAFER Status:	161				