California Water: Assessment of Toxins for Community Health (Cal-WATCH)

October 10, 2024

HABs in and around Clear Lake - why study?

- Increase in blooms for over a decade but most recently due to droughts, warmer temps, nutrients being added to the lake
- Many residents and visitors complain
  - more common
  - lasting longer
  - bad smell
  - health impacts (human and animal)
- •The state requires notification and supports monitoring of tap water in systems with 5 or more connections but little or no surveillance for private wells/self-supplied systems
  - ~493 self-supplied systems near/around Clear Lake

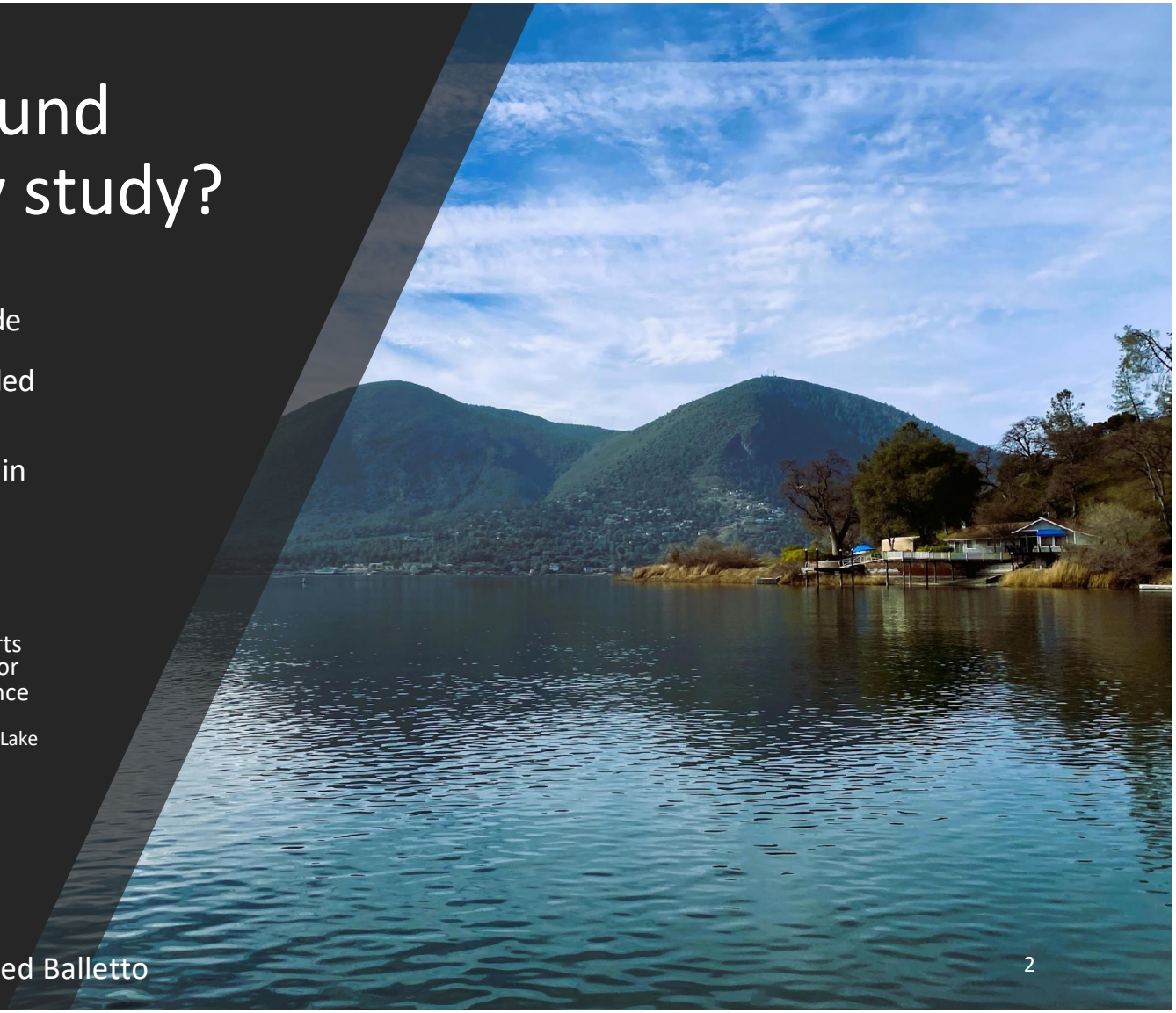

Photo credit: Alfred Balletto

Background / Terms / Definitions

- **Public Water Systems** – water systems, including treatment, that regularly serves 25 or more people 60 days of the year and are regulated
  - Seventeen public water systems are located around the Clear Lake shoreline and serve ~44,000 people

- **Self-supplied systems** – these are unregulated drinking water treatment systems supplying households that have fewer than 5 connections
  - Approximately 493 households receive water from self-supplied systems around Clear Lake
  - Approximately 3,600 domestic wells or ~15% of the population receives water from domestic wells in Lake County

- **Treatment barriers** - protective measures to minimize water system contamination

- **Disinfection Residual** - for a chlorine/bleach system, there is still some protective quality available after reacting with other compounds that remains

What is Cal-WATCH?

- **California Water: Assessment of Toxins for Community Health**

- Five-year grant from the CDC to learn about and address:
  - Self-supplied water systems' safety
  - Harmful algal blooms

- A partnership between:
  - Big Valley Band of Pomo Indians
  - Tracking California (Public Health Institute)
  - California Office of Environmental Health Hazard Assessment
  - California State Water Resources Control Board

BIG VALLEY RANCHERIA

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

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INFORMING ACTION FOR HEALTHIER COMMUNITIES

OEHHA
California Office of Environmental Health Hazard Assessment

Second and Third Year of Drinking Water Project

- Goals:
  - Identify all the homes in Clear Lake that are NOT served by a public water system (PWS)
    - homes not served by PWS with wells/intakes 50 ft from Lake County Creeks were added
    - homes who made changes to their treatment system after results were returned were invited to be re-tested
  - Enroll residents from these homes in the project
    - Consent, questionnaire
    - No cost to residents
  - Test water over the course of one year for seasonal contaminants
    - Nitrates
    - Bacteria (Total coliform and *E. Coli*)
    - Cyanobacteria/cyanotoxins
  - Return results to residents and provide health education and resources
  - Work with state and local agencies to help solve water access problems identified

What does Big Valley Rancheria Do?

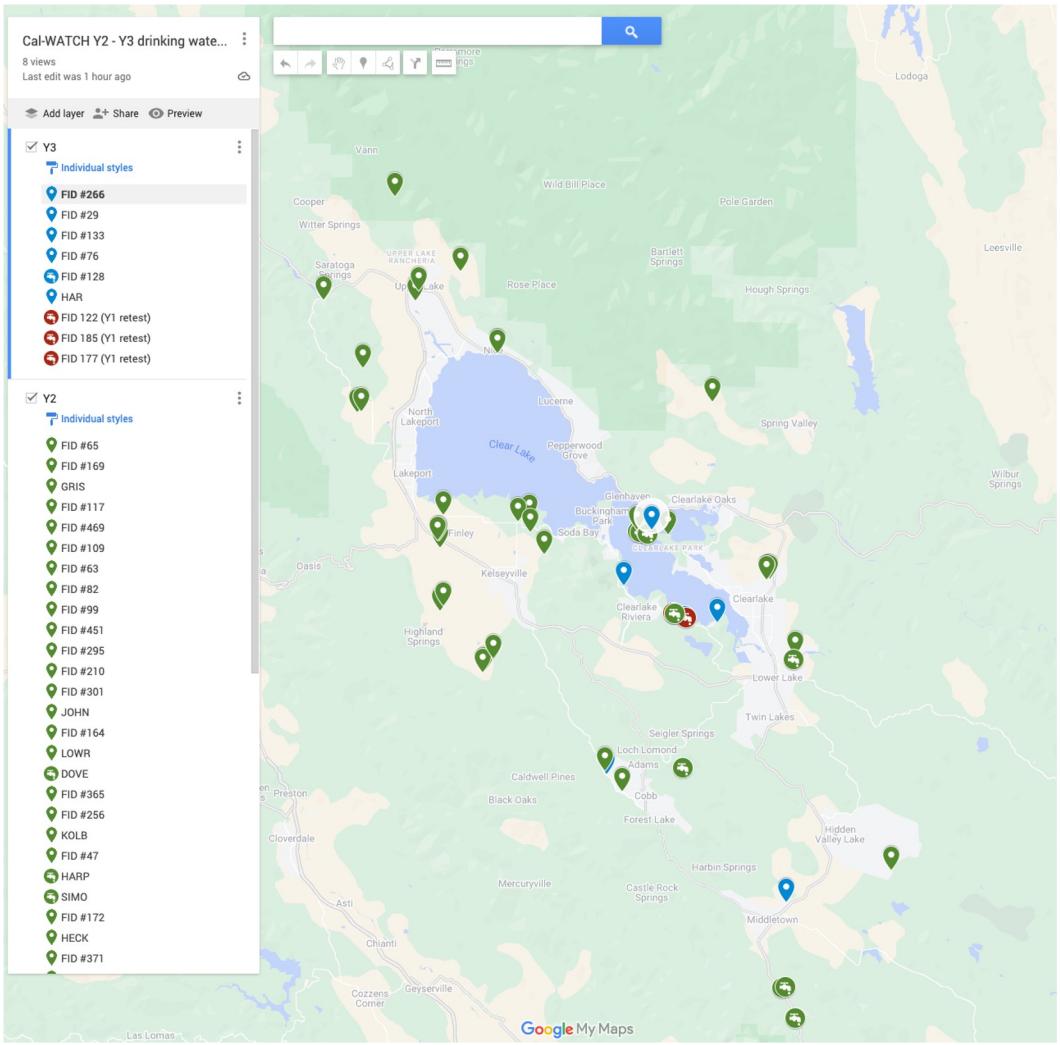
- The Team from Big Valley Rancheria:
  - Monitors the lake frequently during spring-fall for cyanobacteria and cyanotoxin
  - Investigates illness reports that may be due to HABs exposure
  - Provides health education and information to the community on avoiding HABs
  - Works closely with state and local agencies to share information and keep residents and visitors safe
  - Visited each home several times to sample water for testing and to understand each home's water treatment system and the way water is used in the home.

Clear Lake and Lake County creek Cyanotoxin monitoring and Testing

Legend for map signage

- None (green)
- Caution (yellow)
- Warning (orange)
- Danger (red)

Creek toxin testing results are now shown on the map. Look for the circle icons which will pinpoint the creek location that was tested.

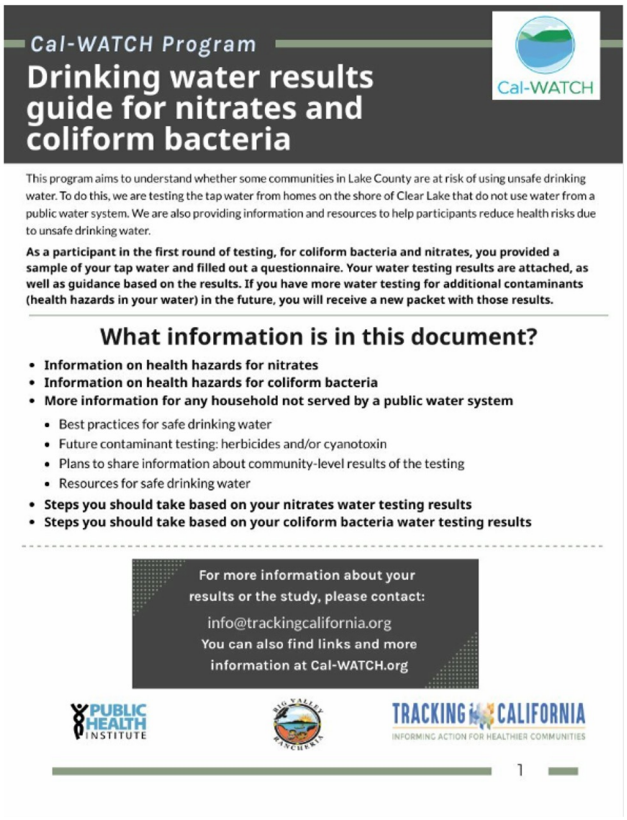


Clear Lake Drinking Water Testing overview

Well samples = 39
Intake samples = 16

Total homes sampled = 55

What was in your results packet?



Cal-WATCH Program

Drinking water results guide for nitrates and coliform bacteria

Cal-WATCH

This program aims to understand whether some communities in Lake County are at risk of using unsafe drinking water. To do this, we are testing the tap water from homes on the shore of Clear Lake that do not use water from a public water system. We are also providing information and resources to help participants reduce health risks due to unsafe drinking water.

As a participant in the first round of testing, for coliform bacteria and nitrates, you provided a sample of your tap water and filled out a questionnaire. Your water testing results are attached, as well as guidance based on the results. If you have more water testing for additional contaminants (health hazards in your water) in the future, you will receive a new packet with those results.

What information is in this document?

- **Information on health hazards for nitrates**
- **Information on health hazards for coliform bacteria**
- **More information for any household not served by a public water system**
  - Best practices for safe drinking water
  - Future contaminant testing: herbicides and/or cyanotoxin
  - Plans to share information about community-level results of the testing
  - Resources for safe drinking water
- **Steps you should take based on your nitrates water testing results**
- **Steps you should take based on your coliform bacteria water testing results**

For more information about your results or the study, please contact:
info@trackingcalifornia.org
You can also find links and more information at Cal-WATCH.org

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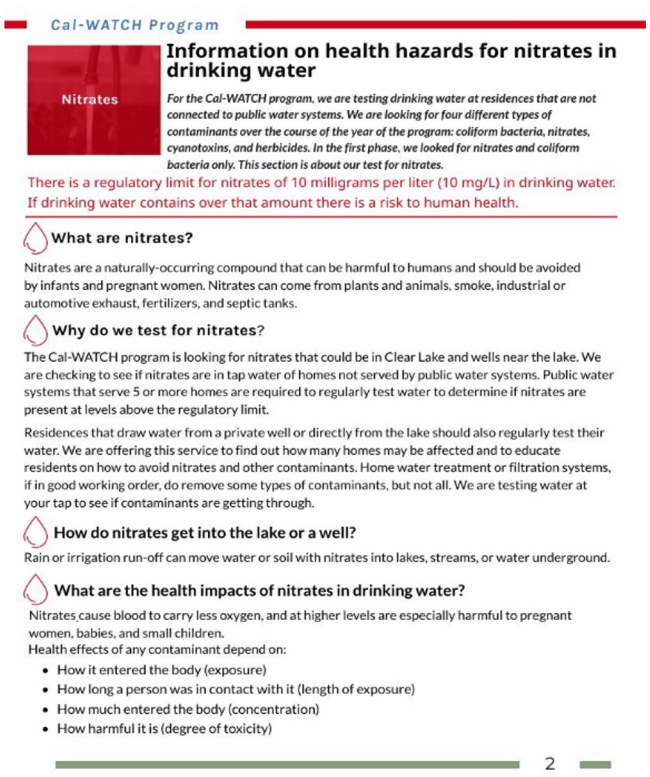

Cal-WATCH Program

Nitrates

Information on health hazards for nitrates in drinking water

For the Cal-WATCH program, we are testing drinking water at residences that are not connected to public water systems. We are looking for four different types of contaminants over the course of the year of the program: coliform bacteria, nitrates, cyanotoxins, and herbicides. In the first phase, we looked for nitrates and coliform bacteria only. This section is about our test for nitrates.

There is a regulatory limit for nitrates of 10 milligrams per liter (10 mg/L) in drinking water. If drinking water contains over that amount there is a risk to human health.

What are nitrates?

Nitrates are a naturally-occurring compound that can be harmful to humans and should be avoided by infants and pregnant women. Nitrates can come from plants and animals, smoke, industrial or automotive exhaust, fertilizers, and septic tanks.

Why do we test for nitrates?

The Cal-WATCH program is looking for nitrates that could be in Clear Lake and wells near the lake. We are checking to see if nitrates are in tap water of homes not served by public water systems. Public water systems that serve 5 or more homes are required to regularly test water to determine if nitrates are present at levels above the regulatory limit.

Residences that draw water from a private well or directly from the lake should also regularly test their water. We are offering this service to find out how many homes may be affected and to educate residents on how to avoid nitrates and other contaminants. Home water treatment or filtration systems, if in good working order, do remove some types of contaminants, but not all. We are testing water at your tap to see if contaminants are getting through.

How do nitrates get into the lake or a well?

Rain or irrigation run-off can move water or soil with nitrates into lakes, streams, or water underground.

What are the health impacts of nitrates in drinking water?

Nitrates cause blood to carry less oxygen, and at higher levels are especially harmful to pregnant women, babies, and small children.
Health effects of any contaminant depend on:

- How it entered the body (exposure)
- How long a person was in contact with it (length of exposure)
- How much entered the body (concentration)
- How harmful it is (degree of toxicity)

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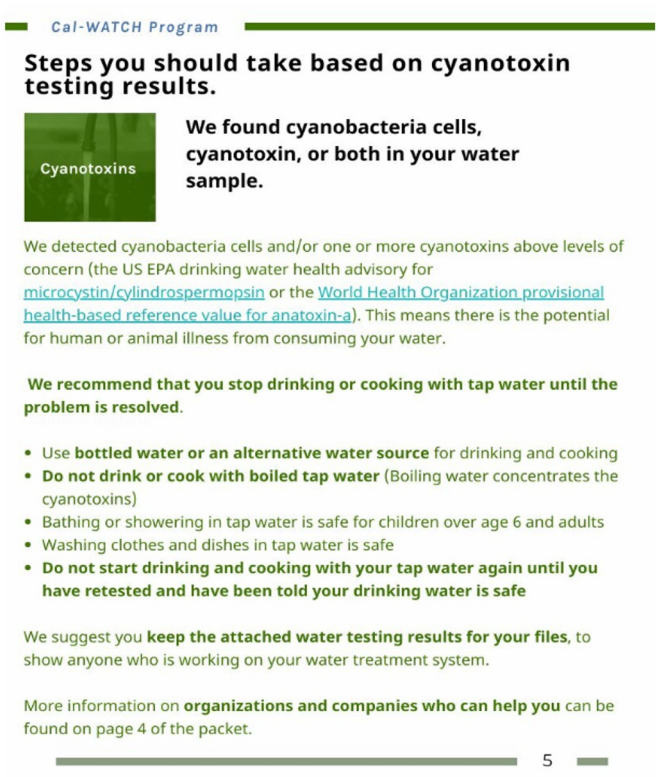

Cal-WATCH Program

Steps you should take based on cyanotoxin testing results.

Cyanotoxins

We found cyanobacteria cells, cyanotoxin, or both in your water sample.

We detected cyanobacteria cells and/or one or more cyanotoxins above levels of concern (the US EPA drinking water health advisory for microcystin/cylindrospermopsin or the World Health Organization provisional health-based reference value for anatoxin-a). This means there is the potential for human or animal illness from consuming your water.

We recommend that you stop drinking or cooking with tap water until the problem is resolved.

- Use **bottled water or an alternative water source** for drinking and cooking
- **Do not drink or cook with boiled tap water** (Boiling water concentrates the cyanotoxins)
- Bathing or showering in tap water is safe for children over age 6 and adults
- Washing clothes and dishes in tap water is safe
- **Do not start drinking and cooking with your tap water again until you have retested and have been told your drinking water is safe**

We suggest you **keep the attached water testing results for your files**, to show anyone who is working on your water treatment system.

More information on **organizations and companies who can help you** can be found on page 4 of the packet.

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Still have questions or didn't receive your packet?
Please contact us at info@trackingcalifornia.org

Contaminants of Concern

Several acute contaminants were monitored during this project, including the following:

Contaminant	Public Health Thresholds	Steps to Take/Recommended Actions
Bacteria, total coliform and *E. coli*	Presence	Boil water until problem resolved
Nitrates (as N)	> 10 mg/L	Do not drink, do not boil
Cyanobacteria/ Cyanotoxins	Detection	Do not drink, do not boil
If multiple contaminants		Do not drink, do not boil

Scenario 1: As a well owner, you decide to collect a water quality sample from your tap and the results are as follows:

- total coliform (present)
- *E. coli* (absent)
- nitrate concentration is 4 mg/L

1. **Are you at risk? If so, which contaminants?**

2. **What actions can you take?**

Water System (WS) Hazard Category

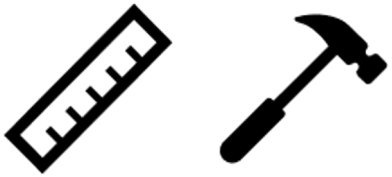
You should have received an email inviting you to this meeting with your WS Hazard Category…

Filtration

Intakes

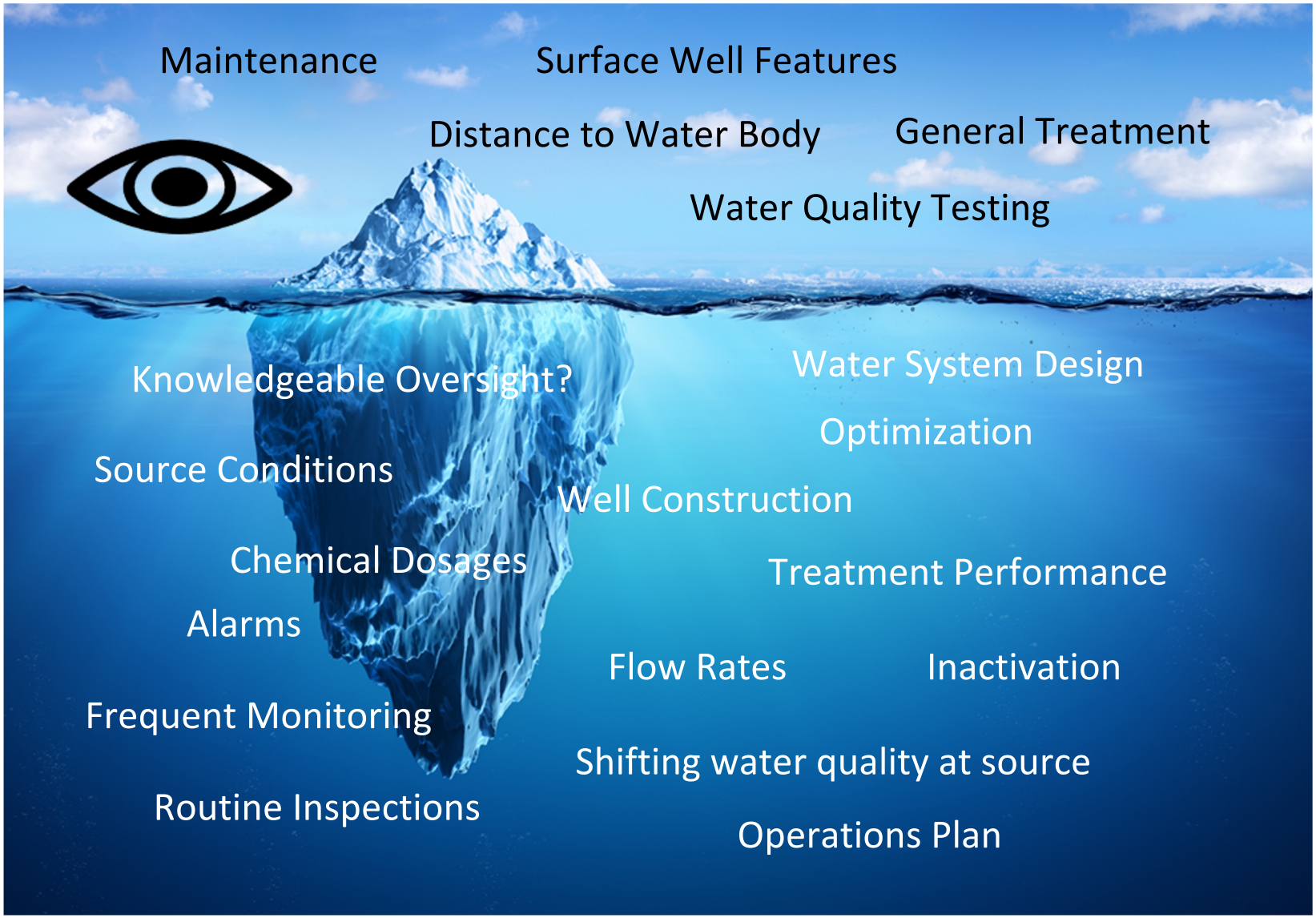
Disinfection & Maintenance

All



Distance to Surface Water & Surface Construction Features

Wells


Maintenance
Surface Well Features
Distance to Water Body
General Treatment
Water Quality Testing
Knowledgeable Oversight?
Water System Design
Optimization
Source Conditions
Well Construction
Chemical Dosages
Treatment Performance
Alarms
Flow Rates
Inactivation
Frequent Monitoring
Shifting water quality at source
Routine Inspections
Operations Plan

Building the Water System Hazard Category

Step 1. Points were awarded for safeguards in place (e.g., far from a water body, well maintained, good surface well features (wells), multi-barrier treatment approach (intakes))

Step 2. A Water System (WS) Hazard Category was assigned based on points accumulated. With more safeguards, closer to the **MINOR** category. With fewer safeguards, closer to a **MAJOR** category. And those in between, were assigned a **MODERATE** category.

Step 3. All participant water quality testing is summarized by WS Hazard Category in tables

Treatment Barrier Factors - Disinfection

Disinfection is a critical treatment process to reduce potential pathogens present in source water, including viruses and *Giardia lamblia* cysts.

Factors Considered for Disinfection Treatment Systems	Effectiveness	Points
UV Class A with NSF 55 certification	Neutralizes virus, *Giardia* and *Cryptosporidium*	+5
Chlorine residual ≥ 0.2 mg/L	Effective against virus and with proper design, *Giardia,* but not *Cryptosporidium;* filters reduce *Crypto*	+5
Chlorine residual ≥ 0.1 mg/L		+2.5
Chlorine residual < 0.1 mg/L		+1
Ozone disinfection with a residual	Very effective against virus, *Giardia*, and *Cryptosporidium*	+5
Ozone disinfection without a residual		+2.5
Max Possible Score		10*

Treatment Barrier Factors - Maintenance (M)

Both design and maintenance are critical to operating successful water systems. Without maintenance, treatment systems are at risk to fail

Maintenance frequency scores:

Quarterly maintenance	**+10**
Annual or reactive maintenance	**+5**
Max possible score	**10**

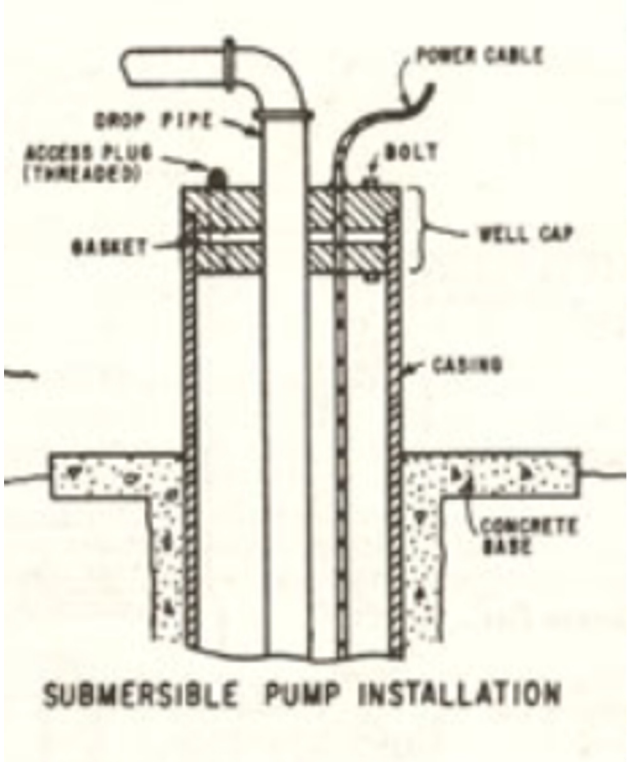
Typical Surface Features for a Domestic Well with a Submersible Pump

Vent (not shown): prevents well from collapsing; should terminate above flood level in U-shape with a screen

Concrete base or pad: typically 4-inches thick and 2 feet around well; all cracks should be sealed

Power cable: potential route of contamination if not sealed

Well cap: needs to be watertight



Source: DWR Well Bulletin Standards, Figure 6

Groundwater Treatment Barrier Factors - Surface Construction Features

It's important to minimize potential routes of contamination; these are a few features that could be observed from photographs. If no photograph available, an average score was awarded.

Factors considered for Surface Construction Features	Points
Surface pad is present and free from cracks	+2.5
Well casing and plate is free from potential routes of contamination (no holes)	+2.5
A vent was present, screened, U-shaped, and above the flood zone	+2.5
Well is not located in a flood zone	+2.5
Max possible score	10

Groundwater Barrier Factors - Distance from a surface water body

A domestic well located close to a surface water body can lead to potential bacteriological contamination

Distance from water body, feet	Score
0	0
10	+2
20	+4
30	+6
40	+8
>= 50	+10

Example - Major WS Hazard

Originally considered a domestic well but based on location, this is better categorized as a surface water intake source.

Limited Treatment installed: Only ultraviolet disinfection

+5 for UV disinfection

(assuming NSF55 certified Class A unit; designed for PWS applications)

Given cloudy source water, this is not ideal for ultraviolet disinfection treatment

Both total coliform and *E. coli* present at the tap

Nitrate: not detected

Example - Moderate WS Hazard

- free chlorine residual concentration measured 0.12 mg/L (+2.5)
- not located in a flood zone (however casing is <18-in. from ground) (+2.5)
- likely no holes with routes of contamination in well cap (+2.5)
- distance to surface water >50 feet (+10)

No bacteriological activity at the tap

Nitrate was not detected

Example - Minor WS Hazard

Proactive maintenance +10

Not in a flood zone +2.5

Surface pad wo cracks +2.5

Well cap is intact wo holes +2.5

400 feet from surface water +10

System has point-of-use (POU) device installed (not considered in hazard assignment; critical system is free of bacteriological activity for POU)

WQ Results: no bacteriological activity and no nitrate present

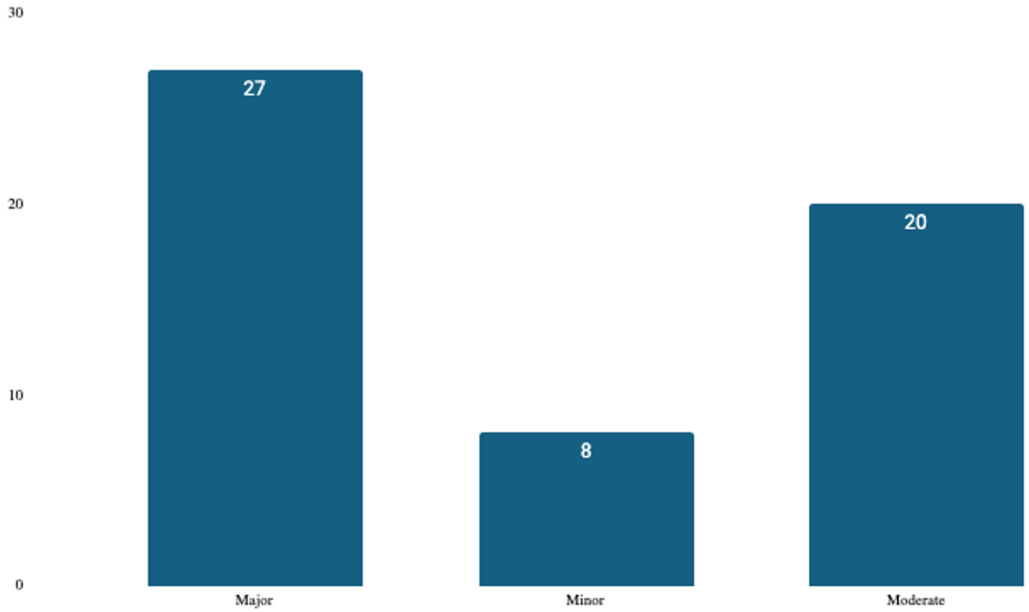
Scenario 2: You have a well with the following criteria

- Disinfection:
  - UVA (non-NSF certified)
  - chlorine residual ≥ 0.2 mg/L
  - No ozone disinfection
- Maintenance:
  - annually
- Construction:
  - surface pad is free of cracks
  - well casing is free of holes
  - vent is present but below flood zone
  - well is in flood zone
- Distance:
  - 50 feet from creek

1. What is your WS Hazard Category?

2. What improvements can you make to your WS?

Count of homes in each WS Hazard Category



WS Hazard Category	Count of homes in each category
Major	27
Minor	8
Moderate	20

Overall Results: Summary

	Number of homes	Major WS Hazard	Moderate WS Hazard	Minor WS Hazard
Total Coliform - PRESENT (%)	17	59%	41%	0%
E. Coli - PRESENT (%)	4	**100%**	0%	0%
Nitrate - PRESENT (%)	19	53%	26%	21%
Cyanotoxin (Microcystin) - PRESENT	6	**33%**	**77%**	0%
cyanobacteria OBSERVED	4 (intakes)	25%	50%	25%

- 100% *E. Coli* found in systems with major WS hazard
- cyanotoxins found in both moderate/major WS hazard category

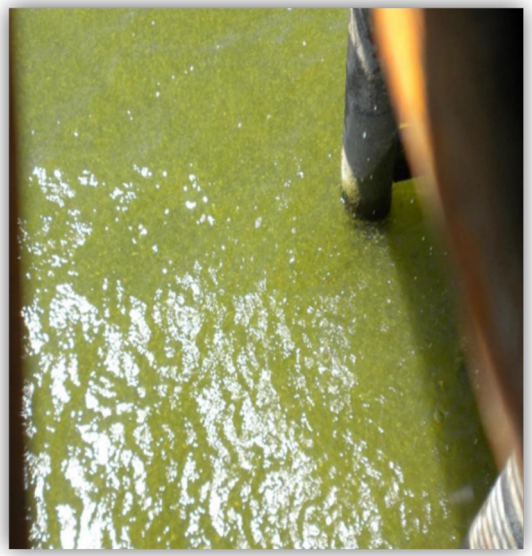
Any Questions so far?

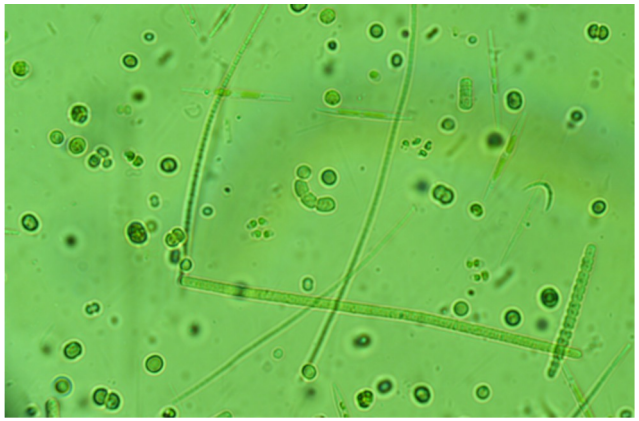
Scenario 3: As an intake owner, your water quality samples come back:

- total coliform (present)
- *E. coli (absent)*
- Nitrate concentration 2 mg/L
- Microcystin concentration is 0.4 ug/L

1. **Are you at risk? If so, which contaminants?**

2. **What actions can you take?**





Potential Actions to Consider for INTAKES:

- Multi-barrier approach (more than one treatment installed; i.e., filter and disinfection)

- Filter considerations:
  - 1 µm, filter loading rate, operations, & inspections

- Disinfection considerations: check disinfection residuals (aim for 0.5 mg/L), use alternative supplies if pathogens in tap water, UV units are designed for municipal supplies (free of cloudy water)

Potential Actions to Consider for WELLS:

- Consider installing a vent (prevent collapse) and end in U-shape above potential flooding levels (prevent aquifer contamination)
- Install a surface pad (2’ x 2’ x 4”) that slopes from well; repair any cracks
- Inspect well cap to ensure no holes are present
- Try to obtain the well log (may help identify fractured rock present which is difficult to address; if present, consider treating as though a surface water source esp. when there is water near the well)
- Consider bacteriological water quality monitoring within 24 to 48 hours following 1-inch of rain

Potential Actions to Consider for ALL CASES:

- Routine water quality monitoring
- NSF/UL/WQA/CSA/IAPMO materials only
- Only consider point-of-use (POU) devices if confident there is no bacteria contamination
- If microcystin is present and no bacteriological contamination, consider installing a NSF POU device
- Maintain treatment and equipment

Concerns

- The results shared today only represent a snapshot in time
- This does not describe a comprehensive ongoing monitoring effort
- An absence of bacteria or contaminant does not imply that this is recommended treatment

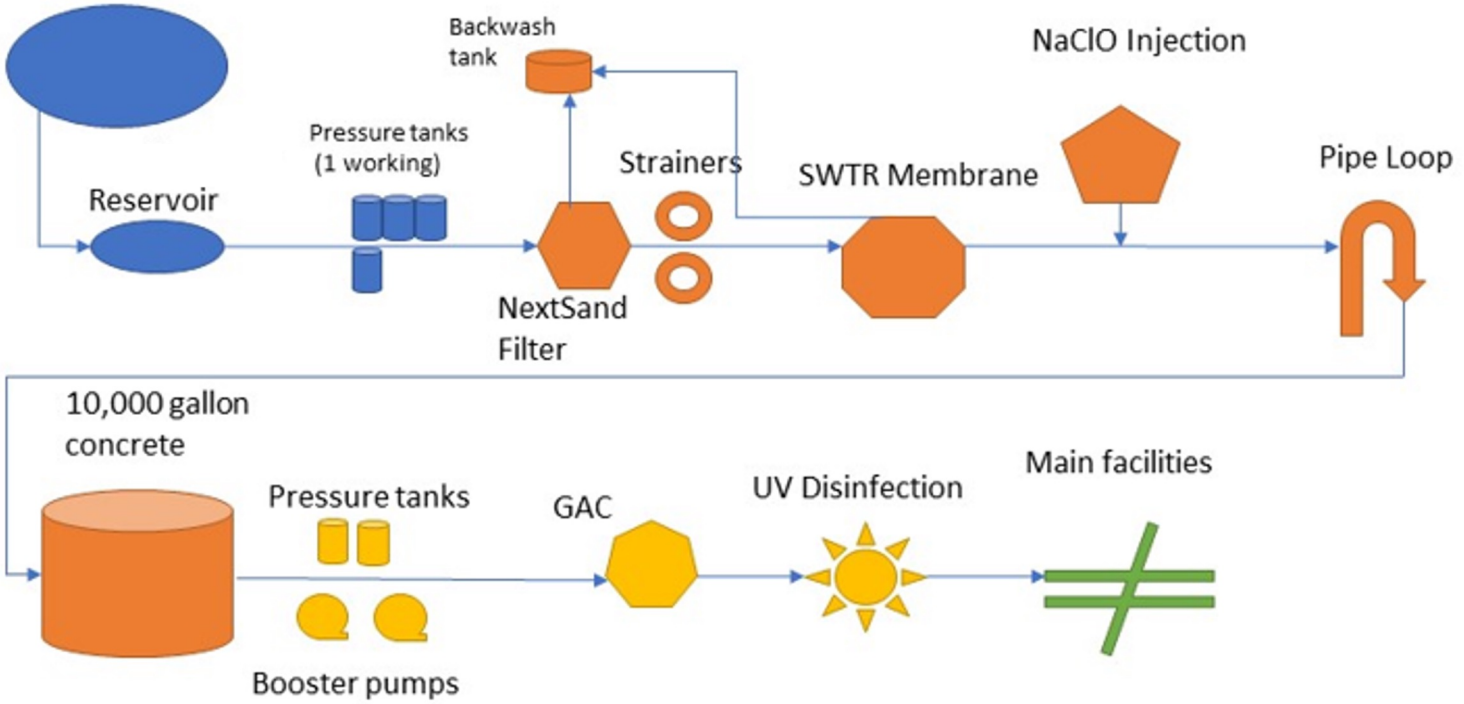
Good news: there are some potential actions one can take to minimize potential hazards

Bad news: there are a significant number of factors that we cannot see for typical self supplied water systems; without significant changes to design, routine quality monitoring and a full time certified operator, there are potential factors present beyond your control that can potentially create hazards

What does treatment look like at a PWS?

- Design is a rigorous process by drinking water engineers to ensure a reliable water system
- Certified personnel operate these complex PWS treatment systems on a full-time basis
- Intense monitoring requirements to ensure disinfection and filtration systems are working properly
- Equipped with alarms to detect shifts quickly
- Source water quality and more are monitored to anticipate treatment shifts
- Systems are constantly adapting and optimizing treatment, maintaining equipment, and planning for future regulations

PWS - Intake system of similar size



Funding Solutions & Consolidation

- Potential grant funding available to connect to a PWS
  - **Contact: Kiera Brown, GHD: 707-267-2270 or kiera.brown@ghd.com**

- Use this outreach tool to see if you are near a public water system to connect: Drinking Water System Outreach Tool (ca.gov)

- Contact: sydney.little@waterboards.ca.gov for more information

Any other questions?

Resources

- CA registered devices with health-related claims have been tested and certified by an independent, accredited certification organization:
  - NSF: http://www.nsf.org/
  - UL:https://industries.ul.com/plumbing-products-and-water-system-components/water-filtration/
  - WQA: https://www.wqa.org/
  - CSA:https://www.csagroup.org/testing-certification/product-areas/plumbing/water-quality-and-health-effects/
  - IAPMO: http://www.iapmo.org/rt

Resources

- Maintenance is important! Imperial Valley shares their experience on that here: POE Maintenance Manual_dec2021 by Vanessa Ramirez – Flipsnack
- CDC guidelines on boiling water: What-to-Do-During-a-Boil-Water-Advisory.docx (live.com)
- Is our Water Safe to Drink?
  https://www.mywaterquality.ca.gov/safe_to_drink/unregulated_dw_supplies/
- Cal-WATCH Resources Page:
  https://trackingcalifornia.org/projects/calwatch/resources#gsc.tab=0

Local Resources and laboratories

- Alpha Analytical Inc (Ukiah)
- Brejle and Race Laboratories Inc (Santa Rosa)
- CLERC (Lake County, bacteriological only)

2021 MICROCYSTIN LABORATORY LIST

(in order by distance from Clear Lake, CA)

Laboratory	Methods Available	Phone number
Kennedy Environmental	EPA Method 546 (ADDA ELISA)	(707) 530-5320
Bend Genetics	EPA Method 546 (ADDA ELISA)	(916) 550-1048
Eurofins Eaton Analytical	EPA Method 546 (ADDA ELISA) or EPA Method 544	(626) 386-1100
King County Environmental Laboratory	EPA Method 546 (ADDA ELISA) or EPA Method 544	(206) 477-7200
Beagle Bioproducts	EPA Method 546 (ADDA ELISA) or EPA Method 544	(614) 682-6588
LSSU Analysis Environmental lab	EPA Method 546 (ADDA ELISA) or EPA Method 544	(906) 635-2076
Greenwater Laboratories	EPA Method 546 (ADDA ELISA)	(386) 328-0882 (877) 869-2542

There are numerous other water quality analyses that may benefit a public water system from monitoring, including cell identification/density, enumeration, and pigments. A more comprehensive laboratory list is available here:
https://mywaterquality.ca.gov/habs/resources/field.html#laboratories

Please, contact our office if you have any questions at (707) 576-2145 or dwpdist03@waterboards.ca.gov.

What next?

- If you made changes to your treatment system since we last tested your water and are interested in a re-test, please complete the following form:
  - https://forms.office.com/g/G9CcycGGwi

- $50 Online MasterCard Gift
  - David will be reaching out via email to send the thank you gift cards

- Still have questions or concerns?
  - Contact David at david.chang@trackingcalifornia.org

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