SAN FRANCISCO BAY AREA TAP WATER TESTING REPORT

July 2024

DEPARTMENT OF WATER RESOURCES
STATE OF CALIFORNIA

San Francisco
ESTUARY
PARTNERSHIP

ASSOCIATION
OF BAY AREA
GOVERNMENTS

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Executive Summary

In 2012, California became the first state to recognize that every human being has the right to safe, clean drinking water (AB 685). There is a tremendous amount of work that goes into ensuring tap water meets regulatory standards and is safe to drink in California. However, negative experiences at the tap can lead to increased distrust. How individuals perceive the safety of the water coming out of their tap influences whether they use tap water to quench their thirst or reach for an alternative, such as bottled water or a sugary drink. In turn, distrust of drinking water quality and subsequent reliance on alternative beverage sources can adversely impact individuals' health, welfare, and the environment.

This report details the formation and implementation of a novel Tap Water Testing program, which operated from 2019 to 2022 in the San Francisco Bay Area, to address tap water concerns in local communities. The Tap Water Testing program—including data collection, analysis and interpretation—formed directly from the Disadvantaged Community and Tribal Involvement Program's San Francisco Bay Regional Water Needs Assessment findings, and subsequent requests by Disadvantaged Communities and Tribes to investigate their concerns about their tap water quality. The overall goal of the Disadvantaged Community and Tribal Involvement Program was to support a community-led problem-definition and solutions development processes and to create a more lasting social infrastructure to include Disadvantaged Communities and Tribes into water-related decision-making and planning. This approach served to build the capacity of the participating Outreach Partners—over 15 Disadvantaged Communities and five Tribes—to define their own water-related challenges and develop solutions.

The San Francisco Estuary Partnership and Outreach Partners developed the community-driven Tap Water Testing Program in response to the widespread distrust of tap water documented in the San Francisco Bay Regional Water Needs Assessment. While this testing program was not the first community-driven tap water quality testing program in this region, it is the largest of its kind to be conducted in California to date, to our knowledge.

The Tap Water Testing Program collected and analyzed data about tap water quality in locations where residents reported experiencing tap water quality issues or otherwise expressed distrust in their tap water. To ensure independently verified and scientifically robust results, San Francisco Estuary Partnership and the Outreach Partners partnered with SimpleLab, an independent water quality testing logistics company that connects individuals and groups with certified laboratories to conduct rigorous environmental testing. The project team and SimpleLab worked with each interested community and Tribe to decide which types of tap water quality constituents to test for based on their location, existing water quality data, and specific tap water quality concerns collected in the Regional Needs Assessment. Extensive consultation was also undertaken with local utilities, regulators, and other groups to ensure that this was not a "gotcha" program in which distrust or observed deficiencies in tap water were not immediately framed as a product of utilities or regulators' neglect, but rather a data collection effort envisioned and led by the participating communities and Tribes, and a testing and reporting effort carried out by an independent third party. .

After extensive planning, design, and consultation, the water quality sample collection effort began in February 2022 and finished in June 2022. The final dataset included 555 samples and 34,296 tests that looked at 142 distinct drinking water quality constituents of interest. To illustrate the breadth of the effort, this number of constituents exceeds the combined number of constituents on the U.S. Environmental Protection Agency's primary and secondary water quality standards lists.

DEFINITIONS
Public Health Goals (PHGs): Standards that California's public water systems should strive to achieve if it is feasible to do so. These may not be feasible if technology isn't available to meet the PHG, or if the cost of meeting PHGs would make the water unaffordable.
Primary Maximum Contaminant Levels (MCLs): Water systems are legally required to meet these standards for all potential contaminants. As long as drinking water complies with all MCLs, it is considered safe to drink, even if some contaminants exceed PHG levels. MCLs are supposed to set as close to the PHGs as possible, while taking into account what is economically and technically feasible. NOTE: Lead does not technically have an MCL, but rather, an Action Level. It is not a violation but can trigger required monitoring and treatment actions. For the purposes of this report, the lead action level will be referred to and reported on as an MCL.
Secondary Maximum Contaminant Levels (Secondary MCLs): Also known as secondary health standards, secondary MCLs are established for aesthetic (taste, feel, appearance) rather than primary health reasons and are enforceable in California, not just advisable.

Key quantitative findings from the effort were nuanced but include that:

- Approximately 0.08% of tests exceeded primary regulatory standards where they existed (10/12,895).
- Exceedances of much stricter Public Health Goal standards were found to occur in about 5% of all tests where they existed (640/12,946), with a consistent range of 3-6% by community
- About 2% of all tests with relevant secondary (aesthetic) standards exceeded those standards (89/4,565).
- 70 samples were taken and tested for 14 different per- and polyfluoroalkyl substances (PFAS, also known as a forever chemical), 4 of which have response and notification standards. None exceeded any health-related response or even notification level. About 8.6% of the samples, across the four chemicals, had any detection above zero (5/70).

Given the unprecedented scale and community-driven nature of the program, we also identified 11 qualitative overarching lessons learned for future testing programs in the Bay Area and elsewhere. These are:

Build in flexibility and constantly dialogue with partners
Communicate and accommodate differences in relative health risk thresholds and regulatory standards
Develop a program-level framework to drive decision-making but leave decisions about community level implementation to community partners
Partner with a logistics firm that only utilizes certified labs or partner directly with certified labs for testing

Assist community partners in deciding what to test for and how to sample – provide context to community partners for this decision-making process
Tap water education should include technical lessons learned, including for hot water, hot showers, and infrequently used faucets
Survey efforts should be considered a mandatory part of a program, or not included as part of a testing effort at all, due to the need for robust datasets to inform conclusions
Expect complications in the testing result interpretation process and be prepared to bring on impartial educators unrelated to the project
Be ready to address concerning testing results with CBO partners and utilities
Acknowledge and strategize around legal constraints on current public funding solutions
Recognize that community-driven efforts can support water providers' aims

We also identified 7 different key stakeholder groups who can and should play a part in future tap water testing efforts and implement these lessons learned. The report contains recommendations for how these groups should be involved in future actions to address the findings in the report.

The groups are:

1. **concerned residents and community-based organizations;**
2. **local non-profits, including legal advocacy groups;**
3. **rental housing property owners and managers;**
4. **affected water systems;**
5. **local government decision makers (especially county public health departments);**
6. **the State Division of Drinking Water, and**
7. **the research community.**

Drinking water quality, and therefore, trust in tap water, is an essential prerequisite to human health, dignity and affordability. The Tap Water Testing Program in the Bay Area highlights the continued need for efforts to be responsive to residents' concerns about and distrust of their tap water in disadvantaged communities. While these efforts may not resolve all concerns quickly, if done well, they can advance a dialogue with residents that helps enhance trust in communities around agency responsiveness to residents' experiences with tap water, as well as increase the level of understanding of tap water quality and drinking water standards. The result of increased trust in—and use of—tap water is worth the effort and supportive of the broader aims of the state's Human Right to Water.

I Introduction

Context for the Tap Water Testing Program

The Integrated Regional Water Management (IRWM) Program, administered by the California Department of Water Resources (DWR), provides funding for regionally driven implementation projects that help meet the long-term water needs of the state. Since 2012, the San Francisco Bay Area IRWM Funding Area has obtained six grants through the DWR program and implemented over 50 projects ranging from climate resiliency, green infrastructure, and habitat restoration to flood protection, recycled water, water conservation, and water supply projects. These grants have been awarded to the Association of Bay Area Governments (ABAG), which passes through the funding to local sponsors to design and build the projects. The San Francisco Estuary Partnership (SFEP), a program of ABAG and the US EPA, has managed and administered the grants.

In recent years, acknowledging that local and regional water planning and decision-making efforts often overlook the needs of Disadvantaged Communities, state and local agencies and non-governmental partners leading the IRWM efforts in the region have worked to change that dynamic. The state structured their Prop 1 IRWM grant program to provide funding to document water-related needs and increase capacity within Disadvantaged Communities through Disadvantaged Community Involvement (DACI) Program grants. The state also set aside a portion of the funding for implementation projects that directly benefit Disadvantaged Communities. The region has worked to integrate Disadvantaged Communities and Tribes into the regional IRWM funding program by adding community- and Tribal-specific seats to the governance structure and crafting regional evaluation criteria for project selection that give a competitive advantage to projects working with and benefiting Disadvantaged Communities and Tribes. However, it should be acknowledged that IRWM projects that have in the past claimed to benefit Disadvantaged Communities have often been initiated or fully developed without significant input or engagement from those communities. In addition, these efforts did not explicitly include Tribes.

In 2016, DWR granted $6,500,000 to the San Francisco Bay IRWM Funding Area as part of the statewide DACI Program. The broad mandate to include Disadvantaged Communities in IRWM planning was implemented differently by the 12 IRWM Funding Areas throughout California. The San Francisco Bay Funding Area, which covers the majority of the nine Bay Area counties, expanded DACI to the Disadvantaged Community and Tribal Involvement Program (DACTIP) to explicitly include Tribes.

The overall goal of the DACTIP in the Bay Area was to support community-led development processes that defined problems and solutions and to create a more lasting social infrastructure that included Disadvantaged Communities and Tribes in water-related decision-making and planning. The DACTIP in the Bay Area partnered with community-based organizations (CBOs), non-profits, Tribal organizations, and agencies (outreach partners) with existing local Disadvantaged Community and Tribal relationships to design, conduct outreach for, and write community and Tribal water needs assessments. This partnership approach served over 15 Disadvantaged Communities and five Tribes to build capacity so they could define their own water-related challenges and solutions.

The 2022 San Francisco Bay Regional Needs Assessment Report (Regional Needs Assessment) includes 15 Disadvantaged Community needs assessments and an aggregated Tribal (five participated) needs assessment conducted by outreach partners between 2017 and 2021, as well as a synthesis of findings and recommendations for stakeholders and decision-makers in the San Francisco Bay Area. The report also includes a section on people experiencing homelessness. An intended outcome of this work was to support Disadvantaged Communities and Tribes in collecting necessary information to identify, develop, and implement projects that address stated needs.

The Tap Water Testing program, which is the focus of this report, was a data collection effort that was motivated directly by the Regional Needs Assessment findings and subsequent requests by Disadvantaged Communities and Tribes to investigate their concerns related to tap water. We refer to participating groups as outreach partners throughout the report, which collectively refers to the community and Tribal partners who conducted tap water testing with their community or Tribe.

Grant Structure at a Glance

The 2016 DWR grant to the San Francisco Bay IRWM Funding Area was implemented in two phases from 2017 to 2023.

Phase I – Water Needs Assessment and Capacity Building (2017–2022)

- This first phase included 13 Disadvantaged Community outreach partners who served 15 communities as well as a Tribal outreach partner who coordinated with five Tribes in the Bay Area. Most of these partners were selected through an RFP process. After that initial solicitation, additional outreach was conducted in some communities to increase the number of partners and the representation of Bay Area Disadvantaged Communities.
- Disadvantaged Community and Tribal outreach partners conducted community-level needs assessments around the Bay Area. Each process was tailored to the specific community or Tribe and used multiple methods—individual surveys, group listening sessions, community meetings, and other platforms—to collect information from community and Tribal members about their needs and priorities as *they* saw them.
- The 2022 Regional Needs Assessment Report synthesized community needs, priorities, and solutions. The report contains a section on each community and Tribe's needs assessment process of gathering community information and findings. It also contains a section summarizing the common needs identified across the region, a section documenting the challenges faced by unhoused individuals, and a section capturing lessons learned for public agencies.
- In addition to the community-level needs assessments, this phase also focused on building capacity of communities and local public agencies through funding opportunity tracking, grant writing support, and other approaches to gather additional information and identify solutions. During this phase, the DWR grant also funded the community- and Tribal-led initiative to amend the governance model of the San Francisco Bay Area IRWM Coordinating Committee, the regional governing body that has selected projects for funding and guided all IRWM grants in the region since 2007. In coordination with the Regional Needs Assessment process, the IRWM Coordinating Committee amended their state-required IRWM Plan in 2019 to add six seats to the existing 12 so that three community and three Tribal representatives participate as voting members.

Phase II – Project Development, Continued Capacity Building, & Tap Water Testing (2020–2022)

- The second phase of the project shifted the emphasis from broad needs documentation to deeper needs and solutions development through more narrowly focused projects. The outreach partners led the efforts in their respective communities to develop fundable projects, in many cases in collaboration with public agency partners.

- Outreach partners were supported by consultants (Woodard & Curran: Ryan Hirano, Lotus Water: Maddie Duda) assisting in the needs assessment, capacity building, and project development process in six successful grant writing efforts, securing $1,026,328 to address local needs. There were several more proposals this program submitted that were not successful. Successful proposals included:
    - EPA Enhanced Air Quality Monitoring for Communities Grant Program: $498,828 (Marin City)
    - BAAQMD James Cary Smith Community Grant Program: $100,000 (Marin City)
    - Resources Legacy Fund Grant for Community Capacity Building and Organizing: $15,000 (Marin City)
    - Marin Community Foundation Buck Family Fund Grant Program: $160,000 (Marin City)
    - SF Bay Restoration Authority Measure AA Community Grants Program: $237,500 (Oakland)
    - Patagonia Community Grant Program: $15,000 (Association of Ramaytush Ohlone)

- Project development efforts were geared toward the next round of IRWM funding (Prop 1 Round 2 Implementation Funding applications for projects submitted October 2022 and awarded by DWR in May 2023). DACTI Program outreach partners developed projects to propose for funding during this round, which has a total of $32,214,479 available, with $6,500,000 set aside for projects benefiting Disadvantaged Communities. Two projects championed by outreach partners that directly address the needs of communities as described in the Regional Needs Assessment were selected and totaled $8,003,650 in grant funds awarded.
- DACTI Program outreach partners requested that the program use unspent grant funds, approximately $1,000,000, to develop and implement a tap water testing program. Thus, the Tap Water Testing Program which is the focus of this report was developed and deployed. Outreach partners that participated in the Tap Water Testing Program included:

*Table 1: **Tap Water Testing Outreach Partners***

Outreach partner name	Geography
All Positives Possible	Vallejo, Richmond, Rodeo, Contra Costa County, Solano County
Brower Dellums Institute for Sustainable Policy Studies and Action	Oakland, Alameda County
California Indian Environmental Alliance	Entire Bay Area – Tribes
Contra Costa Resource Conservation District	Pittsburg and Antioch, Contra Costa County
First Generation Environmental Health and Economic Development	San Francisco, San Francisco County
Friends of Sausal Creek	Oakland, Alameda County
Marin City Climate Resilience and Health Justice	Marin City, Marin County
Mujeres Empresarias Tomando Acción	San Jose, Santa Clara County
Multicultural Center of Marin	San Rafael, Marin County
Nuestra Casa de East Palo Alto	East Palo Alto, San Mateo County
Sonoma Ecology Center	Three Springs area, Sonoma County
The Watershed Project	Richmond, Contra Costa County

Tap Water Testing Program Background

Many Disadvantaged Communities and Tribes in the Bay Area who participated in the DACTI Program Regional Needs Assessment process reported concerns about the safety and quality of using tap water for drinking, cooking, and cleaning purposes and called for independent testing by Disadvantaged Communities and Tribes. The near ubiquitous concerns communities and Tribes shared regarding drinking water was a surprising finding from the Regional Needs Assessment, and a summary of findings for each community and Tribal subregion can be found in the *Trust in Bay Area Tap Water* section below. Some expressed concerns about the role that aging community and in-home infrastructure plays in water quality, as well as concern about the lack of agency that renters have to address infrastructure issues. Many community members reported relying on bottled water for cooking and drinking. In addition to drinking water quality, many Disadvantaged Communities and Tribes also raised concerns about water affordability, an issue highlighted by the COVID-19 pandemic (Gonzalez et al., 2021). Tap water unaffordability necessitates calculated trade-offs with other needs for those on tight budgets. The cheapest bottled water is over 150 times more expensive per gallon than tap water, with many retail bottled water brands being approximately 500+ times more expensive (Javidi & Pierce, 2018). Particularly striking, 75% of over 700 participants in East Palo Alto responded that they rely on bottled water for cooking and drinking. Similarly, 75% of over 250 responses in Marin City reported they rely on bottled water for cooking and drinking. Concerns with tap water quality often stemmed from negative experiences with the taste, smell, or appearance of water from the tap, as well as an awareness of the intersection of inequity and tap water quality, as demonstrated on the national stage by recent crises in Flint, Michigan, and Jackson, Mississippi. Participants also often expressed a perception that water quality was better in surrounding, more affluent areas.

A community-driven Tap Water Testing Program and survey effort was developed by the SFEP, ABAG, and the outreach partners in response to the distrust of tap water documented in the Regional Needs Assessment. While this testing program was developed in direct response to communities' stated needs and is the largest of its kind which we are aware of in California, it was not the first community-driven tap water testing program in the region.

As explained by LaDonna Williams in 2023, the first community-driven tap water testing program was in Vallejo:

"In 2018, All Positives Possible conducted a limited Tap Water Sample/Testing project and survey effort which was developed in response to discolored and foul-smelling water coming through our pipes resulting in distrust [of] the quality of tap and drinking water documented in the Disadvantaged Communities in South Vallejo. We took samples from 15 households testing only for lead, using our own funds because there was no support from DACTIP at that time. All Positives Possible, one of the community outreach partners who participated in the Bay Area DACTI Program, developed, and completed a tap water testing program in Vallejo, California, further demonstrating that the motivation for tap water testing was envisioned and brought to realization by Disadvantaged Communities."

Tap Water Testing Overview

The overall goal of the DACTI Program in the San Francisco Bay Area was to support community-led problem-definition and solutions development processes. As such, the testing effort followed a convenience sample framework and is not representative of the experiences of all Disadvantaged Communities in the Bay Area. Each outreach partner led the development of the specific tap water quality testing effort in their community or Tribe. Participants were recruited by each outreach partner and were often the same individuals or households who participated in the Regional Needs Assessment. In this way, participants self-selected, and the effort was designed to test the water of those who expressed concern and had a desire to learn more to understand potential issues and their solutions.

The Tap Water Testing Program generated information about tap water quality where residents have experienced issues or otherwise expressed distrust in tap water quality. The goals of the tap water quality testing effort were to:

- Co-produce information to grow the capacity of interested community members to understand:
    - Their tap water quality and associated data reporting.
    - Rights and avenues to receive tap water quality information, including from their utility.
    - Where water flowing through the tap comes from and the role of their utility.
    - Aesthetic water issues that don't affect health, how to identify such issues, what causes them, and options to address them.
- Generate better regional data on tap water quality and perception that is informative and rigorous, including:
    - Distrust levels and tap avoidance decision-making contextualized by household and community characteristics.
    - Identification of any tap water that exceeds California primary and secondary health-related regulatory standards.

- Increase community understanding of and trust in Bay Area tap water where it meets health standards.
- Build and strengthen partnerships between communities, outreach partners, and their utilities, municipalities, and other public stakeholders.
- Generate and provide information about short-term, on-site solutions to premise plumbing-caused aesthetic or health concerns with tap water, and funding mechanisms for addressing these issues long term.
- Document a replicable model and lessons learned for Disadvantaged Community tap water quality testing efforts in other regions of California and beyond.

While we provide more detail in the Process and Methods chapter (Chapter 3) of this report, the basic details of the testing effort were as follows. The Bay Area DACTIP partnered with SimpleLab, an independent logistics and testing company that partners with laboratories to connect individuals and groups with certified laboratories to conduct rigorous environmental testing. SimpleLab worked with each interested community and Tribe to decide which types of tap water quality constituents to test for based on their location, existing water quality data, and specific tap water quality concerns collected in the Regional Needs Assessment.

All sample and test packages came with sample collection instructions tailored to the panel of tests in the package. Outreach partners brought sampling kits to the residence of individual participants and in most cases assisted participants with collecting the tap water samples. However, in a small subset of cases, individual participants were given the kits to collect samples on their own and mail in their tap water samples.

Those collecting the sample, whether individual participants or outreach partners, were trained to take a first-draw or "fully flushed" sample of their tap water. They were asked to fill out a survey about tap water quality experiences after taking the sample. Then they were instructed to seal the package with a prepaid shipping label and place it in the mail to a certified lab for testing. Participants and DACTI Program administrators could access the results of the tests on the SimpleLab platform, along with some analysis of these findings to put them into perspective alongside regulatory and public health standards.

Figures 1 and 2 below show screenshots from the SimpleLab platform demonstrating how the sample data was contextualized for participants as well as the information that the system offered to each participant in the testing program. The results each participant received were provided in table format with a visual component that allowed them to quickly see if the primary regulatory health standards, called maximum contaminant levels (MCLs), or public health goal (PHG) standards were exceeded. It also provided information on how individual results could affect aesthetics of the water and how contaminants could affect premise plumbing. By clicking on the contaminant, a pop-up window (Figure 2) allowed participants to access much more detail on the sources, impacts, and history of that contaminant.

*Figure 1: **Sample results for a participant. The panel on the left allows participants to find information on how their results could be affecting the aesthetics of the water they consume and how that water could affect their plumbing. The "Next Steps" section provides filtration options if warranted. The "Nearby Water" tool allows participants to look at data SimpleLab has on water quality in their area. This data is gathered through their testing as well as publicly available data from utilities and regulators. In this example the standard being compared to is the California MCL. Participants were able to change this to California PHGs as desired, which would change the visual benchmark accordingly.***

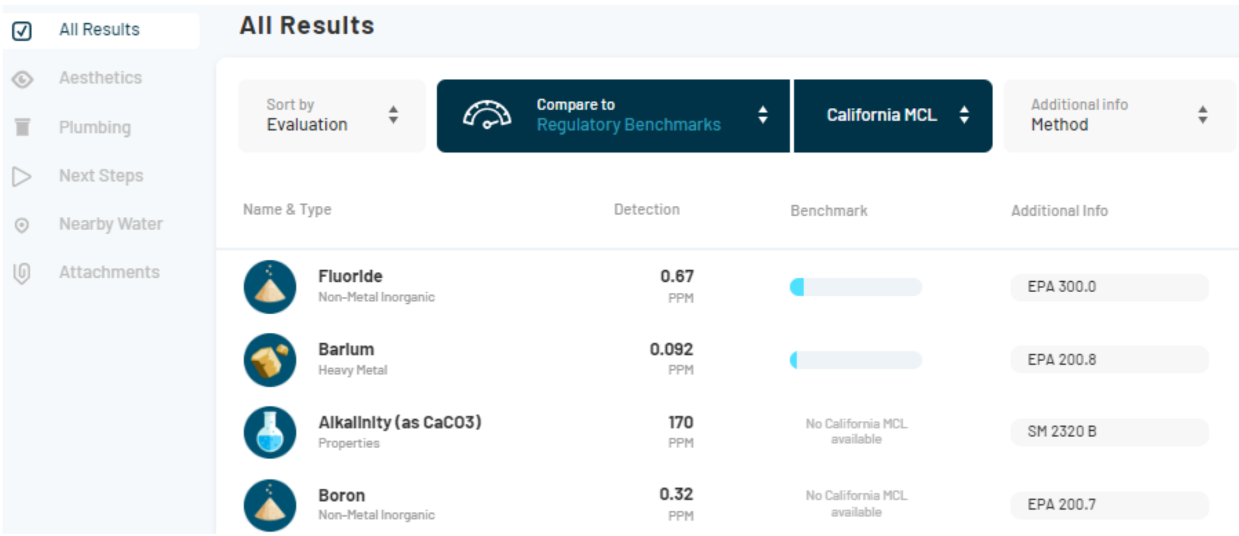
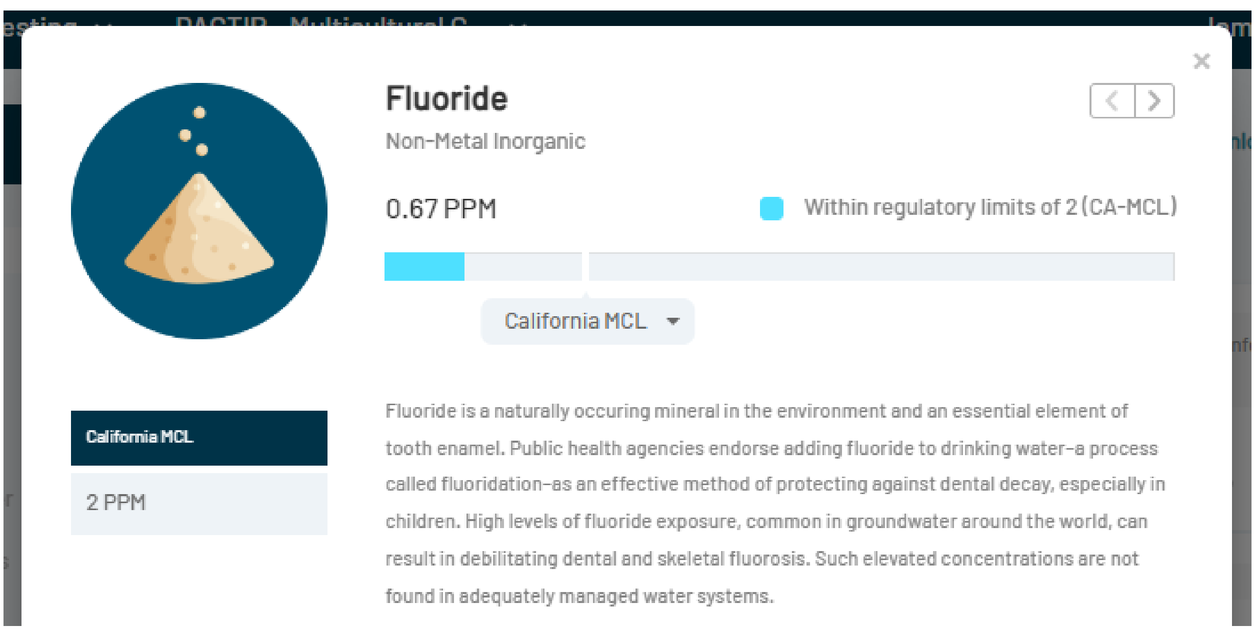


*Figure 2: **Information on contaminants. If a participant were to click on the name of the constituent in their results section shown in Figure 1, they would see this type of information. It shows their test result in comparison to the California regulatory standard and a large amount of information about the contaminant itself, including health-related issues that could result from too much exposure.***



After the results were released to the participants, outreach partners worked to help them interpret the findings. The approach each outreach partner used was very different and was not prescribed by the DACTI Program. This approach was preferred as it respected the capacity, existing relationships, and culturally appropriate tactics employed by each outreach partner within their communities. Some outreach partners did not do any formal follow-up, while conversely, some went back to participants' homes to discuss the results in person. Other notable approaches to this follow-up included community meetings with county agencies and utilities, and the work of community health advisors (such as "promotores") with medical experience to engage participants. The DACTIP researched neutral third party tap water quality experts, solicited their participation, and introduced them to the outreach partners in order to support partners' efforts.

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II What Past Research Tells Us About Tap Water Distrust

Past research shows that households choose what type of water (and more broadly, all beverages) to drink based in part on their perception of the risks associated with the water and other beverage sources available to them. Regardless of the motivating reason, the choice to apply additional filtering to tap water and/or to rely on tap alternatives impacts household expenditures, affects physical and psychological health, and has broader social equity implications.

From a policy perspective, any choice to not drink tap water is suboptimal. In particular, households' purchase of bottled water as an alternative to tap water involves significant costs in terms of time, money, and overall utility. Despite evidence showing that bottled water is less regulated and no safer on average than the tap, many US households believe bottled water to be higher quality than tap water and are more likely to use bottled water when they perceive their drinking water supplies as unsafe (Anadu & Harding, 2000; de França Doria, 2010; Hu et al., 2011). The water scandal in Flint, Michigan, led to heightened distrust of tap water and increasing reliance on bottled water across the US (Rosinger & Young, 2020).

Substituting bottled water for tap water can result in thousands of dollars per year in additional costs for households even according to the most conservative estimates (Javidi & Pierce, 2018). Further, studies have proven that the perception of tap water as unsafe has marked health consequences (Ogden et al., 2012), as households more commonly substitute sugary beverages for all types of water when they perceive the tap to be unsafe (Onufrak et al., 2014). One increasingly well-documented impact of tap water distrust is on mental ill-health, including anxiety and depression (Wutich et al., 2020). For example, water contamination has been associated with emotional distress in Flint, Michigan (Carrera et al., 2019; Sneed et al., 2020), and Texas colonias (Jepson & Vandewalle, 2015).

Both conceptual and empirical research, however, suggests that consumers are more likely to distrust their tap water when it has aesthetic deficiencies than when it violates primary regulatory health standards, or MCLs (Spackman & Burlingame, 2018; Pierce & Lai, 2019). The national Safe Drinking Water Act (SDWA) addresses aesthetic (i.e., taste, odor, and color) characteristics of drinking water by setting National Secondary Drinking Water Regulations (NSDWRs) or "secondary standards." While the NSDWRs outline "secondary maximum contaminant levels" (SMCLs) for 15 contaminants, in contrast with primary MCLs, compliance with the secondary MCLs standards is not mandatory.

Bottled water companies use branding and marketing to benefit from public concerns around health risks (Wilk, 2006) and the stigmatization of tap water (Brewis et al., 2021). While guidelines of the International Bottled Water Association in theory impede companies from marketing using direct comparisons to tap water, scholarship on bottled water companies' tactics suggests otherwise (Gleick, 2010; Pacheco-Vega, 2019). People who drink primarily bottled water tend to drink less water (Rosinger et al., 2018), and the resulting under-hydration leads to negative health outcomes (Rosinger & Young, 2020).

Sugar-sweetened beverage companies, too, use misleading marketing, which indirectly undermines tap water consumption (Cohen et al., 2015; Moran et al., 2018), again with well-documented negative health outcomes. The most ubiquitous health impact of high consumption of sugar-sweetened beverages is degraded dental hygiene via higher risk of dental cavities (Ogden et al., 2012). Sugar-sweetened beverages are also associated with excess weight gain (Schwartz et al., 2016), which is of heightened concern among children in historically marginalized communities. Finally, the perception of tap water as unsafe degrades the environment via the increased consumption of bottled drinks that must be packaged and shipped, sometimes thousands of miles before reaching a consumer (Merkel et al., 2012).

In terms of equity, these negative consequences of alternative choices to the tap are felt most severely by disadvantaged households, as studies have shown that low-income, minority households disproportionately perceive their tap water to be unsafe (Pierce & Gonzalez, 2017; Regnier et al., 2015; Scherzer et al., 2010). Some research revealing higher levels of tap water distrust among households of color is interpreted as being purely the result of people's lack of information or misunderstanding (knowledge deficit model). In other words, distrust is rendered (incorrectly) as misperception of tap water quality.

An overemphasis on organoleptics in historically marginalized communities obscures how patterns of inequality, poverty, racism, and coloniality produce distrust in tap water (Meehan et al., 2020). Higher distrust results from severe tap water quality deficiencies experienced in both the past and present by people subjected to economic impoverishment, discrimination, and political marginalization (Fragkou & McEvoy, 2016; Abrahams et al., 2000; Anadu & Harding, 2000).

Building Trust with Communities

Consumer confidence reports (CCRs) are the primary way in which large water systems are mandated to formally communicate water quality results directly to—and as their name implies, build trust among—customers in the US. However, nationally, CCRs are often not translated for non-English speaking consumers and are often not delivered to residents such as renters on master-metered water utility accounts. Even when delivered in relevant languages, these reports are often difficult to understand for their intended audience.

For instance, Roy et al. (2015) analyzed 30 CCRs for water systems across the US for language reading level. As with other studies (Johnson, 2003), it found CCRs were not digestible to the average reader, as CCRs were written at the 11th–14th grade level, well above the recommended 6th–7th grade level for most public health communications. On the other hand, very recent efforts have embarked at both the national level[1] and state level[2] to support systems to both provide CCRs in compliance with regulation and improve CCR readability over and above regulatory standards.

Readable CCRs could play a noteworthy role in increasing tap water trust (Roy et al., 2015); however, the relationship between CCRs and tap water trust is a two-way street, with trust affecting how CCRs are read and vice versa. Roy summarizes that "these findings expose a wide chasm that exists between current water quality reports and their effectiveness toward being understandable to US residents." As Scherzer et al. (2010) put it: "For vulnerable populations, technical reports of water safety have not only to be believed and trusted but matched or superseded by experience before meaningful change will occur in people's water consumption habits."

There are ongoing efforts in the San Francisco Bay Area to make CCRs more readable and interesting nationwide (Banjerjee & Villegas, 2021; Evans & Carpenter, 2019). At the same time, as noted above, there remain limits to this type of knowledge deficit model focus on improving the information and framing of existing water-trust tools such as CCRs (Evans & Carpenter, 2019; Roy et al., 2015). A pure knowledge deficit model can lead to fairly tone-deaf recommendations such as a focus on "dispelling misconceptions and educating low-income people" (for instance, see Family 2019).

Water Quality Complexity and Regulation

Part of the confusion and distrust regarding tap water results from the inherent complexity and nuance of tap water quality science and regulation, which itself only applies to "publicly regulated water systems." Private wells, which serve over 10% of the US population, are not subject to any mandatory quality regulation or testing in California. There are also common misunderstandings about who is responsible for the quality of regulated water provision by the time it reaches the tap. Water generally proceeds from a raw source to a treatment plant, then from a treatment plant through the distribution network of a regulated system to customer properties (premise plumbing), where end users access the water from the tap (see Figure 3).

For most regulated drinking water contaminants, testing takes place at a centralized treatment plant.[3] One of the reasons for this centralization is that, for many contaminants, it is just as effective to test at the treatment plant as in the distribution network or at a tap point. There are also legal, logistical, and cost-savings advantages of centralized testing. After testing, water enters and remains in the distributional network of a system until it reaches the property line of customers and enters premise plumbing. Quality within the distributional network, including changes in the water chemistry that interacts with the system to introduce contamination, is the ultimate responsibility of the regulated

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[1] For instance, see https://www.policyinnovation.org/water/ccr-template.

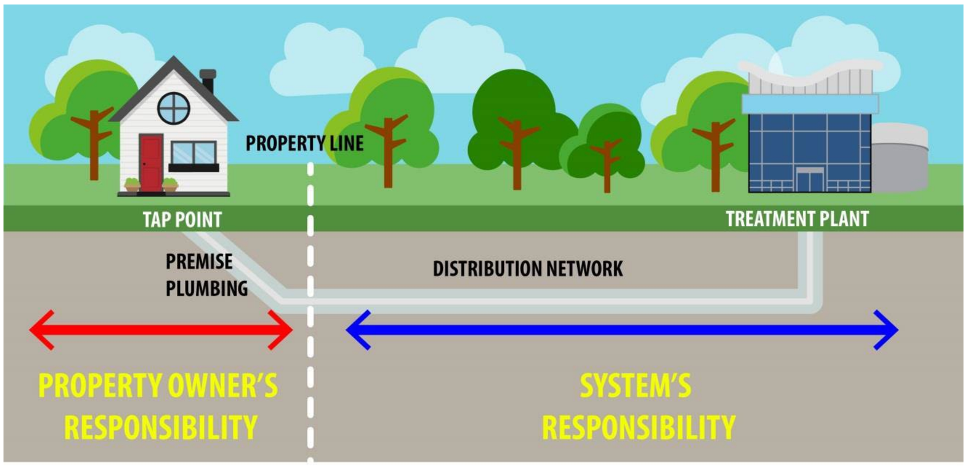
[2] For instance, see https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/CCR.html.

[3] Some water quality testing to comply with primary, health-related regulatory standards, such as for the Total Coliform Rule (TCR) and disinfection byproducts, does takes place in the distributional network. Moreover, some quality testing by systems that is not required for regulatory purposes, for example for pH and turbidity, is also routinely performed in the distributional network. Finally, lead and copper quality testing is required to be performed by regulated water systems at a sample of tap points, but this by no means represents comprehensive testing at every customer tap point.

community water supplier. Similarly, any contamination introduced within premise plumbing is the responsibility of the property owner or landlord.

While there are a limited set of contaminants that can be introduced after water enters the distribution system (and an even more limited set once it enters premise plumbing), especially if distributional and premise pipes are well-maintained, only testing at the tap can give households the best representation of their tap water quality.

Figure 3: ***A simplified cartoon of the flow of water from water system treatment plant to the tap.***



Tap Water Quality Standards: Primary and Secondary MCLs and PHGs

As noted above, the inherent complexity and nuance of tap water quality science and regulation adds to part of the confusion and distrust regarding tap water. This complexity necessarily makes any simplification of language difficult, and usually contested. We summarize the basic landscape of regulation below.

The US SDWA sets standards for drinking water quality served through public water systems to homes across the country. This law, enforced by the US EPA, classifies potential contaminants into different categories. Each public water system is required to test for nearly 100 potentially health-harming contaminants and proactively treat the water to ensure all contaminants are below legal primary MCLs and to immediately treat the water if it exceeds an MCL.

There are two key scientific terms to understand in interpreting water quality served by regulated systems in California: Primary Maximum Contaminant Levels (MCLs) and Public Health Goals (PHGs). MCL and a PHG limits are set for each contaminant (like lead or arsenic) that a water system is required to test and treat for, with MCLs often set higher, or less restrictive, than PHGs.

Water systems are legally required to meet primary MCLs but not PHGs. According to the California health agency that sets PHGs, "As long as drinking water complies with all MCLs, it is considered safe to drink, even if some contaminants exceed PHG levels." MCLs are health-protective drinking water standards, whereas PHGs represent goals that California's public water systems should strive to achieve if it is feasible to do so. However, the achievement of PHGs is often hindered by water testing technology and especially by water testing costs. In other words, if a water system worked to meet PHGs for all contaminants, their water bill would likely be much higher than it is now.

In addition to federal standards, states may choose to adopt federal Secondary Maximum Contaminant Levels (Secondary MCLs) standards as mandatory and can also establish their own enforceable or advisory drinking water standards. The state of California is generally much more active than many other states in adding both mandatory and advisory standards beyond the primary standards of the SDWA. In fact, in California, secondary MCLs established for aesthetic rather than primary health reasons are enforceable, not just advisable, but are also applicable only to community systems. Thus, non-community systems, particularly non-transient non-community (NTNC) systems such as schools and workplaces, do not receive the benefits of the secondary standard (CA Water Board, 2023).

The California State Water Resources Control Board (SWRCB) can establish—and has established—state MCLs for contaminants not in the SDWA. Thus, in California, it is not uncommon to see a contaminant with two MCLs—one developed by the federal agency (US EPA) and the other developed by the state agency (State Water Board). The California MCLs may only be equal to or less than the federal MCL. An example of dual MCLs is the contaminant Freon-11 (trichlorofluoromethane). The state may also establish an MCL for a contaminant which does not have a federal MCL. Examples of this additional MCL setting in California include the contaminants Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane), bentazon, molinate, and thiobencarb.

Supportive Clean Drinking Water Policy in California

In 2012, California became the only state in the nation to legally recognize a Human Right to Water, per Assembly Bill (AB) 685. The language of the bill declares that it is the established policy of the state that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.

To date, the state agency responsible for drinking water quality regulation in California, the SWRCB, has interpreted the right to "safe, clean" water as water provided by a publicly regulated drinking water system that meets the primary or health-related standards of the California version of the SDWA. Hundreds of regulated water systems remain that fail to meet these standards endemically, many but not nearly all of which are clustered in the San Joaquin Valley in the central region of the state.[4]

Failure to comply with primary MCLs and the risk of failure is the focus of California's Senate Bill (SB) 200, which enabled the State Water Board to establish the Safe and Affordable Funding for Equity and Resilience (SAFER) Program. SB 200 established a set of tools, funding sources, and regulatory authorities that the State Water Board harnesses through the SAFER Program to help struggling water systems sustainably and affordably provide safe drinking water. The bill also requires the State Water Board's Division of Drinking Water to conduct an annual needs assessment on the attainment of AB 685's Human Right to Water requirements.

As discussed above and below, much of the distrust of tap water, particularly in urban areas, originates from water that complies with these primary standards. More broadly, distrust of tap water in California has been as persistent of a challenge as outlined nationally.[5] Distrust also functionally

[4] California State Water Resources Control Board. (2022). Drinking water needs assessment. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2022needsassessment.pdf

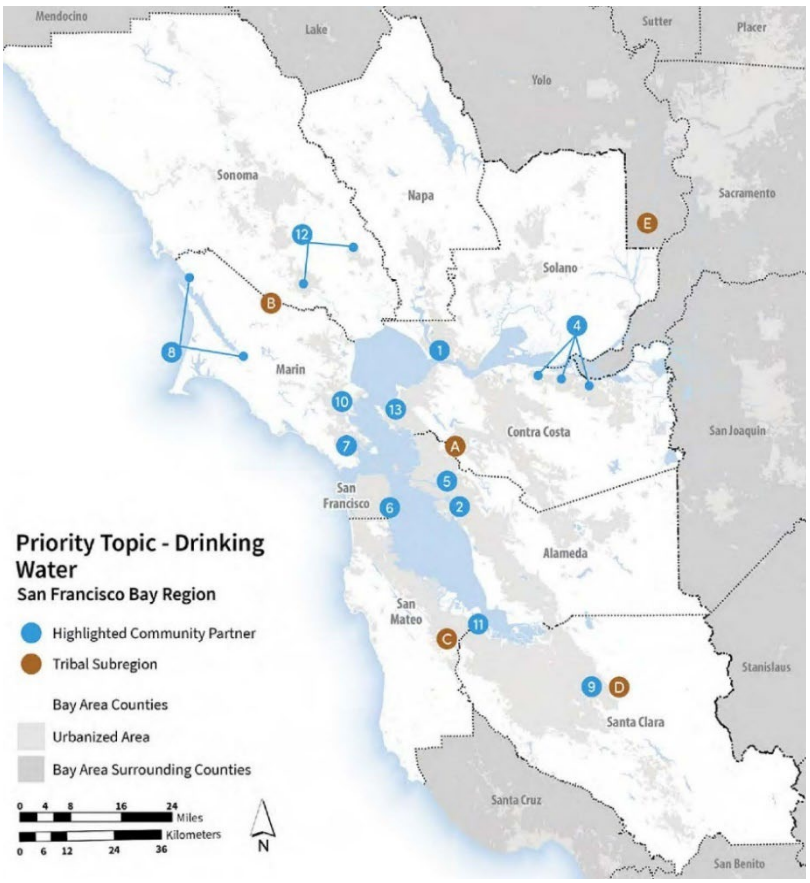
[5] Pierce, G., Gonzalez, S. R., Roquemore, P., & Ferdman, R. (2019). Sources of and solutions to mistrust of tap water originating between treatment and the tap: Lessons from Los Angeles County. *Science of the Total Environment*, *694*, 133646.

undermines the Human Right to Water, given that distrust results in negative health and affordability consequences for households, especially those often underrepresented in decision-making.

Trust in Bay Area Tap Water

In the Regional Needs Assessment process, it quickly became clear that tap water quality was a key concern, albeit to varying degrees, across all communities and Tribes as shown in Figure 4. The map below shows generally where the issues and concerns about tap water have manifested in the participating communities and Tribes. The graphic below provides the local perspective from community members and Tribal members.

Figure 4: ***Communities that documented distrust in tap water quality in the Regional Needs Assessment.***



As described in the Regional Needs Assessment, community members reported that their tap water is brownish/discolored and foul smelling. Community members also reported being met generally with flippant, rude, and/or unsupportive responses to specific concerns and inquiries they have brought to their water and health agencies about tap water quality. These experiences have fueled further community distrust in local water agencies, on top of the incident in 2018, where sediment affected the taps of 1,000 households.

Some residents reported feeling that their negative health effects are connected to poor water quality, which causes extreme anxiety and stress when drinking water, cooking, or bathing. Due to this concern, many residents felt they have no choice but to purchase bottled water, causing further financial burdens on low-income residents, many of whom already have compromised health.

The issue of drinking water quality was further exacerbated by the COVID-19 pandemic. Residents were homebound during the pandemic, and nearly everyone's water use was higher, underlining the importance of the quality of water that community members are in constant contact with. Additionally, past severe fire seasons, when community members have gone without electricity and phone usage, have also increased the urgency of concern about drinking water quality. The concern communities shared in the Regional Needs Assessment process was uncertainty as to how the fire-related ash could affect their drinking water sources, and how the loss of electricity or communications could affect how their water is treated, tested, and distributed.

Figure 5, below, summarizes the findings from the San Francisco Bay Regional Water Needs Assessment related to distrust in drinking water. We note that the outreach partners sometimes worked in multiple communities, and that we aggregate Tribal perspectives into subregional areas.

*Figure 5: **Findings from the Regional Needs Assessment by Disadvantaged Community and Tribal subregion.***

1	**All Positives Possible (Vallejo)** Drinking water was identified by community members as brownish/discolored and foul smelling. Some residents report a connection between poor water quality and feeling negative health effects, which causes anxiety when drinking water, cooking, or bathing. Many residents feel they have no choice but to purchase bottled water, causing further financial burdens on low-income residents.	Community Partners
2	**Brower Dellums Institute for Sustainable Policy Studies and Action (Deep East Oakland: Brookfield Village, Columbia Gardens, Sobrante Park)** Respondents expressed concerns about polluted drinking water, including taste, cloudy appearance, smell, and cost.	Community Partners
4	**Contra Costa Resource Conservation District (Antioch, Bay Point, Pittsburg)** Taste of water and unsafe drinking water are top priorities. Some participants noted that they buy bottled water for their animals to drink—that is the extent to which they felt their tap water is not safe to drink.	Community Partners
5	**Friends of Sausal Creek (Fruitvale District, Oakland)** Many participants expressed concern that their tap water isn't safe to drink, and many buy purified water to cook and drink. Participants were also concerned about the rising cost of water.	Community Partners
6	**Greenaction for Health and Environmental Justice (Bayview Hunters Point)** One-fifth of residents rated their drinking water as bad and almost another fifth rated theirs as poor.	Community Partners
7	**Marin City Climate Resilience and Health Justice (Marin City)** Most residents were concerned about the quality of water in Marin City and use bottled water as their main water source. Many respondents connected poor quality of water to health issues.	Community Partners
8	**Marin County Community Development Agency (Dillon Beach and Pt. Reyes Station)** In Dillon Beach more than half of respondents have water quality concerns. In Pt. Reyes Stations over a third have water quality concerns. In both locations, taste of water is an issue.	Community Partners
9	**META (East San Jose)** Safety of tap water was the top concern. Many participants buy bottled water for cooking and drinking. Specific concerns cited include: water is brown or yellow and tastes/smells like bleach. Other priority issues include old infrastructure, and the cost of water.	Community Partners
10	**Multicultural Center of Marin (Canal District, San Rafael)** Many community members feel that faucet water is not safe, and have concerns of possible health effects. Specific concerns about tap water cited include: water being unclear, having an unusual color, being cloudy, and having a chlorine or metallic smell. Many homes rely on purchased bottled water.	Community Partners
11	**Nuestra Casa (East Palo Alto)** Three quarters of respondents report buying bottled water for cooking and drinking. Respondents indicated that water quality depends on location and believe that expensive water is of better quality. There is concern about the environmental effects of buying so much bottled water. Specific water quality issues identified include: water is brown, yellow, rusty, black, cloudy, contaminated, tastes bad, smells bad, smells of chlorine, smells of bleach, causes health issues including rashes, burns skin, people's hair falling out, and eyes burning.	Community Partners
12	**Sonoma Ecology Center and Daily Acts (Petaluma and The Springs)** Many people, especially in the Latinx community, do not trust tap water for drinking. Many people are choosing to purchase bottled water or filter their tap water in place of drinking water directly from the tap.	Community Partners
13	**The Watershed Project (North Richmond)** Almost half of respondents experience problems with their tap water and many choose to drink bottled water.	Community Partners
A	**East Bay Tribes** Forty percent of respondents stated they noticed a difference in the quality and taste of their water. Additionally, most of the East Bay subregion residents stated they pay between $10-$50 extra a month on bottled water and/or five-gallon jugs for drinking water purposes.	California Native Tribes
B	**North Bay Tribes** The Tribal organizations desire to have their water tested since well water is the source of their drinking and cooking water. They host large gathering sites for Tribal ceremonies where clean water is necessary. Respondents were also concerned about how climate change affects water quality and supply.	California Native Tribes
C	**Peninsula Tribes** Respondents have all experienced some fluctuation in taste. All respondents identified they would like their tap water tested against the standard of the region. Half of respondents said they have had trouble paying for drinking water and identified access to affordable water as a priority. Half of respondents have experienced disruptions in their water service. Half of respondents identified having enough water as a concern.	California Native Tribes
D	**South Bay Tribes** Eighty-eight percent of respondents have noticed a difference in their water quality while living in their communities. Some Tribal members have stated that they taste chemicals in their water, or note a slight metallic smell, or that it is a bit gritty, and over time they developed less trust in their water quality. One-third of respondents rated the quality of their water as poor. Forty-four percent used bottled water for cooking and for mixing baby formula because they do not trust their tap water sources. All of South Bay subregion residents stated they pay between $26-$75 extra per month on bottled water and/or five-gallon jugs for drinking water purposes. A third of respondents said they have trouble paying for their drinking water.	California Native Tribes
E	**Tribes living outside of the SF Bay Region** Fifty-seven percent of respondents stated they use a different method for cooking and cleaning than their tap water. Forty percent of respondents pay over $100-$150 on their water bill a month. Thirty-eight percent of respondents stated they have trouble paying their monthly water bill.	California Native Tribes

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III Tap Water Testing Program Development: Process and Methods

This Tap Water Testing Program was envisioned, requested, and implemented by communities and Tribes, with the support of SFEP, and they rightfully have ownership of the idea to test tap water and the data collected. All outreach partners from the Regional Needs Assessment were offered the opportunity to participate in the Tap Water Testing Program, and ultimately, 11 outreach partners agreed to participate. An additional outreach partner that did not participate in the Regional Needs Assessment process, First Generation Environmental Health and Economic Development, joined the cohort of 11 to total 12 outreach partners participating in the Tap Water Testing Program. These partners can be found in Table 1 in Chapter 1 above.

This section describes the process SFEP undertook to ensure there was a common framework that communities and Tribes could use to curate their programs to fit their community's needs and capacity. It also describes the outcomes of such a model and delves into considerations that future programs should take into account when developing their own tap water testing program.

Technical Expertise to Support the Program

Planning for the development of the Bay Area regional TWQ testing effort began in early 2021. SFEP first worked to assemble a tap water testing Development and Implementation Team. To ensure sufficient expertise was embedded in the Development and Implementation Team, SFEP contracted with two subject matter experts and was supported by two community engagement consultants. These two consultants, Maddie Duda (Lotus Water) and Ryan Hirano (Woodard & Curran) were procured initially and contracted to support communities in the Regional Needs Assessment process.

Following an open procurement process in winter 2019–spring 2020, two drinking water policy, equity, and quality experts, Dr. Greg Pierce and Dr. Silvia R. González from the University of California, Los Angeles (UCLA), were contracted to help inform the process and program. Dr. Pierce and Dr. González have worked extensively with a range of stakeholders on urban tap water quality issues in California, and specifically in the Los Angeles region. While at UCLA for more than 10 years, they have published a number of studies on related topics using advanced qualitative and quantitative methods. They have undertaken this research in conjunction with community-based, environmental justice, and local public health organizations; willing water systems; and regulators.

After securing technical expertise to help guide the testing program's creation, the Development and Implementation Team worked to secure tap water testing services. The Development and Implementation Team held a workshop with Bay Area water providers and outreach partners to discuss considerations for a testing program. In the workshop, community members stressed the need for third-party testing not tied to any utility. Participating utilities emphasized the importance of using labs certified by the California Environmental Laboratory Accreditation Program (ELAP) to ensure industry-standardized methods were used by labs certified to conduct them.

Based on this feedback, the Development and Implementation Team began a review of ELAP-certified labs throughout the San Francisco Bay Area to assess what labs could handle the types of water quality tests the program anticipated. Out of the 26 labs with one or more ELAP certifications, only five were found to have a majority of the certifications needed to test for the contaminants which Bay Area communities and Tribes were interested in. It became clear from this review that a single lab would be unlikely to meet the testing needs of the program. The program sent a request for bids to all five labs as well as SimpleLab, a Berkeley-based company that offers broad tap water testing services to the public via contracts with labs it has throughout California. The only response received was from SimpleLab, confirming that individual labs were either not equipped or not interested in executing this program. It is also worth noting that because the program was being built from the ground up, with no preexisting models to reference, many unknown variables in the request for bids could have discouraged responses from labs. SimpleLab was contracted to coordinate the testing effort in late 2021 and worked with the Development and Implementation Team to help define what was possible considering community and Tribal needs within the lab's scope of services and the overall effort's budget.

Once the expertise and testing logistics partners were procured, the Development and Implementation Team worked with the outreach partners in an iterative process of learning, collecting feedback, and advancing program development. This process took place over several months and required a massive amount of information sharing and feedback between our community and Tribal partners, the Development and Implementation Team, and SimpleLab. This engagement resulted in a framework that all outreach partners could agree to but also left ample room for individual communities and Tribes to tailor their approaches to meet their residents' needs.

Setting up the Program and Supporting Partner Preferences

Once in contract with SimpleLab, the program set clear testing options for community and Tribal partners to choose from. SimpleLab's business model offers panels of water quality tests that look for a variety of contaminants that can be found in drinking water. SimpleLab has three city water panels that test for a variety of contaminants, ranging from 44 to 115 in number. They also offer well water testing panels for participants not connected to city water and targeted panels that assess specific groups of contaminants like VOCs (volatile organic compounds), radiation, or PFAS (perfluorooctanoic acid). Each of the panels were assessed and a test use case was provided to the outreach partners to help contextualize the contaminants included as they decided which panels they wanted to order. It is important to note that no tests were done outside of lab settings, and only sample collection occurred at participants' homes.

The specific tap water testing strategy within each community (participant selection, testing panels, locations, sampling support, etc.) was determined by local outreach partners and wound up varying significantly within available options. All participation was completely voluntary and facilitated by the outreach partners. The Development and Implementation Team had no interaction with the participants directly during the testing phase. The contract with SimpleLab included $200,000 for testing. Each outreach partner was initially allocated $15,000 of that budget for testing, which left a buffer of $20,000 to be allocated to outreach partners as needed. Depending on the panels selected, $15,000 could pay for 23–109 samples for testing. As expected, there was a wide range in the final number of samples tested by each outreach partner and their associated budget, ranging from $2,999–$42,504.

The Development and Implementation Team supported each of the community and Tribal outreach partners to ensure the program had a common technical framework (see section below), that outreach partners had the necessary information related to water quality regulations and science, and that the data obtained was informative and rigorous. The Development and Implementation Team also reached out to all 11 of the water utilities that directly serve the communities and Tribes that participated in the tap water quality testing effort. The team met with eight utilities to inform them of the effort and inquire about their interest in a partnership and potential responsiveness to resident and outreach partner questions. The program team also met with regional staff from the State Water Resources Control Board's Division of Drinking Water. The Development and Implementation Team provided technical sampling and testing information and was available to answer any questions and concerns raised by the agencies.

As the Development and Implementation Team engaged the utilities, many expressed concerns regarding the testing effort, including:

- Accurately conveying regulatory information – Utilities were particularly concerned with accurately portraying MCL regulatory standards. The use of PHGs as a non-regulatory standard to compare results in the SimpleLab system was a concern of utilities and regulators due to the limitations of achieving such standards, either technically or economically. The Development and Implementation Team addressed these concerns by sharing prepared material regarding PHGs and MCLs and committed to working with and educating all outreach partners on these standards using the material and talking points shared with utilities.
- Conveying causal factors – Utilities were concerned that by testing at the tap and not at a utility meter, collected data could be construed to insinuate the utility system was responsible for any impairment of tap water. The program directly addressed the issue of causal factors and the impacts that premise plumbing can have on tap water in the monthly meetings the Development and Implementation Team had with outreach partners and in the informational materials distributed to partners.
- Frustration over distrust – Several of the utilities shared a general frustration that their water is not trusted. They pointed to the robust regulatory testing they are required to conduct, CCRs, and various lead testing programs offered. Although this frustration is understandable, the project Development and Implementation Team was very clear that this distrust is a product of negative experiences at the tap, systemic underfunding in Disadvantaged Communities, and past negative interactions with utilities. We also shared the Division of Drinking Water's perspective that, admittedly, players in the drinking water world have been hyper-focused on meeting regulatory standards and have not put enough focus on effective outreach and communication that can change trust dynamics between utilities and the constituents they serve.

In these meetings with utilities, the Development and Implementation Team wanted to be very clear that the effort was not intended to be a "gotcha" program but rather a data collection effort envisioned and led by the participating communities and Tribes, and that distrust or observed deficiencies in tap water were not immediately framed as a product of utilities' or regulators' neglect. The Development and Implementation Team shared that, regardless of the testing results, utilities can improve the trust dynamic with communities by participating in efforts like the tap testing program and by more proactively engaging the constituents they serve. This feedback was based on research and on-the-ground experience where the Development and Implementation Team observed that community members felt their tap water was unsafe, regardless of the underlying cause. Such perceptions can lead to reliance on tap water alternatives, negatively impacting household economics and physical and psychological health.

The tap water sample collection effort began in February 2022 and was completed in June 2022. There was a last-minute extension at the end of the period of two weeks for outreach partners to meet their numerical sampling goals. It should be noted that getting this extension was particularly difficult because SimpleLab relies on agreements with expiration dates with labs across the state to facilitate their testing. SimpleLab had to negotiate new agreements to facilitate this short extension. It is critical for programs that intend to do this type of community sampling and testing to build in enough time for outreach partners to complete their testing and to limit final orders for sample kits well before the contract end date to avoid samples being discarded.

The outreach partners and Tribes collected a total of 577 samples. Due to errors in sampling, logistics, and shipping, 22 samples were not tested. Our final dataset includes 555 samples from 440 distinct home and other facility locations, totaling over 34,000 data points.

Technical Sampling, Testing, and Reporting Details

After the testing panels were selected by the outreach partners, SimpleLab shipped out the sample collection kits with prepaid return labels. SimpleLab handled the ordering/shipping logistics, tracked the packages in the mail, ensured that labs received and processed the samples, and provided the data online via their system[6]. They also were available at any time via their online platform to answer logistical questions or to resolve issues that arose with the kits, sampling, or the online system. Once the kits arrived at the offices of the outreach partners, they were deployed in one of two ways: 1) the outreach partner took them to the sampling locations and assisted with the sample collection, or 2) they mailed the kits to participants for them to collect the sample and send in the mail.

[6] While there were some variances from protocol standards, resulting in some QA/QC findings, these are generally going to result in low biases with some notable exceptions like Nitrate.

Photo courtesy: Nuestra Casa de East Palo Alto

All labs SimpleLab sent samples to were ELAP certified and thus use industry-standard methods, most of which are EPA-derived methods or are more rigorous. Each participant who had their water tested had access to their own data and information about each test, contaminant, and standard being used to assess the data via the SimpleLab system. SimpleLab offered a number of customizations to its portal to meet the program's needs, including displaying both California MCLs and PHGs and removing automatic home filter recommendations (see Figure 6). Compared to traditional reports generated by labs, SimpleLab's platform is more interactive and easier to interpret. It visually presents the data so the end user can quickly see if a water sample exceeds regulatory or health goal standards. It also provides health and aesthetic information where applicable (see Figure 7).

Figure 6: ***A participant's individual results presented by SimpleLab's platform.***

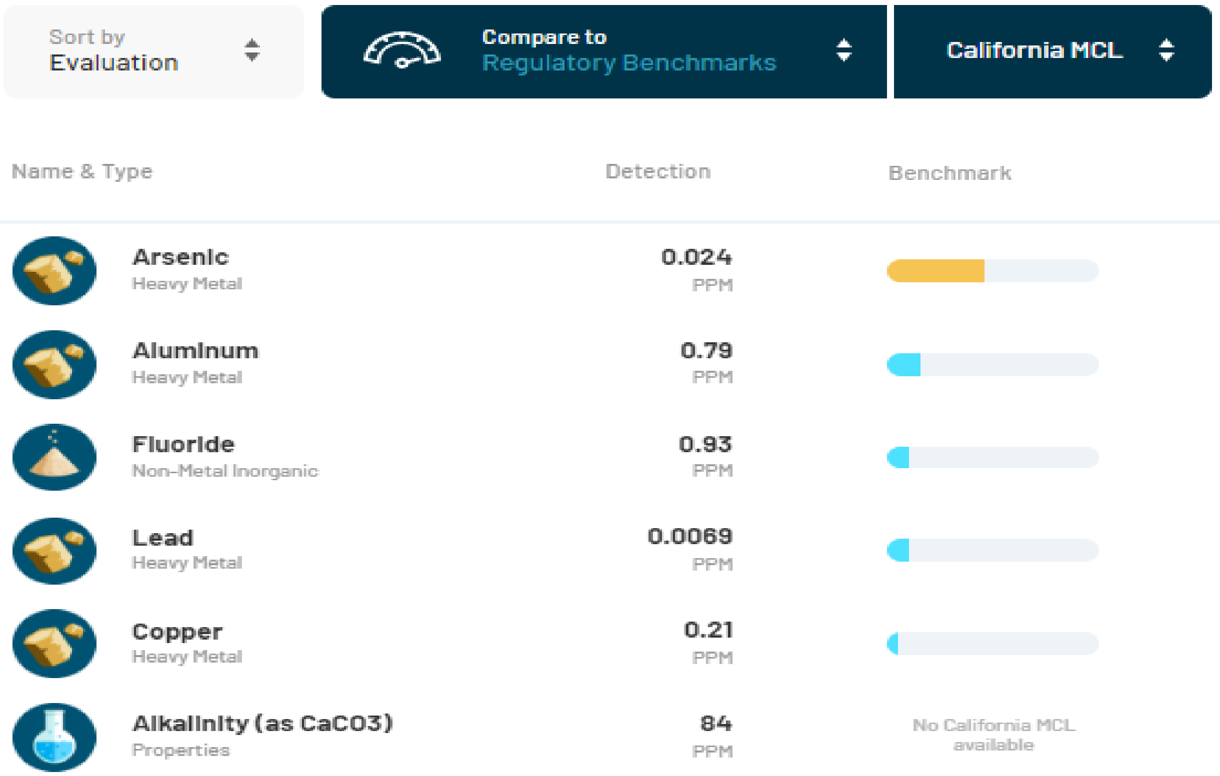
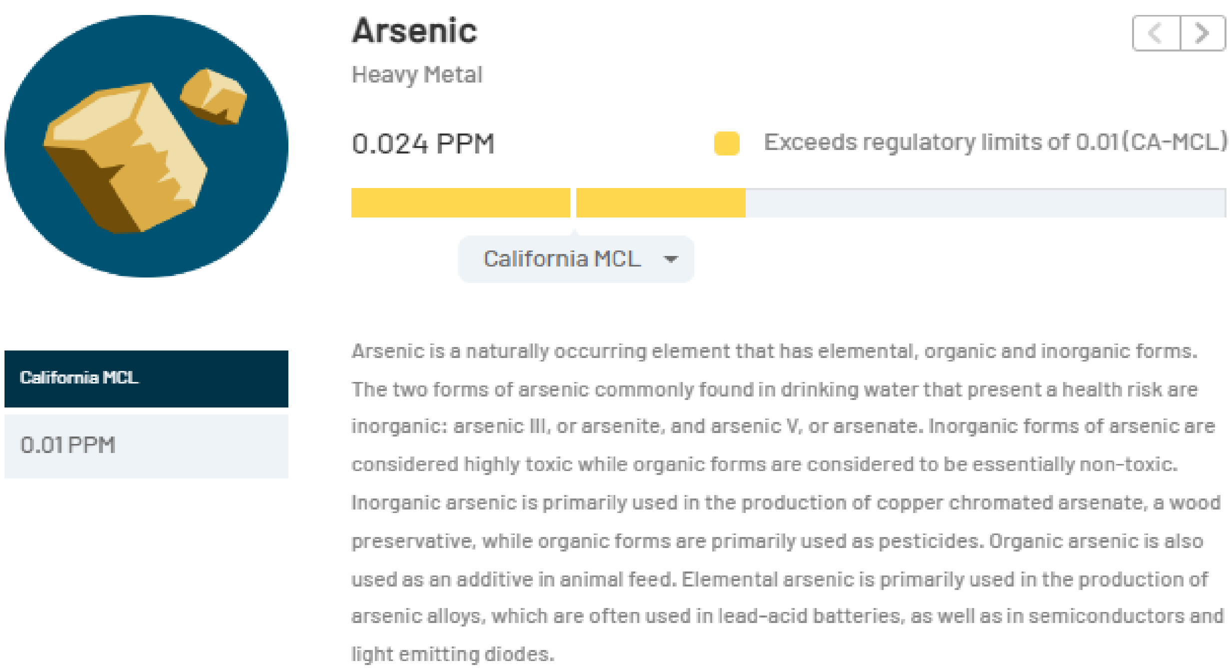


Figure 7: ***Snapshot of information presented when an end user clicks on any given contaminant shown in Figure 6.***



Outreach partners had access to all participant data in their community. The Development and Implementation Team had access to all data from all participants from all communities. After receiving all data from SimpleLab, the program team analyzed the results. This report aggregates all the data regionally, highlights test results by outreach partner, where appropriate, and provides qualitative lessons learned from the program and testing process itself.

Research and Goal Setting

The Development and Implementation Team, led by the technical experts involved in this stage, developed and adapted several informational materials, described next, to share with outreach partners, community members, and other stakeholders throughout the project. These materials were designed and revised with iterative input on their usefulness from outreach partners and consultatively with utilities and regulators in order to:

- Explain in as brief and accurate of a manner how tap drinking water quality regulation works and key constituents of potential concern at the tap.
- Suggest feasible options for program implementation by the community.
- Share detailed information about SimpleLab logistics, methodologies, and requirements.
- Elicit information from stakeholders which would inform our evaluation of the program.

The first two documents were developed in tandem over the course of fall 2020–spring 2021: a two-page document entitled “Drinking Water Quality Testing Requirements and Standards: Your Water System & Bottled Water” as well as a companion 14-page document entitled “Key Water Quality Constituents to Sample and Test for in Bay Area Regional Drinking Water Quality Effort.” These documents were distributed by outreach partners to interested community members via email in spring 2021.

The second set of documents were developed by SimpleLab to ensure all outreach partners had access to sampling and logistical instructions. Two videos were created for the program, including “Video Instructions: Advanced City” and “Video Instructions: Essential City,” referring to the program’s two most commonly used sampling kits. Three PDFs were created that provided detailed information on testing logistics and how to get help from SimpleLab when needed.

The final set of documents were survey instruments designed to elicit information from households, and secondarily managers of community facilities, about their tap water concerns and experiences before (two pages), at the point of (five and seven pages), and following the testing process. However, after extensive conversations with outreach partners, only at the point of testing surveys were deployed at scale, and participation was voluntary. While this more limited approach inherently constrains the ability to determine with certainty the causal impact of the testing and program intervention, it reflects the desire of outreach partners as the process evolved, which was the primary priority for the effort. Limiting data collection from residents was part of a broader sentiment of “survey fatigue” experienced by community groups, especially in the pandemic environment.

All of the above referenced documents can be found at: https://www.sfestuary.org/disadvantaged-community-and-tribal-involvement-program/.

Report Back and Dialogue Regarding Results

Once testing data was collected and results were returned, the Development and Implementation Team supported outreach partners in understanding the results and shared suggested approaches when discussing the results with participants. Some outreach partners held meetings with the participants and were supported by independent water quality experts that the Development and Implementation Team introduced to the cohort. The degree of follow-up with participants varied wildly between outreach partners and ranged from one-on-one meetings with participants to non-engagement post-testing, relying on the SimpleLab system to provide the interpretation needed to understand the results. Due to capacity and budget limitations, the Development and Implementation Team was not able to provide more direct support to community and Tribal outreach partners with this follow-up phase, and future efforts must better ensure that resources are in place to accommodate a greater degree of post-testing engagement support while ensuring the CBO and Tribal outreach partners define the level and type of support provided. In total, there were 10 MCL exceedances returned from samples collected by three of the outreach partners; CIEA (7), FGEHED (2), and META (1). Follow-up with participants who received results with MCL exceedances was conducted by the outreach partners and was not uniform. The Development and Implementation Team worked with the outreach partners to understand the exceedances and to offer technical support where desired. Outreach partners engaged utilities where permission was given by the participant to do so and resulted in additional testing done outside of the scope of this project and report. In future efforts, implementing entities should assign appropriate resources to ensure MCL exceedances are tracked and that the follow-up with each participant is recorded and outcomes documented.

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IV Quantitative Testing Results

This chapter describes the results of the water quality sample collection effort that began in February 2022 and finished in June 2022. The program worked with 12 of the outreach partners which participated in the Regional Needs Assessment and collected a total of 577 samples. Due to errors in sampling, logistics, and shipping, 22 samples were not tested.[7] Our final dataset thus includes 555 samples, totaling 34,296 data points on 142 distinct constituents of interest.[8] To illustrate the breadth of our effort, we note that this number of constituents exceeds the combined number of constituents on the EPA's primary and secondary MCL lists.

SimpleLab also provided detailed sample collection protocols. The advanced and extended city water panels required a glass vial to be filled up entirely in addition to a larger plastic bottle that all kits contained. The sampling errors made in the program were all for the procedures required in SimpleLab's advanced or extended city water panel sampling kits that had glass vials. The glass vial was used to test for VOCs and other compounds whose concentrations change when the sample is exposed to air. The split in how these samples were handled directly resulted from feedback from SimpleLab contracted labs. Due to logistical challenges in processing incomplete samples, the labs requested that they be allowed to dispose of entire kits that had sampling errors rather than partially testing them. SimpleLab granted this allowance to ensure they were operating according to their contract requirements with the labs they sent samples to. After the first 14 samples were processed for partial sampling, all kits with sampling errors were disposed of entirely.

The basic breakdown of individual tests and test kits and MCL and PHG exceedances are shown below, with additional results reported in the Appendix. As usual, the interpretation of the results is nuanced. We stress that some of the null findings below do not definitively mean or suggest that communities are not experiencing tap water quality problems. Residents from the participating communities have expressed negative perceptions of tap water due to their personal experiences and the information they have been provided by utilities and government agencies in the past. While tests

[7] A breakdown of untested and partially tested samples can be found below:

- Sampling errors (28)
    - All these samples arrived at the lab with head space in the glass vial used to test for a subset of volatile contaminants.
        - Fourteen samples were tested for everything but VOCs.
        - Fourteen samples were not tested.
- Shipping or logistical (eight)
    - These samples either were not sent in by the contracted end date with SimpleLab, an issue occurred with shipping, or the partner did not properly follow logistical steps in the online platform as required.
        - Four samples were not tested because they were late.
        - Three samples were not tested because of shipping issues.
        - One sample was not tested due to logistical errors.

[8] We also conducted tests of six types of locally purchased bottled water as a comparison to tap water results. In summary, we found no reason for concern regarding these bottled water sources. The test results yielded no MCL exceedances. However, we note that the analytes we found that did not have MCLs also did not have PHGs.

showing no exceedances can provide a helpful data point, residents likely will not automatically trust tap water without further explanation and acknowledgment of what they may be seeing or hearing. We also note that these results are not statistically "representative" in any sense of individual communities. Different sampling combinations, kits, and individual tests were also applied across communities, meaning the number of tests by individual contaminant varied substantially in some cases (see Appendix). These tests also represent a snapshot in time and may not capture the instances that have caused concerns from residents that are not regularly occurring yet still have influenced their trust in drinking water.

Summary of Regional Testing Results

Adding to the complexity of interpretation, MCL (n=12,895) and PHG (n=12,946) levels have been established as a standard for only approximately one third of the total test results (34,296) (see Table 2). In other words, only 12,895 of the total data points had MCL regulatory standards to compare against. There are contaminants of interest that were part of this study that have both an MCL and a PHG, an MCL but not a PHG, and vice versa. There are also different ways of grouping the 142 individual analytes tested for into a narrower set of categories of concern. We group analyte type for summary purposes below using five categories provided by the US EPA: microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, and radionuclides.[9]

MCL Exceedances: Outreach Partner Overview

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
APP	95	4384	0	1,566	0.0%	84	1598	5.3%

All Positives Possible administered 95 test kits including 4,384 contaminant results, which identified no MCL exceedances in the community. Four samples tested by All Positives Possible showed the presence of total coliform, but none found E. coli to be present. However, more than five percent (84) of the individual test results for contaminants with PHGs exceeded these goals. There was one exceedance of the PHG for arsenic in Vallejo, and 20 or more PHG exceedances each for the disinfection byproducts bromodichloromethane, dibromochloromethane, and chloroform. All Positives Possible was one of three outreach partners to conduct testing for PFAS, and only one type of PFAS was present in five test samples. All five test results for perfluorooctanoic acid were below the proposed notification level of 0.0051 ppb.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
CCRCD	11	627	0	234	0.0%	13	229	5.7%

The **Contra Costa Resource Conservation District** administered 11 test kits in Pittsburg, including 627 individual contaminant tests, which identified no MCL exceedances in the community. However, 5.7% (13) of the 229 tests for contaminants with PHGs exceeded them. There was one PHG

[9] See https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

exceedance each for lead, nickel, and uranium, and two PHG exceedances each for the following contaminants: aluminum as well as the disinfection byproducts bromodichloromethane, bromoform, chloroform, and dibromochloromethane. There was no testing conducted for, and thus results on, the presence of total coliform or E. coli, nor did CCRCD test for PFAS chemicals.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
CIEA	70	4,397	7	1,671	0.4%	75	1,658	4.5%

The **California Indian Environmental Alliance** administered 70 test kits, including 4,397 individual contaminant tests. Uniquely among outreach partners, these tests were carried out at home and facility locations throughout the Bay Area. This testing uncovered seven MCL exceedances—three for arsenic, two for lead, one for nitrite, and one for total THMs (trihalomethanes). The nitrite MCL exceedance was found on a sample taken from a private well. Two of the arsenic exceedances were from samples taken at the same location and are suspected to be well water. The two exceedances for lead were from samples taken at the same location.

With respect to PHGs, more than four percent (75) of contaminant tests with associated PHGs exceeded the target levels. The majority of PHG exceedances were for bromodichloromethane (18), chloroform (18), arsenic (14), dibromochloromethane (seven), and lead (six). Fewer than five PHG exceedances were found for each of the following contaminants: aluminum, cadmium, copper, fluoride, nickel, nitrite, and uranium. CIEA did not test for PFAS chemicals.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
FGEHED	62	3,752	2	1,317	0.2%	56	1,316	4.3%

First Generation Environmental Health and Economic Development outreach partner administered 62 test kits in San Francisco, including 3,752 individual contaminant tests, and found two MCL exceedances for Gross Alpha Activity. There was one test that detected the presence of total coliform, but there were no positive tests for E. coli presence. FGEHED also did limited testing for PFAS chemicals, but no results were above zero. Regarding PHGs, 56 of the 1,316 tests (4.3%) with applicable goals uncovered exceedances. Most of these exceedances were due to just two disinfection byproduct contaminants, bromodichloromethane and chloroform, with 27 exceedances each. FGEHED also found one PHG exceedance for arsenic and one for lead.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
ISPSA	7	513	0	199	0.0%	7	201	3.5%

David R. Brower, Ronald V. Dellums Institute for Sustainable Policy Studies and Action administered seven test kits, including 513 tests for individual contaminants, in Oakland. These tests revealed no MCL exceedances, and no tests were conducted for E. coli, total coliform, or PFAS. ISPSA found seven PHG exceedances out of the 201 tests with applicable PHGs (3.5%). Most of these exceedances were for the disinfection byproducts bromodichloromethane and chloroform (three each) PHGs, and the remaining PHG exceedance was found for dibromochloromethane.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% Exceeding MCL standard	PHG Exceedances	Tests with existing PHG standard	% exceeding PHG standard
MCCRHJ	63	3,305	0	1,189	0.0%	75	1,175	6.4%

Marin City Climate Resilience and Health Justice administered 63 test kits, including 3,305 individual contaminant tests, throughout Sausalito and Marin City. This testing uncovered no MCL exceedances but did find the presence of total coliform in six of the 16 kits that included this kind of testing (no E. coli was detected). MCCRHJ also did limited testing for PFAS, but had no results yield any trace of the chemicals. With respect to PHGs, more than six percent (75 of 1,175) of contaminant tests with associated PHGs exceeded their goals. The majority of PHG exceedances were due to the disinfection byproducts bromodichloromethane (25), chloroform (25), and dibromochloromethane (24). There was also one nickel PHG exceedance.

Photo courtesy: Nuestra Casa de East Palo Alto

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
META LLC	74	4,899	1	1,880	0.1%	121	1,878	6.4%

META LLC administered 74 test kits with 4,899 tests for individual contaminants in San Jose. META LLC found one MCL exceedance for nitrate, with a test value of 830 ppm (well above the MCL target of 10 ppm). No testing was performed for E. coli, total coliform, or PFAS. The outreach partner did identify 121 PHG exceedances (6.4% of 1,878 tests with applicable PHGs), most of which were for the disinfection byproducts bromodichloromethane, chloroform, dibromochloromethane, and bromoform, as well as arsenic (19, 19, 19, 18, and 15, respectively). There were also 12 PHG exceedances for uranium, while there were six or fewer exceedances each for copper, lead, cadmium, antimony, nitrate, and nickel.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
MCCM	78	4,750	0	1,799	0.0%	72	1,778	4.0%

Multicultural Center of Marin administered 78 test kits with 4,750 tests for individual contaminants in San Rafael. The results of the testing identified no MCL exceedances. No tests were conducted for E. coli, total coliform, or PFAS. MC Marin did identify 72 PHG exceedances (4% of 1,778 tests with applicable PHGs), most of which were for the disinfection byproducts bromodichloromethane, chloroform, and dibromochloromethane (18, 18, and 17, respectively). There were also eight PHG exceedances for arsenic, seven for bromoform, three for lead, and one for nickel.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
Nuestra Casa	46	4,343	0	1,762	0.0%	72	1,833	3.9%

Nuestra Casa conducted their testing in East Palo Alto and found no MCL exceedances among the 1,762 tests for individual contaminants (46 tests kits) for which MCL standards exist. Among 4,343 individual tests for contaminants, less than four percent (72) had PHG exceedances among 1,833 tests with relevant public health goals. The outreach partner did not test for E. coli, total coliform, or PFAS. Nuestra Casa found 32 PHG exceedances each for the disinfection byproducts bromodichloromethane and chloroform. There were also five PHG exceedances for bromoform, one for dibromochloromethane, one for lead, and one for uranium.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
FOSC	10	445	0	160	0.0%	8	150	5.3%

Friends of Sausal Creek administered 10 test kits in Oakland, including 445 individual contaminant tests, which yielded no results with MCL exceedances in the community. There was no testing conducted for the presence of total coliform, E. coli, or PFAS chemicals. However, 5.3% (eight) of the 150 tests for contaminants with public health goals exceeded them. All of the PHG exceedances that Sausal Creek identified were for metals, including four for arsenic, three for lead, and one for cadmium.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
SEC	16	1,254	0	489	0.0%	32	497	6.4%

The **Sonoma Ecology Center** partner conducted 1,254 individual contaminant tests (16 test kits) in both Glen Ellen and Sonoma. These tests yielded no MCL exceedances in the community, however one kit conducted additional coliform testing and found the presence of total coliform (no E. coli was detected). Among the 497 test results for contaminants with PHGs, 32 (6.4%) exceeded the goals, with the most notable results for traces of disinfection byproducts. Dibromochloromethane tests had eight exceedances, with seven exceedances each for bromodichloromethane and chloroform. There were also six PHG exceedances for bromoform and four for arsenic. Sonoma Ecology Center did not test for PFAS.

Outreach partner	Test kits	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
TWP	23	1,627	0	629	0.0%	25	633	3.9%

The Watershed Project administered 23 water quality test kits in the Richmond, Berkley, and Lafayette areas (1,627 individual contaminant tests). No MCL exceedances were found. The Watershed Project did not test for the presence of total coliform, E. coli, or PFAS chemicals. Regarding public health goals (PHGs), 25 test results exceeded the standards (3.9% of tests for contaminants that have PHGs), all of which were found in Richmond. The greatest number of PHG exceedances were for the disinfection byproducts bromodichloromethane (nine), chloroform (nine), and dibromochloromethane (four). There were also two tests identifying PHG arsenic exceedances and one lead exceedance.

MCL Exceedances: Regional Overview

As shown in Table 2, only 10 MCL exceedances were discovered across the 12,895 tests on individual analytes where an MCL standard could serve a comparison point. Given there are so few exceedances, we provide further detail on each MCL occurrence, including follow-up information, in the Appendix to this chapter. Each of these exceedances were found within the samples collected by three outreach partners. In other words, nine of the 12 partners did not receive any quality test results back that exceed regulated, MCL standards.

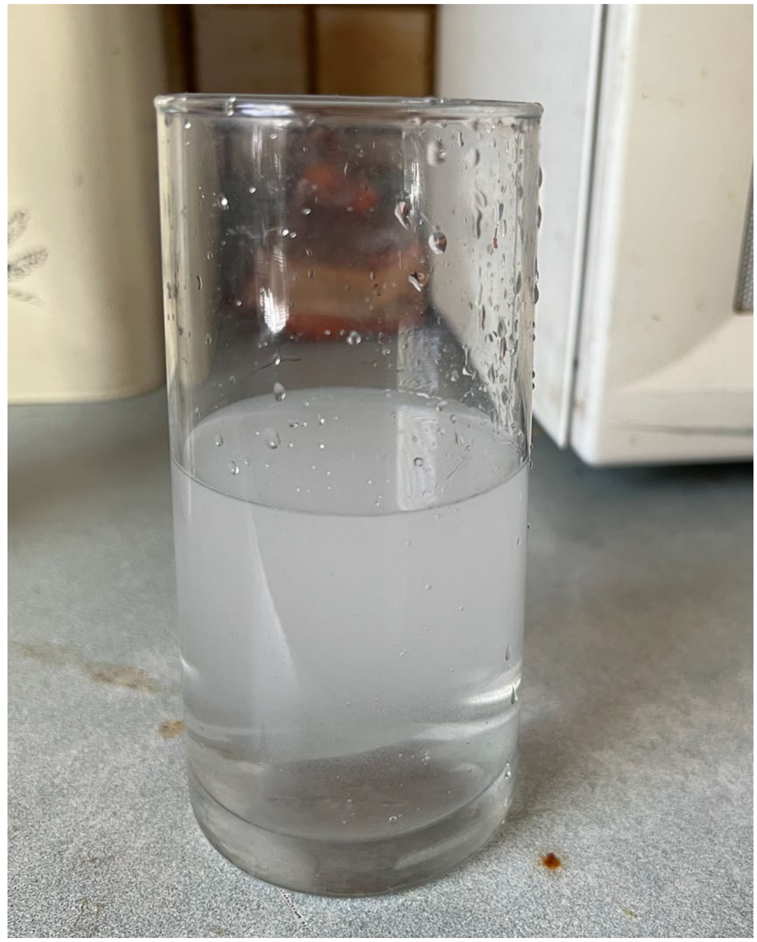

Photo courtesy: Nuestra Casa de East Palo Alto

Table 2: ***Summary of Tap Water Testing Results by Project Partner***

Outreach partner	Test kits*	Tests for individual contaminants	MCL exceedances	Tests with existing MCL standard	% exceeding MCL standard	PHG exceedances	Tests with existing PHG standard	% exceeding PHG standard
APP	95	4,384	0	1,566	0.0%	84	1,598	5.3%
CCRCD	11	627	0	234	0.0%	13	229	5.7%
CIEA	70	4,397	7	1,671	0.4%	75	1,658	4.5%
FGEHED	62	3,752	2	1,317	0.2%	56	1,316	4.3%
ISPSA	7	513	0	199	0.0%	7	201	3.5%
MCCRHJ	63	3,305	0	1,189	0.0%	75	1,175	6.4%
META LLC	74	4,899	1	1,880	0.1%	121	1,878	6.4%
MCCM	78	4,750	0	1,799	0.0%	72	1,778	4.0%
Nuestra Casa	46	4,343	0	1,762	0.0%	72	1,833	3.9%
FOSC	10	445	0	160	0.0%	8	150	5.3%
SEC	16	1,254	0	489	0.0%	32	497	6.4%
TWP	23	1,627	0	629	0.0%	25	633	3.9%
Grand total	**555**	**34,296**	**10**	**12,895**	**NA**	**640**	**12,946**	**NA**
Average	**46**	**2,858**	**0.8**	**1,075**	**0.1%**	**53.3**	**1,078.8**	**4.9%**

Moreover, certain contaminants of concern, including Total Coliform Residual, do not have an MCL which can be applied to a single sample but do have binding regulatory standards of interest. In the case of coliform, the standard is the Revised Total Coliform Rule. Accordingly, we analyze these separately where five outreach partners commissioned TCR and E. coli tests.[10] As shown below, no samples which were tested for E. coli came back positive, whereas 12 of 52 (23%) samples taken indicated the presence of total coliform. Of particular concern were the six of 16 samples taken in Marin City, as well as the four of 28 samples taken in the Richmond area, which came back with results indicating total coliform presence. These results were discussed with the outreach partners, local water systems, and elected officials. A full breakdown of test numbers by outreach partner is provided in Table 3, below. It should be noted that positive results for total coliform do not point to the source of the problems. Due to the well-documented, ubiquitous nature of coliforms in our natural and built environments, coliforms detected could be the result of improper handling of sampling equipment, exposure of sampling equipment to coliforms in the air, faucet contamination, issues with the private or public distribution system, or improper disinfection at treatment plants. Synchronized testing at the tap and at the nearest testing point in the distribution system would provide more data on vulnerabilities of tap water infrastructure to coliform.

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[10] See https://www.epa.gov/dwreginfo/revised-total-coliform-rule-and-total-coliform-rule.

*Table 3: **Breakdown of Coliform Tests Conducted by the Program***

Outreach partner	Kits testing coliform measures	Present/Absent
APP	28	
E. coli		0
Total coliform		4
CIEA	1	
E. coli		0
Total coliform		0
FGEHED	6	
E. coli		0
Total coliform		1
MCCRHJ	16	
E. coli		0
Total coliform		6
SEC	1	
E. coli		0
Total coliform		1
Total	**52**	**12**

Table 4 contains a further breakdown of where tests for certain contaminants exceeded an MCL, as well as where tests were within 80% of the MCL standard but below 100%. The reason for the inclusion of the 80% threshold for comparison is that levels of contamination between 80–100% may indicate an increasing trend of water quality contamination toward an MCL, especially those attributable to anthropogenic causes. This risk indicator has been used in the California State Water Board's Drinking Water Needs Assessment (CA Water Board, 2021). In addition to the 10 exceedances of MCLs and the 12 positive total coliform detections reported in the tests results from samples submitted by outreach partners, we identified four test results that were at or within 80% of the maximum contaminant level standard. Thus, while the 80% threshold can be used as a drinking water quality risk factor, it did not materialize as a relevant secondary threshold of concern in our effort.

*Table 4: **MCL Exceedances With 80% Risk Threshold Exceedances***

Contaminant	Tests*	MCL exceedances	Within 80% of but not exceeding an MCL
Disinfection byproducts**	**288**	**1**	**3**
Haloacetic acids (total)	78	0	1
Total THMs	210	1	2
Inorganic chemicals***	**6,437**	**7**	**1**
Aluminum	415	0	0
Antimony	415	0	0
Arsenic	415	3	1
Barium	415	0	0
Beryllium	415	0	0
Cadmium	415	0	0
Chromium (total)	415	0	0
Copper	415	0	0
Fluoride	415	0	0
Lead	415	2	0
Mercury	415	0	0
Nickel	415	0	0
Nitrate (as N)	415	1	0
Nitrite (as N)	212	1	0
Selenium	415	0	0
Thallium	415	0	0
Organic chemicals	**5,669**	**0**	**0**
Radionuclides	**501**	**2**	**0**
Gross Alpha Activity	86	2	0
Uranium	415	0	0
Total	**12,895**	**10**	**4**

*Number of tests for contaminants with an MCL

**There are no PHGs for disinfection byproducts

***A state MCL exists for aluminum and nickel but not a federal MCL

Describing the 10 Maximum Contaminant Level (MCL) Exceedances in Detail

There were two exceedances of the Gross Alpha Activity (GAA) MCL standard of 15 pCi/L reported by FGEHED in San Francisco, CA, 94124. One test measured GAA at 68.3 pCi/L (test kit 5RFBSY), and the other measured a level of 24.2 pCi/L (test kit KCFHZ2). GAA levels were sampled on 27 other occasions by FGEHED, with zero GAA detected on 25 occasions. (The other two GAA results of 10.5 and 6.98 pCi/L did not approach 80% of the MCL standard). There is no PHG for Gross Alpha Activity.

There was one exceedance of the total THMs MCL standard of 80 ppb reported by the CIEA from a sample taken in Napa, CA, 94558. The test in this location measured total THMs at 90.5 ppb (test kit 47LELY). Three other tests at this location measured total THM levels of 35.8 ppb, 36.5 ppb, and 65.77 ppb. Though the level of 65.77 ppb from test kit 7XCHE5 does not exceed the MCL standard, it is above 80% of the MCL standard (82.2% of the 80 ppb MCL for total THMs). In addition, CIEA reported a total THM level of 64.1 in Vallejo, CA (test kit 2NEKNP), which is also above 80% of the MCL for that contaminant. There is no PHG for total THMs.

An exceedance of the nitrate MCL standard of 10 ppm was reported by META LLC in San Jose, CA, 95127. The test in this location measured a nitrate level of 830 ppm (test kit KAYFF5). Nitrate levels were sampled on 73 other occasions in the San Jose area by META LLC, and no other result came close to 80% of the MCL standard. The PHG for nitrate levels is the same as the MCL standard.

There was one exceedance of the nitrite MCL standard of 1 ppm reported by CIEA from a private well in St. Helena, CA, 94574. The test in this location measured a nitrite level of 1.8 ppm (test kit X6DYW8). Nitrite levels were sampled on 20 other occasions by META LLC, and the only other non-zero result was 0.2 ppm, far from 80% of the MCL standard. The five other test values indicating any level of nitrite remained at or below 0.2 ppm across all outreach partners. The PHG for nitrite levels is also 1 ppm.

The MCL for lead is 0.015 ppm, and 43 tests across all outreach partners detected lead levels above 0 ppm. Two of these tests found exceedances of the lead MCL, but none of the other 41 test values came close to the MCL standard. However, half (22) of the tests detecting any lead levels above zero uncovered exceedances of the PHG, which is set considerably lower at 0.0002 ppm. The two MCL exceedances for lead were reported by CIEA and both occurred in El Cerrito, CA, 94530. One test measured lead at 0.073 ppm (test kit LGEET2), and the other measured a level of 0.043 ppm (test kit LQC2RX).

The MCL standard for arsenic, 0.01 ppm, is much higher than the PHG of 0.000004 ppm. Therefore, all 49 non-zero test values for arsenic exceed the PHG for this contaminant. Three test values exceeded the MCL, all of which were reported by CIEA. In El Sobrante, CA, one test detected an arsenic level of 0.024 ppm (test kit 2XC3MK), and another detected a level of 0.089 ppm (BW7GFN). The third MCL exceedance of 0.011 ppm (test kit 4ST42Q) was found in Rohnert Park, CA, 94928. One test value approached but did not exceed the MCL standard; Sonoma Ecology Center reported an arsenic level of 0.0084 ppm in Sonoma, CA, 95476.

Seven of the 10 maximum contaminant level exceedances (one for nitrate, one for nitrite, one for total THMs, two for Gross Alpha Activity, two for lead, and three for arsenic) were found through testing performed by CIEA throughout the Santa Rosa area and San Francisco Bay Area.

In addition to 10 exceedances of MCLs reported by outreach partners, there were four test results that were at or within 80% of the maximum contaminant level standard (total THMs and arsenic results described above). The fourth test value approaching the MCL standard found a total haloacetic acid level of 0.051 ppm, quite close to the MCL of 0.06 ppm and well above the PHG of 0 ppm.

PHG Results Breakdown

The results for PHG exceedances are shown below, in Table 5, by outreach partner and contaminant category type. There were 640 PHG exceedances in total, with the number by partner ranging from seven to 121, and an average per partner of 53. About 45% of all test kits, 252 kits in total, had individual test results with at least one PHG exceedance. This level of prevalence contrasts with the level of MCL prevalence identified above and is not isolated to certain communities. PHG exceedances were found to occur in about 5% of all tests where a PHG standard existed and were also consistently reported at a rate between 3–6% of tests in each community.

*Table 5: **PHG Exceedances by Type and Outreach Partner***

Outreach partner	Inorganic chemicals	Organic chemicals	Radionuclides	Total PHG exceedances
APP	1	83	0	84
CCRCD	4	8	1	13
CIEA	30	43	2	75
FGEHED	2	54	0	56
ISPSA	0	7	0	7
MCCRHJ	1	74	0	75
META LLC	34	75	12	121
MCCM	12	60	0	72
Nuestra Casa	1	70	1	72
FOSC	8	NA	0	8
SEC	4	28	0	32
TWP	3	22	0	25
Total	**100**	**524**	**16**	**640**
Average	**8**	**48**	**1**	**53**

Given their generally much stricter thresholds, it is not necessarily surprising that PHG exceedances are much more common than MCL exceedances. As previously mentioned, PHGs represent goals that California's public water systems should strive to achieve if feasible. In the absence of public subsidies, achieving PHGs in these instances would likely mean substantially higher water rates imposed by systems to pay for the additional testing and treatment technology required. Higher water rates could in turn greatly affect many residents of Disadvantaged Communities who can ill afford additional water bill expenses.

However, several trends in PHG exceedance clearly merited further investigation. In particular, five outreach partners had 10% or more of their samples exceed the PHG standard among the organic chemicals category class as presented in Table 6. Higher levels of organic chemicals are most commonly caused by agricultural, industrial, and commercial production applications, as well as by disinfection byproducts. The organic chemicals PHG exceedances observed in these five outreach partner tests appear exclusively due to the presence of four different, but similar disinfection byproducts. Chloroform and the three other THMs found to exceed PHG levels at high rates—bromodichloromethane, dibromochloromethane, and bromoform—are disinfection byproducts commonly produced when chlorinated water interacts with organic substances, including bacteria that chlorine is intended to eliminate (Ivahnenko & Zogorski, 2006). Moreover, one outreach partner (Meta LLC) had a particularly high exceedance rate for PHGs in the radionuclide category, and

CCRCD also had a relatively high rate of PHG exceedance. Radionuclides most commonly derive naturally from the soil, and in this case, uranium was the radionuclide contaminant found in each PHG exceedance case.

*Table 6: **Total Tests with PHGs to Compare Against, the Number of Tests Exceeded, and the Prevalence of PHG Exceedances by Contaminant and Outreach Partner***

Outreach partner	Tests for individual contaminants	PHG exceedances	% with exceedance
All positives possible	**1,598**	**84**	**5%**
Inorganic chemicals	510	1	0%
Organic chemicals	1,054	83	8%
Radionuclides	34	0	0%
CCRCD	**229**	**13**	**6%**
Inorganic chemicals	156	4	3%
Organic chemicals	62	8	13%
Radionuclides	11	1	9%
CIEA	**1,658**	**75**	**5%**
Inorganic chemicals	1,000	30	3%
Organic chemicals	588	43	7%
Radionuclides	70	2	3%
FGEHED	**1,316**	**56**	**4%**
Inorganic chemicals	420	2	0%
Organic chemicals	868	54	6%
Radionuclides	28	0	0%
ISPSA	**201**	**7**	**3%**
Inorganic chemicals	101	0	0%
Organic chemicals	93	7	8%
Radionuclides	7	0	0%
MCCRHJ	**1,175**	**75**	**6%**
Inorganic chemicals	375	1	0%
Organic chemicals	775	74	10%
Radionuclides	25	0	0%
META LLC	**1,878**	**121**	**6%**
Inorganic chemicals	1,060	34	3%
Organic chemicals	744	75	10%
Radionuclides	74	12	16%
MCCM	**1,778**	**72**	**4%**

Inorganic chemicals	1,111	12	1%
Organic chemicals	589	60	10%
Radionuclides	78	0	0%
Nuestra Casa	**1,833**	**72**	**4%**
Inorganic chemicals	585	1	0%
Organic chemicals	1,209	70	6%
Radionuclides	39	1	3%
FOSC	**150**	**8**	**5%**
Inorganic chemicals	140	8	6%
Radionuclides	10	0	0%
SEC	**497**	**32**	**6%**
Inorganic chemicals	233	4	2%
Organic chemicals	248	28	11%
Radionuclides	16	0	0%
TWP	**633**	**25**	**4%**
Inorganic chemicals	331	3	1%
Organic chemicals	279	22	8%
Radionuclides	23	0	0%
Total	**12,946**	**640**	**5%**
Outreach partner average	**1,079**	**53**	**5%**

*Only shown for contaminants with existing PHGs
**Bromoform, chloroform, dibromochloromethane, and bromodichloromethane have PHGs but not MCLs

To further examine local areas of concern within outreach partner geographic boundaries, we also looked at concentrated PHG exceedances at the zip code level. Table 7 shows the top 10 zip codes with the highest percentage of PHG exceedances. The zip codes with the highest levels were found in Oakland, which exceeded 16% of all samples, and several others in Redwood City, San Jose, and Walnut Creek, served by the outreach partner CIEA, also exceeded 10%.

Table 7: ***Top 10 Zip Codes with the Most PHG Exceedances***

Zip	PHG exceedances	Contaminants tested*	% of tests exceeding PHG	City	Outreach partner
94602	5	30	16.7%	Oakland	FOSC
94061	2	15	13.3%	Redwood City	CIEA
94088	2	15	13.3%	San Jose	CIEA
94597	2	15	13.3%	Walnut Creek	CIEA
94618	2	15	13.3%	Oakland	FOSC
95111	2	15	13.3%	San Jose	CIEA
95132	4	47	8.5%	San Jose	META
94803	11	139	7.9%	El Sobrante	CIEA
95127	34	436	7.8%	San Jose	META
94558	16	217	7.4%	Napa	CIEA

Beyond the zip code level, we also identified the individual sample kits with several PHG exceedances. At the individual testing kit level, 120 kits had three or more contaminants exceeding PHG. However, only three kits had five or more contaminants exceeding a PHG (see Appendix table). Two of these results were reported by CIEA (in El Sobrante and Napa, respectively) whereas one was reported by CCRCD in Pittsburg.

Aesthetic (Secondary MCL) Effects Analysis

As discussed throughout this report, distrust of tap water often stems from factors which cause noticeable aesthetic effects: discoloration or foaminess, taste, and smell. Accordingly, we further singled out tests for constituents which fall under the EPA's Secondary MCL Drinking Water Standards for "nuisance chemicals" because they are commonly associated with aesthetic impacts which contribute to distrust, but not necessarily primary health impacts (see Table 8). Four of the 15 constituents identified by the EPA as advisable secondary standards were not available for testing in SimpleLab's capacity (see peach-colored rows in Table 8 below), so we focus on results for the 11 remaining constituents of potential concern.

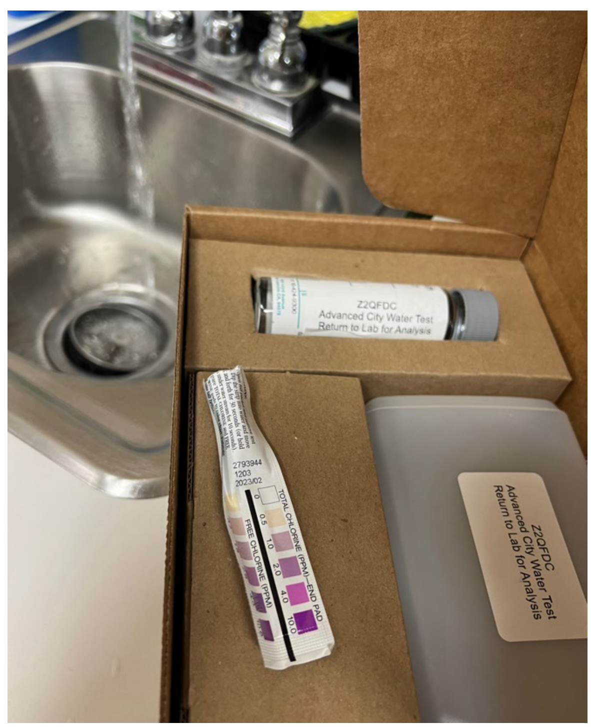


Photo courtesy: Nuestra Casa de East Palo Alto

Table 8: ***Table of Secondary Drinking Water Standards Which Present Potential Aesthetic Concern. From "Secondary Drinking Water Standards: Guidance for Nuisance Chemicals,"*** ***https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals#table-of-secondary.***

Contaminant	Secondary MCL	Noticeable effects above the secondary MCL
Aluminum	0.05 to 0.2 mg/L	colored water
Chloride	250 mg/L	salty taste
Color	15 color units	visible tint
Copper	1.0 mg/L	metallic taste; blue-green staining
Corrosivity	Non-corrosive	metallic taste; corroded pipes/fixtures staining
Fluoride	2.0 mg/L	tooth discoloration
Foaming agents	0.5 mg/L	frothy, cloudy; bitter taste; odor
Iron	0.3 mg/L	Rusty brown, orange-red color; sediment; metallic taste; reddish or orange staining
Manganese	0.05 mg/L OR 0.02 mg/L	black to brown color; black staining; bitter metallic taste
Odor	3 TON (threshold odor number)	"rotten-egg," musty, or chemical smell
pH	6.5 - 8.5	low pH: bitter, metallic taste; corrosion high pH: slippery feel; soda taste; visible deposits
Silver	0.1 mg/L	skin discoloration; graying of the white part of the eye
Sulfate	250 mg/L	salty taste
Total Dissolved Solids (TDS)	500 mg/L	hardness; deposits; colored water; staining; salty taste
Zinc	5 mg/L	metallic taste

In our data, there are 4,565 testing records measuring secondary drinking water contaminants, with 415 test kits measuring each of the 11 contaminants. Community partners in San Jose and San Rafael ran the most tests for these contaminants (78 each). A full breakdown of test numbers by outreach partner is provided in the Appendix.

Overall, as shown in Table 9 below, 1.9% of all tests with relevant secondary standards exceed those standards. The maximum secondary standard exceedance rate is observed for aluminum (6.3%), likely to be experienced in the form of discoloration. The second highest exceedance rate was for pH (5.8%), which is likely to cause bad taste and visible effects. On the other hand, six of the 11 aesthetic constituents do not ever exceed the relevant secondary standard. In short, secondary standard exceedance is much more common than primary MCL standard exceedance, but only about 40% as prevalent where tested for as PHG exceedances in the tests taken as part of this effort.

*Table 9: **Exceedances of Secondary Drinking Water Standards***

Contaminant	MCL standard exceedance	PHG standard exceedance	Secondary standard exceedance	Within 80% of secondary standard	Total tests	% exceeding secondary standard
Aluminum	0	3	26	26	415	6.3%
Chloride	—	—	0	0	415	0.0%
Copper	0	8	0	0	415	0.0%
Fluoride	0	1	0	0	415	0.0%
Iron	—	—	14	15	415	3.4%
Manganese	—	—	15	20	415	3.6%
pH	—	—	24	—	415	5.8%
Silver	—	—	0	0	415	0.0%
Sulfate	—	—	0	0	415	0.0%
Total Dissolved Solids	—	—	10	31	415	2.4%
Zinc	—	—	0	0	415	0.0%
Grand Total	**0**	**12**	**89**	**92**	**4,565**	**1.9%**

As shown in Table 9, there is additional inconsistency in the overlap between the presence and the exceedance of primary MCL and PHG standards for those contaminants which also have secondary MCL standards. Three of the contaminants have thresholds for all three types of standards whereas the other eight have none. In the case of aluminum, secondary standard exceedance is much more common than PHG exceedance, whereas in the case of copper and fluoride, PHG exceedances are incurred where secondary standards are not.

We also note that manganese has an existing secondary MCL standard of 0.5-mg/L, but the State Water Board is currently proposing lowering both the notification and response levels for this contaminant to 0.2-mg/L based on new toxicological evidence about potential adverse health effects (CA Water Board, 2023). This example is particularly of interest given the prevalence of manganese in drinking water in urban areas and also illustrates that both regulatory standards and guidance are subject to change over time (Glickfeld et al., 2021). Nowhere is this change more likely to be the case than with respect to per- and polyfluoroalkyl substances (PFAS) in drinking water.

PFAS Analysis

Finally, three outreach partners expressed particular interest in and accordingly devoted some of their sampling and water quality testing budget to detection of per- and polyfluoroalkyl substances (PFAS), which have grown dramatically in both regulatory and broader public concern in very recent years. PFAS are a group of more than 12,000 human-made substances that are not naturally occurring and are resistant to heat, water, and oil, and can enter the human body through several pathways including water. PFAS are popularly known as “forever chemicals,” and have drawn great public concern recently regarding their toxicity at relatively low levels.[11]

As of the writing of this report, while numerous water systems are voluntarily testing and some states are already requiring testing for PFAS in drinking water, California and the federal government have yet to enshrine mandatory MCL or PHG levels for various PFAS. California does have tentative regulatory standards which are similar in some ways to MCL and PHG standards, characterized as “response” and “notification” levels respectively. However, even these standards only exist for 4 of the 14 PFAS chemicals which were tested for in this effort (see Table 10). The 70 samples that were tested for PFAS resulted in 980 data points, only 1.7% (17/980) of which had any detections above zero. Most importantly, in all 70 samples taken and tested for various PFAS, none exceeded any response or even notification level, and only six of 280 samples across the four chemicals with proposed standards had any detection above zero. The only PFAS chemical not included below that was tested for and had detections above zero was Perfluorohexanoic acid. About 15.7% of samples (11/70) had detections with test values ranging from 0.0017ppb to 0.003ppb.

*Table 10: **PFAS Test Results by Outreach Partner***

	Test counts			
Test values (ppb*)	**Perfluorobutane sulfonate** (Proposed notification level 0.50 ppb)**	**Perfluorohexane sulfonic acid (Proposed notification level 0.003 ppb)**	**Perfluorooctane sulfonic acid (Proposed notification level 0.0065 ppb)**	**Perfluorooctanoic acid (Proposed notification level 0.0051 ppb)**
APP				
0	28	28	28	22
0.0022				1
0.0023				3
0.0024				1
0.0033				1
FGEHED				
0	27	27	27	27
MCCRHJ				
0	15	15	15	15
Total tests	**70**	**70**	**70**	**70**

*CA Water Board notification levels are presented in ppt (1 ppt = 0.001 ppb)

**Reported together with and is equivalent to Perfluorobutane sulfonic acid

[11] For instance, see https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/pfas.html#:~:text=As%20of%20August%202022%2C%20there,the%20Division%20of%20Drinking%20Water.

Resident Survey Summary Results

As detailed in the *Research and Goal Setting* section, after consideration of various options, a voluntary survey was designed to capture resident experiences at the tap alongside and simultaneously deployed with the tap water sample collection. The survey design was aimed to collect information on tap water experiences and perceptions, as well as socioeconomic and housing characteristics, to help support a more holistic understanding of factors associated with tap trust in the context of the scholarly literature and to contextualize the relationship between quantitative test results and self-reported experiences at the tap. The full survey instrument deployed can be viewed in the Appendix.

Only three community partners conducted the survey, and none did so systematically among their participating residents, resulting in only 104 valid surveys obtained versus 555 testing kits. CIEA was the most comprehensive in conducting surveys alongside quality sampling, achieving this for 59 of 70 samples as shown in Table 11.

*Table 21: **Number of Surveys Conducted by Each Outreach Partner***

Outreach partners	Surveys conducted
CIEA	59
FOSC	9
MCCM	36
Total surveys	**104**

In short, participation in tap testing was a convenience sample of self-selected individuals and a non-random process whereby residents of local communities, presumably most concerned with tap quality, were most likely to participate. Moreover, participation in the survey component among the tap-sampled population was also non-random. Finally, there was significant non-response on certain survey questions, or inconsistent recording of responses by different outreach partners who conducted the surveys, which may introduce bias. Accordingly, we note that it is necessary to use caution in drawing correspondence between survey results and quantitative testing results or resident socioeconomic characteristics.

That being said, we present some results of the survey briefly below, with Table 12 illustrating summary characteristics by race, ethnicity, and Tribal group status. We note that in some cases, respondents were allowed to make non-exclusive responses, leading to percentage reporting exceeding 100%. This was the case for responses on race, ethnicity, and Tribal group status (which was particularly high given the survey effort conducted by CIEA). Thus, we rely on raw respondent number reporting in most cases.

*Table 32: **Summary of Experimental Survey Results Taken Before Collecting Water Samples for Testing***

	Count of Native American*	Count of White*	Count of Hispanic/ Latina/o/Latinx*	Count of Black*	Count of Asian*	Count of Pacific Islander*	Subtotal
Household income							
Above $71,229	12	9	5	2	1	1	30
Between $42,737 and $56,982	11	5	8	4	3	5	36
Between $56,983 and $71,228	10	5	5	2		1	23
Less than $42,737	20	10	40	6	5	8	89
No household income for another reason	4	2	3	2		1	12
Rent or own home							
Own	17	11	9	2	2	3	44
Rent	25	11	44	5	1	6	92
No response	15	9	8	9	6	7	54
Primary drinking water source							
Bottled water or other non-tap water sources	23	13	11	9	7	6	69
Filtered tap water	19	9	10	2	1	5	46
Unfiltered tap water	15	9	24	5	1	5	59
No response	0	0	16	0	0	0	16
Total count of race/ethnicity response selected	**57**	**31**	**61**	**16**	**9**	**16**	**190**
% race/ethnicity out of 104 respondents*	**54.8%**	**29.8%**	**58.7%**	**15.4%**	**8.7%**	**15.4%**	

The clearest result of the survey in terms of water perception is that survey respondents experienced aesthetic deficiencies in the water coming out of their taps frequently and across a number of dimensions. Discoloration was the most commonly reported issue. Table 13 below shows self-reported discoloration experiences, with most respondents reporting they experienced sedimentation and some form of discoloration most days. In contrast, different types of particular coloration impacts were less frequent.

*Table 13: **Water Quality Results Related to Secondary MCL Exceedances as Related to Experiential Survey Responses, All Outreach Partners***

Average days in past 2 weeks:	Sediment or larger deposits	Other color staining	Blue-green staining	Corroded	Dark black staining	Other color or tinted	Rusty brown, orange-reddish color	Frothy or cloudy water	Brownish-black color
No sec exceed	3.86	4.86	4.29	3.89	3.88	1.85	1.68	4.32	1.33
Any sec exceed	6.25	7.40	2.00	6.89	1.00	4.00	5.70	6.67	1.25
Overall avg	4.58	5.53	3.62	4.86	3.04	2.52	2.83	4.88	1.31

On the other hand, while the sample sizes are small, we find no apparent statistical relationship among residents who participated in the sampling campaign's propensity to take the survey and the likelihood that these same residents had tap test results come back with a higher likelihood of primary MCLs, PHGs, or secondary MCL exceedances. In other words, participation in the survey among the tested population does not seem related to differences in observed water quality.

Survey respondents were asked whether they relied on unfiltered tap water, filtered tap water, or bottled water for their primary drinking source. While differences are again not statistically significant due to small sample sizes, we find relatively higher reliance on unfiltered tap water among relatively lower-income residents who took the survey (50% of households reporting incomes less than $42,737). Similarly, the proportion of the survey respondents renting rather than owning their place of residence was high, and we found higher reliance on unfiltered tap water among renters (44%) than owners (30%).

These findings contrast with general expectations given the literature showing higher levels of tap water distrust among lower-income and renter households. Although again, our survey sample overall was lower-income and more likely to rent than the general population, which is unsurprising given the program was focused on Disadvantaged Communities and represents a non-random sample of the resident group participating in testing.

The survey further asked reasons why some households consider not using their tap water as their primary source of drinking water, as shown in Table 14 below. Among valid responses, just less than half indicated that the safety of water coming out of their current tap was the driver of non-tap reliance, whereas 25% indicated they do not trust tap water in any circumstances. About 15% indicated they don't primarily drink from the tap based on preferences or aesthetics.

*Table 14: **Tap Water Quality Experiential Survey Results Related to Tap Water Trust***

Primary source?	Response count
I don’t drink my tap water because I prefer alternate drinking water sources OR I don’t like the taste of my tap water	9
I don’t trust any tap water	15
I don’t trust my tap water because I am concerned about the safety of drinking it	26
I don’t trust my tap water for another reason	9
T I don’t trust my tap water because I received official notice of poor water quality.	1
No response	28
Grand Total	**88**

Finally, survey respondents were asked to consider a scenario in which their water quality improves and still costs less than buying bottled water and whether they would use tap or bottled water. There were few responses (less than 25) to this question. However, valid responses were relatively evenly split between those who said they would definitely use tap water, those who were uncertain, and those who would definitely not use tap water regardless.

Consistent with the above analysis, it thus appears there is both a significant portion of individuals in Disadvantaged Communities reporting distrust and non-tap reliance that could be addressed by improving quality affordably, as well as a significant portion who would not trust or use tap water regardless of quality upgrades or price differences. Meanwhile, another segment of the population currently not relying on the tap are more nuanced and sensitive to quality and price changes that would influence their relative trust and use of tap water.

V Qualitative Lessons Learned for Future Testing Programs

Over the course of program implementation, both expected and unexpected challenges arose, and many lessons were learned which informed changes in direction during rollout. In this section, we distill 11 key lessons learned from the TWQ testing process from the perspective of the program team. We then summarize important considerations to help inform and streamline future efforts. We order lessons learned below based on their timing with respect to the sequence program design and implementation. We also note that lessons learned are interdependent and cannot necessarily be ranked in terms of importance.

Build In Flexibility and Constantly Dialogue With Partners

Due to the novel nature of this program, the complex and nuanced nature of tap water quality science, regulation, concerns, and testing, as well as the desire for information about tap water quality from participants and information about the program from water providers, the program thus was solidified only as it was developed and implemented. Stakeholders at all points of the process had many questions and there was high demand for ad-hoc conversations in addition to the monthly Technical Advisory Committee (TAC) meetings that all outreach partners attended. The Development and Implementation Team spent significant time addressing questions from individual outreach partners and utilities and set up a region-wide workshop to discuss priorities from each side. Implementing the program was thus very time-intensive and intellectually demanding. Future tap water quality testing efforts will benefit from planning and learning from this experience, but should also build in flexibility with project expectations, timelines, and budgets to best meet the needs of their participants.

Communicate and Accommodate Differences in Relative Health Risk Thresholds

The water quality standards a tap testing effort defines as “concerning” must be decided with community partners and communicated extensively. There is no simple way to do this for several reasons. First, drinking water quality is not easily reducible to a single or even limited set of metrics; the number of “primary” constituents the EPA requires each water system to test for exceeds 90, with hundreds more potential concerns. Second, individual aesthetic sensory experiences, or organoleptics, means everyone is slightly different in perceiving tap water quality. Moreover, according to the most rigorous scientific evidence, the healthiest water is not necessarily the most “pure,” which is a word commonly used in consumer marketing as well as environmental health advocacy efforts.

As described earlier in this report, there are different reporting standards for drinking water system quality concerning human health: MCLs and PHGs. Although there is a federal floor for tap water quality MCL standards, some states, including California, have more stringent limits for certain tap water constituents. To accommodate community partners and utility interests, this program reported results back to residents relative to both MCLs and PHGs and used California MCLs. As described earlier, there are nuanced differences between these, and their names can potentially cause concern among participants. For example, suppose a standard called a “public health goal” is exceeded. In that case, this may cause alarm for some community and Tribal members, even if they are not enforceable regulatory standards and did not exceed MCLs which are “health protective.” This program developed a document used by outreach partners to provide context for understanding the various regulatory terms (MCLs, PHGs, etc.) and their relative expected health impacts. This document is included in the Appendix.

Communicating what these standards are based on, and that MCLs contain technological and economic feasibility trade-off considerations, requires nuance, which is impossible to adequately communicate to all stakeholders' satisfaction. This is in part due to differences in relative risk tolerance among individuals. Different aspects of this nuance caused concern for participants and, in some ways, undermined a previous belief that water quality standards were purely "scientific." Future testing efforts should be prepared to the extent possible to navigate complex conversations about the imperfect nature of scientific standards, studies, and cases where there is currently a lack of information about tap water safety. This includes communicating information about the effects of interactions between different contaminants and if there are different health effects when some contaminants are combined with others.

Additionally, some well-publicized water quality contaminants of potential concern do not currently have PHGs or MCLs. In some cases, this is due to there being insufficient evidence to date that these contaminants have negative health consequences. Standards have not been set in other cases, such as PFAS and other emerging contaminants. When constituents did not have MCLs but were of concern to residents based on their information gathering, this brought up questions for participants that needed to be addressed in a nuanced manner. Future efforts should ensure that there is significant time and resources allocated to accomplishing this nuanced communication after results are received and should partner with community and Tribal groups to ensure communication strategies are appropriate for the communities and Tribes participating.

Develop Program-Level Initial Guardrails to Drive Decision-Making

In addition to expecting the unexpected, important program-level decisions will need to be made at the outset of the effort. These include intent of the effort and required scientific rigor, target numbers for samples collected, what tests or panels will be offered, what water quality standards to use in communication efforts, and identification of the target population. In the case of any conflicts in priorities among stakeholders, a mechanism for prioritization must be developed. In all cases where discretion was available, this program followed the lead of and prioritized communities and Tribes' preferences in terms of implementation pathways. The desire for defensible information about the water that comes out of their tap was also a guiding principle that helped inform decision points.

In this effort, the program created a Technical Advisory Committee (TAC), led by SFEP, that met monthly to give updates and discuss program elements. These forums were generally very useful for getting group consensus, streamlining communication, and working through any disagreements between the outreach partners on approaches. When discussing program elements, the outreach partners had a lot of feedback and requests we incorporated, and some that we ultimately were unable to accommodate. We were unable to accommodate some requests either because the testing firm couldn't meet specific requests or when there was disagreement between the partners. There was a plethora of requests made to our testing firm that were accepted, and some that the firm could not accept due to technical or business model limitations. When disagreements occurred between partners regarding the program-level decisions, they were discussed at the TAC, and individual follow-up was conducted as needed. One example of this was whether or not to conduct experiential surveys when samples were collected. Many partners did not want to survey, citing fatigue among the communities they worked in, while others were very interested in obtaining more information to better understand the scope of the distrust in tap water. Ultimately, we decided not to make surveys mandatory and turned the decision over to each of our outreach partners to survey as desired.

While program-level decisions need to be made at the forefront with buy-in from the group to ensure uniformity of the technical aspects, there are many decisions that can be made at the local level based on the preferences of the community and Tribal partners as described in the *Decide on What to Test for and How to Sample* section.

Partner With a Certified Testing Firm

Other important decisions future programs and participants will need to make is what contaminants will be tested and testing logistics. Different priorities will need to be considered when choosing a water quality testing lab and testing panels/methodologies. This program partnered with SimpleLab, which despite its name is not a single lab. Based on our research and experience, not many certified labs will be capable of or interested in partnering on a program modeled after this effort.

SimpleLab provides the service of coordination between individuals and many certified labs. This program only used labs in California that were ELAP certified, based on feedback from water utilities gathered at the program's outset. There are few testing firms (labs) to do this work; SimpleLab wasn't perfect but was much more responsive and user-friendly to work with than other firms approached. This was the first time the outreach partners and SimpleLab worked on a tap water testing program of this size and complexity. There was a lot of learning on both ends and lessons learned after the program was complete. Generally, the communities appreciated the responsiveness of SimpleLab and their online platform. There were some frustrations with packages getting lost or destroyed by the shipping agency due to some packaging issues causing leaking of melting ice. SimpleLab worked with SFEP and the outreach partners to make substantial changes to their platform to accommodate the needs communities had and also created PDFs and videos for partners to walk them through the sample collection and kit activation process. The support SimpleLab provided on this project exceeded expectations. SimpleLab also had some reflections on the program. The initial budget wasn't quite enough to support the level of effort SimpleLab put into the program. They didn't anticipate creating videos or specialized guidance for our project but accommodated the request from community and Tribal partners. There was also a tremendous amount of communication between SimpleLab and the outreach partners addressing kit activation, order confirmations, and sampling/shipping errors and logistics. The unexpected volume of communication would likely lead them to submit higher bids in the future to be able to accommodate the needs of the outreach partners.

Before partnering with SimpleLab, this program developed a tap water quality experiences survey to determine what to test for based on resident concerns and aesthetic experiences. Once partnered with SimpleLab, the program instead decided to deploy these surveys alongside the testing panels SimpleLab offers, in order to provide additional context for the lab tests and because SimpleLab's testing panels were much more extensive than our original surveys. As discussed above, these surveys were not mandatory and represent less than 20% of the total participants.

SimpleLab offers different prepackaged testing panels participants can choose from, including different numbers and kinds of constituents, based on context and concerns. These constituents are packaged to be cost-effective. The program team and SimpleLab staff supported community and Tribal members in decision-making by providing summary information about what each panel includes and test use cases for consideration. These tests ranged from 48 constituents to over 100. Some tests were tailored toward urban water systems, while others were tailored to constituents that are more commonly found in wells. There were also some very specific tests that looked at a group of chemicals, like PFAS/PFOS.

Decide on What to Test for and How to Sample

This program supported different communities and Tribes in deciding which tests to conduct in their areas, along with input from SimpleLab and technical experts based on historical water quality data and surrounding industry/other local contexts. SimpleLab and the technical experts that were part of the Development and Implementation Team also supported the development of additional materials to assist communities and Tribes in their decision-making process. These materials included information on different aesthetic water issues (brown water, sediments, specific smells, etc.), what could be causing them, what each of the constituents in SimpleLab's test panels are, and how they can manifest in water. Information about specific issues from the needs assessments, including aesthetic issues with tap water quality that community members had experienced, was also used to inform the selection of test panels.

Outreach partners took different approaches based on their relationship with their community or Tribe, background, experiences, and concerns. Overall, many outreach partners reported wanting guidance on what to test for, and future programs should be prepared to provide such guidance. Some outreach partners, however, were quite familiar with contaminants of concern and tap water quality testing, had specific concerns, and performed a significant amount of additional research on their own to inform which panels of tests they used, including into emerging contaminants that existing testing methods could not well accommodate. Other partners had tap water concerns but were unsure what constituents to test for. Some partners chose panels based on specific concerns and deployed these around their community with participants interested in additional information. Partners who had concerns but did not know where to begin often took a phased approach by conducting a few spot tests with many constituents in different areas of their community and following up with more tailored tests based on their initial findings.

How samples will be physically obtained is another key decision point. This program supported each community and Tribal group in deciding their methodology, with input, including video instructions from SimpleLab on some elements of the procedure. Some community and Tribal partners sent testing kits directly to residents' homes, and residents conducted their tests per the instructions provided by SimpleLab and the DACTI Program and returned their test in the mail with prepaid shipping labels. Most partners took samples through outreach workers who went to each resident's home and obtained the sample. The Friends of Sausal Creek partnered with the Native American Health Center in Oakland as they reported getting questions often about tap water quality. The Native American Health Center handed out sampling kits to interested clients. While a novel approach, the short window of the testing effort didn't allow time for the center to rely on word of mouth to increase participation, resulting in less than 10 participants for Friends of Sausal Creek.

Incorporate Technical Lessons Learned Regarding Use of Tap Water

As described above, the project Development and Implementation Team found that there are some considerations communities should be aware of to limit their exposure to certain contaminants. There are three specific findings from our research and engagement that should be widely disseminated to better protect public health:

Using hot water from the tap: As water temperatures increase, the rate at which it can leach contaminants and its total capacity for dissolved substances increases. This gives warm and hot water a greater potential for heightened levels of contaminants. In most homes, water is heated by a centralized water heater. Cold water is diverted from the premise plumbing system into this heater and is then piped to faucets and utilities that require warm or hot water. Studies have shown that contaminants like lead and other metals are generally found at significantly higher levels in hot water coming out of faucets compared to cold water. This makes it imperative to only use cold water for drinking and food preparation purposes. This is especially important for vulnerable populations. An example of a commonly overlooked exposure pathway for young children is the preparation of baby formula with warm or hot water from the tap. Residents should always heat up cold water to meet their drinking and food preparation purposes.

Hot showers: A 2006 article in Environmental Health Perspectives titled "Changes in Breath Trihalomethane Levels Resulting from Household Water-Use Activities" found that hot showers and baths were significant exposure pathways for trihalomethanes (THMs), byproducts resulting from the disinfection of drinking water with chlorine. This is because THMs evaporate more quickly in hot water. It should be noted that THMs in water that meets regulatory standards are much lower than what is known to cause health effects, but some individuals are more sensitive to THMs than others. These individuals can experience skin, lung, and eye irritation. If these symptoms are being experienced, lowering the temperature of showers and baths could reduce the impacts of the THMs.

Infrequently used faucets: Cold water generally leaches contaminants slowly from pipes, but the longer it is in contact, the greater the potential to leach contaminants the pipes are made from. Water that moves through frequently used pipes has less time in contact with the pipes and therefore has less time to leach the substances they are made of. Water that sits in pipes for many days, weeks, or months has much more exposure to those pipes and thus a greater potential to leach contaminants. It should be considered a best practice for individuals to "flush" pipes after a long period of non-use, like after an extended vacation. To flush pipes, the water should be left on for several minutes before being used for drinking or cooking purposes. This water should be captured and used for other purposes during droughts or in areas where water supply is limited.

Secure CBO Commitment to Collect Tap Experience and Water Decision-Making Information

The TWQ program effort, as noted above, included the intent to conduct resident surveys about experiences with tap water quality to contextualize findings and support interpretation as part of the testing package. Outreach partners conducted the surveys and then collected the water sample. While this was not a mandatory requirement, as described above, all outreach partners were highly encouraged to conduct them. Ultimately, fewer surveys were completed than originally envisioned, and far fewer surveys were returned than tests were completed.

This experience suggests that any additional data collection in tandem with water quality testing, including surveys to understand aesthetic experiences with tap water quality, must be clearly explained and explicitly committed to up front in such an effort. While in this case, conversations and even co-design of surveys was conducted early in the program process, many of the communities and Tribes who participated in this program experienced fatigue from over-surveying and thus ultimately expressed dissatisfaction with or declined to carry out surveys in tandem with testing. Future efforts should work with partners to understand the best ways to measure water quality issues and trust/affordability rigorously while respecting survey fatigue.

Expect Complications in the Testing Result Interpretation Process

Reporting results back and interpretation is one of the most—if not the most—important elements to the overall success of a tap water quality testing program. Many of the challenges noted above regarding regulatory and health standards also apply to testing interpretation. Tap water quality testing and reports are inherently technical and complicated. A significant amount of interpretation is necessary to help contextualize the information provided in the tap water testing results and to fill knowledge gaps for participants. This was one of the primary reasons the Development and Implementation Team worked to support community and Tribal outreach partners to conduct this engagement with their participants rather than engage participants directly. The other primary reason for this approach was capacity limitations of the Development and Implementation Team.

While it is important to strive to meet these needs, this information cannot be explained to all stakeholders' full satisfaction as every participant has a different level of understanding, trust, and life experiences that affect their interpretive needs. This program established a baseline for interpretation through the use of SimpleLab's platform and worked with outreach partners to support further interpretive efforts. SimpleLab provides interpretation for water quality reporting, which many labs do not include with their reporting results but is a very important element of any meaningful tap water quality testing program (see Chapter 3 for examples). In some cases, the results and interpretation themselves resulted in more questions for some participants than answers. In some efforts to answer the questions, participants were met with resistance from water utilities, thus potentially contributing to further distrust. In these cases, the outreach partners and the Development and Implementation Team worked to encourage the utilities to commit to engaging the communities they serve above and beyond what is statutorily required. This proved a successful approach in several areas, where two-way conversations between water providers and outreach partners and community members continue well after the testing effort has concluded.

Participants had many questions about their individual results, even with the interpretation that SimpleLab's platform provided, including common questions such as "What do these results mean for me?", "What should I do next?", and "Why is any of this contaminant ok in my water?", which were largely dependent on the specific results. Questions that participants asked reflected various beliefs about tap water quality that messaging and reporting interpretation should address, including that the ideal water for health is "pure"—that it does not have any constituents in it at all. Informational materials should address the natural minerals found in water and their benefits. While the Development and Implementation Team provided individualized feedback to community partners and provided tap water experts from academic and regulatory organizations, many participants expressed a specific desire for medical professionals and public health experts to explain their results and the possible impacts on their body from different constituents in tap water. However, it was not within the scope or budget of the program to meet these unexpected needs, and only one outreach partner (All Positives Possible) was able to independently secure such expertise. Thus, such experts were not able to be on call for individual consultation as part of the TWQ program effort. This reflected the extent of participants' concerns about health related to tap water quality issues, and the disconnect between even trace levels of contamination well below regulatory standards and the popular expectation or desire for "pure" water. Future efforts should expect similar concerns related to health effects of contaminants and should work to secure expertise to help answer the incredibly nuanced questions related to contaminant concentrations and health effects related to long-term exposure.

There was also concern expressed about the quality of tap water relative to neighboring areas and as compared to bottled water. Many of the original needs assessment participants shared experiences of noticing that water tasted, appeared, or smelled better in nearby, more affluent communities, and this interest carried through to the receipt of test results. In this way, it is also important to provide interpretation of individual results within the context of tap water quality in surrounding areas.

A few of the major issues related to distrust in tap water quality that Disadvantaged Communities and Tribes identified, in addition to concern about tap water quality itself, included a lack of information or understanding about the source of their tap water and where to find this information, who to call about any issues, and where issues might be arising, as well as whose responsibility it was to correct any issues they might be experiencing. Communities and Tribes explicitly expressed the desire for additional outreach, educational materials, and direct engagement from water utilities about their tap water. The current disconnect between communities and direct knowledge of water quality infrastructure and information can exacerbate problems of distrust; this speaks to the need for public agencies to enhance outreach and education efforts, as well as intentional transparency. Currently, many renters do not directly receive a water bill due to water being included in their rent, and water bills serve as the main point of contact between community members and water utilities in many cases. Further, many outreach and education materials that exist are only available in English. In contrast, many community members speak languages besides English, such as Spanish and Vietnamese, making these materials inaccessible.

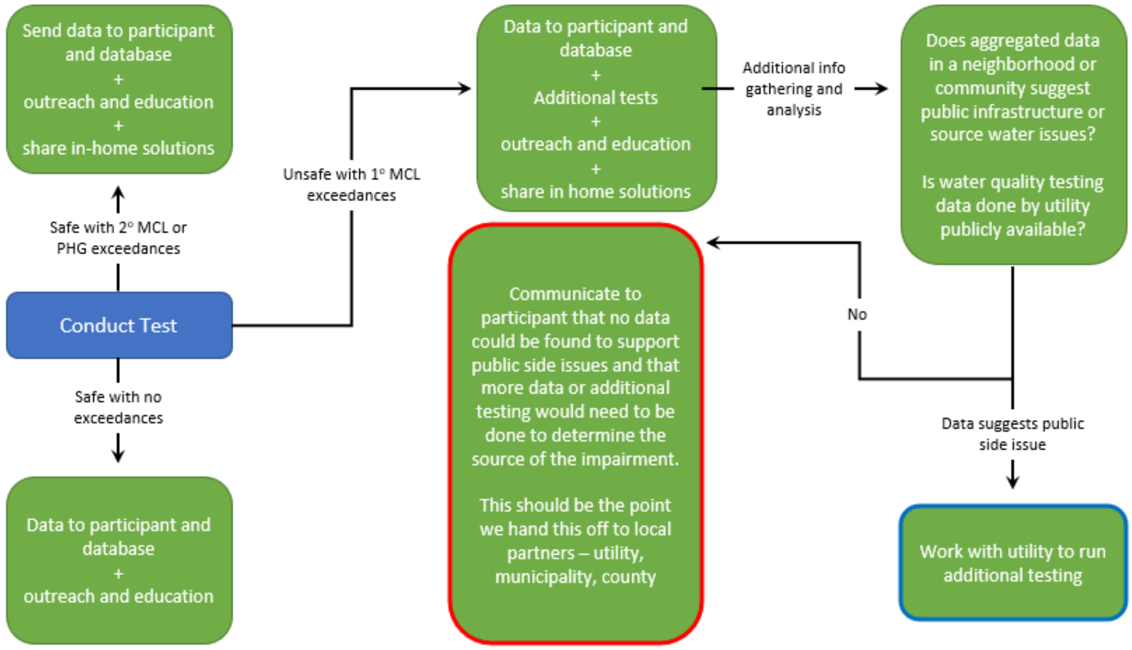
Many Disadvantaged Community members and Tribes also reported defensive or simplistic responses from water providers to concerns raised about tap water issues or concerns, including being told that their "tap water is safe" without further explanation. While tap water might meet all primary MCLs, and health-protective standards, community members might still experience aesthetic issues with water that might cause or deepen distrust. Sometimes community members are experiencing discolored water and are told simply that it is safe without understanding details of what is causing this experience. In that case, this simplistic response might further deepen distrust in the agency, whether or not the issue is arising in an area that is the water provider's jurisdiction.

It should be noted that there is an incredible variation in the size, service area, and capacity of utilities that affect their ability to engage proactively or reactively to community concerns. While some utilities are better than others at engaging and communicating with their communities, concerted effort needs to be made by all utilities to work with community leaders and individual rate payers to increase their knowledge of their water sources, treatment/testing systems, statutory requirements, and distribution systems. Additionally, if any planned maintenance activities could affect the water quality or aesthetics, such as pipe flushing, utilities must work with community leaders, community-based organizations, and other stakeholders to ensure residents are well informed to avoid increasing distrust resulting from operations and maintenance (O&M) activities. Such O&M alerts could be operationalized to reduce the time and effort it takes to achieve this goal.

Be Ready to Address Concerning Testing Results

Future tap testing programs should anticipate that some tests will come back above secondary MCLs, PHGs, and primary MCL regulatory standards. Accordingly, plans should be in place to communicate and/or investigate these "hits." Figure 8 is the flowchart of the planned responses for this testing effort. However, here, flexibility to adjust is key as the best laid plans by the TWQ program team were not fully relevant to the reality of communication and information sharing needs of outreach partners, utilities, and other stakeholders when results of concern came back. Additionally, the capacity to affect the response plan was not sufficient to achieve the intended results. In some cases, additional testing was done, while in others, outreach partners reached out directly to utilities to assist with further testing and diagnostics.

*Figure 8: **Decision Tree Created by the Development and Implementation Team During the Planning Phase of the Tap Water Testing Program.***



Acknowledge and Strategize Around Legal Constraints on Current Public Funding Solutions

When testing at the tap, water providers quickly noted that constituents can affect water quality originating in the premise plumbing, the pipes within residents' homes, beyond the meter and the water provider's jurisdiction. The pipes in the home are the responsibility of the homeowner, and pinpointing premise plumbing issues is among the hardest causal factors of poor water quality to identify. This jurisdictional relationship is exacerbated in the Bay Area and many other areas where there are high numbers of renters, who often are not able, or might not have the financial resources, to fix issues with premise plumbing. To further complicate the matter, if premise plumbing issues are identified and need to be addressed, there are a limited number of solutions with varying levels of technical sophistication required to initiate. These include replacing the potable water plumbing in the residence or replacing the lateral extending from the public distribution system, which requires the involvement of plumbers if not skilled contractors. Other, potentially simpler solutions which may still require a plumber involve the installation of an in-line filtration system, point-of-use filtration system, or a stand-alone filtration system like a Brita filter.

Because all of these solutions exist outside of the publicly regulated distribution system, public funds to address private premise plumbing is extremely hard to find or altogether nonexistent. The use of public funds that could result in the increase of private property value are typically considered a "gift of public funds" and are essentially restricted. It is possible that point-of-use or stand-alone filtration options could be publicly funded, as has been done particularly for lead in recent years, but such funding sources are highly limited. Additionally, filters have a life span, requiring ongoing replacement and maintenance to ensure they are operating as designed. So, even if public funding were able to buy the initial units, outreach would need to be conducted to ensure users were keeping their filtration systems effective. Ongoing expenditures related to filter replacement would also likely not be covered by such funding sources.

Recognize That Community-Driven Efforts Can Support Water Providers' Aims

Water providers work very hard to ensure that they meet state drinking water standards and are very proud of the water quality they provide. These water providers can also be defensive when their water quality is questioned. However, such concern presents an opportunity for water providers to offer information, respond to specific concerns, and work with community members and organizations to identify potential deficiencies in the system and work together on collaborative solutions. This program experienced such an interaction when the outreach partner Marin City Climate Resilience and Health Justice brought a set of concerns and needs to the Marin Municipal Water District after receiving the results from the testing effort. While the District was initially hesitant to engage, they ultimately worked very closely with the community leaders to apply for and successfully obtain over $6,000,000 to address concerns the community brought forward related to the distribution system.

Although water quality science and regulation are incredibly nuanced, community members have the most contact with tap water and should be considered a primary source of observational data. Residents of the community can best describe their experience with the system and can help water providers understand where problems may lie in their system, even if the water being provided is meeting all standards. In some cases, providers can provide more context for aesthetic issues and simple solutions that can remove the aesthetic issue. In others, the providers can begin working with residents or community organizations to understand how widespread the issue is and work together on finding productive solutions that help sufficiently address residents' concerns.

This program attempted to set up concurrent testing with the water providers and the residents to try to locate the root cause of water impairments, either on the water system or in the premise plumbing. This was difficult to coordinate ahead of time and largely didn't end up happening. Future efforts could do more to facilitate front-end coordination of testing days between water providers and participating residents to help identify premise plumbing issues. This approach will require a much greater degree of lead time and capacity than this program had.

VI Next Steps in Addressing Distrust for Different Stakeholders

Given the complexity combined with the diffused responsibility and authority to address tap water distrust concerns, at least seven different types of stakeholders can and should be empowered to take active steps to effect solutions. We provide suggestions for each in turn, in order of proximity to the problem; but we also recognize that responsibilities are overlapping, each tap distrust case is different, and there is no formula to addressing problems. These next steps also build on the quantitative and qualitative lessons learned in Chapters 3 and 4.

We urge the following stakeholders to consider these next steps: 1) concerned residents and community-based organizations; 2) local non-profits, including legal advocacy groups; 3) rental housing property owners and managers; 4) affected water systems; 5) local government decision-makers (especially county public health departments); 6) the State Division of Drinking Water; and 7) the research community.

Residents and Community-Based Organizations

First, residents and community-based organizations are essential to effecting solutions. This is because, typically, a tap trust problem can only be identified based on user experience, rather than external observation. Moreover, oftentimes concern needs to be voiced by multiple households to reach a scale that draws public attention. This is particularly true when distrust is caused by premise plumbing. While the burden would not ideally be placed on residents to sound the alarm, this is the current reactive status quo. Our suggestions below for other stakeholders should support residents and CBOs in raising and helping address tap distrust occurrences quickly.

Non-Profit Organizations

Non-profits can take several roles in addressing tap distrust occurrences. They can help overcome the information gap for tenants facing tap distrust issues. A concerted outreach effort with user-friendly information such as developed in the TWQ would be needed to help tenants recognize that landlords are legally responsible for addressing premise plumbing issues.

More broadly, due to a history of distrust between marginalized communities and publicly regulated water agencies, intentional, direct engagement is needed to work to heal relationships, increase trust in tap water, and identify and address issues where they exist. While issues community members experience might originate in premise plumbing, outside of the jurisdiction of water providers, issues experienced at the tap can decrease trust, and as such it is in water providers' interest to support communities in identifying and understanding any aesthetic tap water issues they are experiencing. CBO and NPO organizations are essential in mediating communication between residents and public agencies.

Finally, but not exclusively, non-profits will be essential in providing user-friendly guidance to communities regarding households' health and financial decision-making matrices regarding comparisons of money expended on bottled water vs filters vs plumbing fixes. Whereas the bottled water industry has aggressively used targeted advertising and marketing strategies to increase bottled water consumption in minority communities, public agencies culturally and often legally resist persuasive counter-campaigns. Only non-profit organizations are likely to be able to fill this space in most cases in providing objective, concise information on the health and financial benefits of tap water reliance.

Rental Housing Property Owners and Managers

Property owners and managers of rental housing need to be part of the solution to increase tap water trust and quality. Generally, we have not found rental property owners and managers to be very responsive to complaints, much less proactive in addressing premise plumbing concerns, unless public agencies compel them to do so. An additional challenge to addressing premise plumbing contamination is that the property owner responsible may have no incentive or compulsion to address a problem without public financing support. While there are nominal legal means in housing codes to compel landlords to take action, advocates and housing regulators hesitate to use these tools in California due to concerns regarding landlord retaliation or even eviction.

In the case of low-income rental housing, a more promising solution to address underlying tap water distrust due to premise plumbing contamination is the development of public financing assistance programs to assist with plumbing upgrades. Past missteps by similar programs designed to upgrade in-home energy infrastructure for low-income residents suggest these programs must be carefully constructed. The only known financing program precedent to address premise plumbing is employed by Halifax Water in Halifax, Canada, where low-interest loans are provided for property owners to replace private lead laterals.

Affected Water Systems

Affected drinking water systems, especially publicly owned ones, should aim to carry out more proactive distributional network replacement. This recommendation is currently only feasible for wealthier communities, in the absence of more robust state or federal subsidies for distributional network upgrades, in order to preserve drinking water affordability, which is of increasing concern in California.

Other solutions to premise plumbing contamination could be best facilitated by water systems, which have no legal responsibility to address premise plumbing issues. This approach may still be attractive to water systems, however, since many tenants assume incorrectly that plumbing issues are the system's responsibility, and systems' efforts may result in positive publicity for the system. In many cases, the magnitude of financial assistance needed to fix premise plumbing issues causing distrust is small enough to be addressed with an on-water bill solution facilitated by a willing water system.

Other Local Government Decision-Makers

Oftentimes water systems are not run by local governments. Thus, other local government decision-makers, besides those that own and operate water systems, must be involved both proactively and reactively, whether they run water systems serving those who distrust or not. County Departments of Public Health (County Public Health) can work with additional water systems to collect and publicly disclose tap quality complaint data, such as that analyzed from LADWP and discussed in Chapter 2 . This type of proactive management by systems could create a more comprehensive understanding of the relationship of mistrust to contamination. It would allow stakeholders to address emerging quality concerns before they lead to widespread tap distrust.

A potentially replicable financial assistance model to households that can be employed by local governments, whether they run a local water system or not, is the use of deferred special assessments (SAs). In California, assessment districts are a commonly used tool to finance improvements when no other source of money is available (California Tax Data, n.d.). Cities or counties can form a district and finance improvements on private property, which property owners defer paying back until they sell the property.

Alternatively, financing models can be particularly appealing to households if they assist them in paying for the cost of premise plumbing in small installments over time, perhaps equivalent to what they would pay for bottled water for the month without premise plumbing upgrades. These models are likely most feasible for local governments which run their water system and can institute on-customer bill charges as the payback model.

State Agencies

In conjunction with county primacy agencies, the State Water Resource Control Board's Division of Drinking Water is responsible for ensuring system drinking water quality standards are upheld. The Division should consider imposing additional monitoring, reporting, and treatment requirements for cleanliness within distributional networks, as they already do for other contaminants of concern that do not have primary standards in the federal SDWA.

State funds being provided to landlords or private property owners to address premise plumbing issues could incentivize landowner action and prevent redistribution of cost onto residents or other potential retribution. However, state agencies are a bit hamstrung by the laws around gifts of public funds. It could behoove all stakeholders if a creative solution around these laws can be crafted to ensure that a reliable and cost-effective solution is available to property owners to improve their premise plumbing. Rebate programs are a potential solution but can have costly up-front costs, which can be infeasible to float and often have difficult-to-navigate processes.

Researchers

Finally, researchers and research funders should continue to support community and non-profit partnerships to analyze and address tap water distrust. Researchers should further develop methods to collect and rigorously analyze data from crowdsourced avenues such as Nextdoor, X/Twitter, or Change.org, which could also help stakeholders understand the prevalence of premise plumbing concerns among tenants. Also increasing the access to tap water testing, potentially through development of smart filter devices, will empower residents and advocacy groups to better understand their water and to advocate for addressment where water quality standards are exceeded.

Reference List

Itzel Vasquez-Rodriguez and Gregory Pierce (January 2024). *Tap Water Quality and Distrust in Los Angeles County: Strategies to Address Premise Plumbing*. UCLA Luskin Center for Innovation. See https://innovation.luskin.ucla.edu/wp-content/uploads/2024/01/tap-water-quality-distrust-and-premise-plumbing.pdf

VII Conclusion: Next Steps for Tap Water Testing in the Bay Area and Beyond

This effort has already begun to be used as an example by other regional tap water testing efforts, accounting for the lessons learned and outlined in Chapter 4 and throughout this report. The most immediate adaptation of a similar effort is being led by the Los Angeles-Ventura IRWM DACIP (LA Water Talks). Based on the surveying of local residents concerned about tap water quality, the Southern California team is undertaking a regional tap testing effort and has consulted with the Bay Area TWQ team on its experience. SimpleLab is also supporting this effort. The Southern California effort is still under development but will vary from the Bay Area program in significant ways, as there are fewer utilities serving the target communities and fewer jurisdictions. It is anticipated that the Southern California effort will also work with a fewer number of community-based organizations to implement their testing program.

In theory and hopefully in practice, the TWQ effort can be used as a model to address urban residents' tap water concerns, especially in other Disadvantaged Communities across the US. However, this effort had three fairly unique and favorable circumstances that may limit its replication feasibility without considerable coordination and resources. The first unique aspect is that the TWQ was embedded in a broader Disadvantaged Community engagement process focused on water and mobilizing community partners' interests and experiences. The second unique aspect is that the program was relatively well-funded (including the costs of the tests themselves) by the state. Finally, the program's institutional setup directly informs designated state allocation of additional funding for infrastructure improvements.

Additional research and practical tool improvements will be necessary to best support Disadvantaged Community tap water trust in future efforts in the Bay Area and throughout the US, as highlighted throughout the report. First, more must be done to make information regarding water quality, testing, and the regulatory process user-friendly, while retaining accuracy, for those concerned about tap water. More development is needed on what and how to easily but rigorously test for contaminants based on observed concerns at the tap. While this effort and other recent initiatives have begun more user-friendly communications on this front, there is more to be done, and multiple versions of information, which are made permanently publicly available and updated, will be helpful to future efforts.

Relatedly, to increase scalability, there must be several more entrants beyond SimpleLab into the US-certified lab testing space who know how to and want to partner with communities on such efforts. Right now, we are unaware of other firms that can feasibly carry out useful testing support in these settings. A potential alternative may be a breakthrough in at-the-tap testing, such as a smart water quality testing sensor that reports water quality results in real time to users on their phone. While we know of such technologies being developed, and they may be viable in the next decade, they are not commercially available, much less field-tested in disadvantaged community settings.

Finally, we need to provide better answers and potential solutions to residents concerned with their tap water following testing efforts. Technology may again play a role if smart tap filters being developed are combined with real-time sensors. However, these are not available now. In their absence, better guidance and cost estimates for point-of-use filters and public funding for premise plumbing upgrades remain the only stopgap solutions.

The future of the Bay Area IRWM Coordinating Committee is somewhat uncertain at the time of writing. Traditionally, IRWM regions convene around available grant funding, and there is no funding currently slated for the IRWM Program in California. It is unclear if the Bay Area IRWM Region will continue to convene in the absence of funding, so the Development and Implementation Team has worked to facilitate connections and share contacts with water providers and communities and other interested parties who may be helpful in furthering the understanding of tap water issues in the outreach partner communities.

> For example, the testing program has resulted in some immediate next steps, including the aforementioned Marin City/San Rafael Water Supply Resilience Project, proposed by the Marin Municipal Water District, which the Bay Area IRWM Project Scoring Committee selected for funding from the Proposition 1, Round 2 Implementation Grant. Nuestra Casa is also working with the City of East Palo Alto on potential consolidation of the O'Connor Tract Co-op Water Company into the city's municipal system to provide improved service. The O'Connor Tract was engaged as part of the program and expressed interest in consolidation as they were struggling to find funding to make the necessary improvements to address water quality issues identified by the State Water Board. Some outreach partners have elected to pursue individual contracts with testing labs to investigate some of their findings further.

Tap water trust is an essential prerequisite to human health, dignity, and affordability, and thus is a necessary aim to pursue and support. Overall, the tap testing program in the Bay Area documented in this report highlights both the opportunity and continued need for efforts to be responsive to resident concerns about and distrust of their tap water in urban Disadvantaged Communities. While these efforts are complex and cannot solve all issues quickly, if done well, they can at a minimum advance a two-way conversation that helps enhance trust in communities around agency responsiveness to resident experiences with tap water, as well as increase the level of understanding of tap water quality itself. The aim of supporting understanding and increased trust in tap water is worth the effort.

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