

# PRIVATE WELL SAMPLING AND TESTING

A Guide for Public Health Laboratories



NOVEMBER 2019

## **Association of Public Health Laboratories**

The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public's health in the US and globally. APHL's member laboratories protect the public's health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

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# TABLE OF CONTENTS

<b>Introduction</b> .....	<b>4</b>
Purpose of this Guide .....	4
Goals.....	4
What’s in this Guide.....	4
<b>Private Wells: How Safe is the Water?</b> .....	<b>5</b>
Overview.....	5
Types of Contamination .....	5
Extent of Contamination .....	6
<b>Testing and Protecting Private Wells</b> .....	<b>7</b>
Testing Private Wells: Responsibility.....	7
Well Testing Process.....	7
Protecting Wells from Contamination .....	12
<b>Role of Public Agencies and Laboratories</b> .....	<b>13</b>
State and Local Regulations.....	13
Role of Public Laboratories.....	13
<b>Key Resources</b> .....	<b>17</b>
Centers for Disease Control and Prevention (CDC) .....	17
Environmental Protection Agency (EPA).....	18
United States Geological Survey (USGS).....	18
US Department of Agriculture, Cooperative Extensions.....	19
Policymakers .....	19
State, Local and National Stakeholders.....	19
<b>Appendix 1:</b> <b>New Hampshire “Be Well Informed” Report</b> .....	<b>21</b>
<b>References</b> .....	<b>29</b>

# INTRODUCTION

## PURPOSE OF THIS GUIDE

Millions of Americans rely upon private wells for their drinking water. But private wells are unregulated at the federal level, while regulations by state and local governments are variable and limited. However, all levels of government and other entities provide education and technical support to private well owners on appropriate testing and ensuring the quality of their private well systems.

This document presents information on sampling and testing actions to assess the quality of these water sources. This guidance is critical as private well owners bear the burden of testing and ensuring that their wells are free from contaminants.

The Association of Public Health Laboratories (APHL) developed this guide to provide information on private well testing and protection measures along with federal, state, local and other support available to well owners. This document was developed in follow-up to a 2017 APHL survey of private well water testing at public health laboratories nationwide, which stimulated discussions at APHL about ways to enhance private well testing services provided by public health laboratories.

The audience for this guidance includes agency staff (in state and local public health laboratories, public health departments and environmental agencies), well owners and policymakers. Users should note that this document's recommendations were not developed by an expert panel, but reflect current field information about protection of private well drinking water quality.

## GOALS

The goals of this document are to:

- Increase awareness about the need to regularly test private wells for contaminants
- Educate well owners and other stakeholders on the types of water testing and how often to conduct tests
- Identify resources to assist well owners in the interpretation of results and treatment options
- Identify other actions well owners and communities can take to minimize contamination of water.

## WHAT'S IN THIS GUIDE

This document includes the following sections:

- **Private Wells: How Safe is the Water?** Information is gleaned from various federal sources on the use of private wells in the US and the extent of well contamination. This section is of particular importance to private well owners.
- **Testing and Protecting Private Wells.** This section highlights the primary responsibility of private well owners in testing their wells and explains the testing process and potential remediation steps.
- **Role of the Public Agencies and Laboratories.** This section outlines the limited array of state regulations on private wells and the work of state and local agencies to support private well owners in assuring the quality of their drinking water. This section also outlines laboratory roles and responsibilities, like public education, testing, interpretation of results and other activities.
- **Key Resources.** Listed here are federal, state, national organization and other private well resources.

# PRIVATE WELLS: HOW SAFE IS THE WATER?

## OVERVIEW

Approximately 13 million American households obtain their water from private wells.<sup>1</sup> In most jurisdictions, private well owners are solely responsible for ensuring their water is free of contaminants. The US Environmental Protection Agency (EPA) regulatory reach is limited to public drinking water systems, which are governed by the federal Safe Drinking Water Act. EPA does not regulate private wells or promulgate criteria or standards, but does issue recommendations. A limited number of states have provisions on private well water safety and quality, while some counties within states have rules governing private well inspections.

The water in private wells comes from rainfall that is absorbed into the ground, where it is trapped in pores and spaces. Also known as an aquifer, this is “groundwater” that is accessed by wells. If groundwater becomes polluted from contaminants during runoff or through seepage, it can result in illness if consumed.

Potential sources of contamination include naturally occurring conditions and/or human activities. These range from minerals and metals that leach from the soil (e.g., arsenic, iron, manganese) to leakage from landfills, leaking septic tanks and pesticides.<sup>2</sup>

Testing well water is a relatively simple process. A sample of water from the well is analyzed by an accredited laboratory. This could be the state or local public health laboratory, an environmental laboratory or a private laboratory. Test kits are provided by the laboratory and can either be dropped off at the laboratory or sent by overnight delivery. The cost of testing varies, depending on the laboratory doing the testing and the number and type of tests conducted. Depending on the type of test, prices can range from a nominal fee to over \$500.

## TYPES OF CONTAMINATION

Significant health-related consequences can result from contaminated water. These include gastrointestinal illness from bacteria, viruses and parasites, heavy metal poisoning from lead, arsenic and other metals or poisoning from fertilizer or chemicals.

### Well Water Contaminants

Adapted from *Potential Well Water Contaminants and Their Impacts*<sup>3</sup>

Contaminant	Source of Contamination	Consequences
Microorganisms (e.g., bacteria, viruses and parasites)	Runoff from rainfall, snow melt, seepage from underground storage tanks and septic leach	Gastrointestinal illness
Nitrate and nitrites	Present in chemical fertilizers, human sewage and animal waste and fertilizers	High levels of nitrate/nitrites can cause methemoglobinemia (blue baby syndrome). Infants under the age of six months who consume water with high levels of nitrate can become ill and die.
Heavy metals (e.g. arsenic, antimony, cadmium, chromium, copper, lead, selenium and others)	Can leach into water from household plumbing and service lines. Activities by mining operations, petroleum refineries, electronics manufacturers, municipal waste disposal, cement plants can contaminate groundwater. Leaching can also occur from natural mineral deposits.	Exposure to high levels of heavy metals can result in acute and chronic toxicity, liver, kidney, and intestinal damage, anemia, and cancer.

Contaminant	Source of Contamination	Consequences
Organic chemicals	Found in many house-hold products and widely used in agriculture and industry, these chemicals can contaminate groundwater through waste disposal, spills, and surface water run-off.	Exposure to high levels of organic chemicals can result in damage to kidneys, liver, circulatory system, nervous system, and the reproductive system.
Radionuclides (i.e., radioactive forms of elements such as uranium and radium)	Can be released by uranium mining and milling, coal mining and nuclear power production. May also be naturally present in groundwater.	Exposure to high levels of radionuclides can result in toxic kidney effects and increased risk of cancer.
Fluoride	Naturally present in many aquifers.	Exposure to high levels can cause skeletal fluorosis, a condition that causes pain and tenderness of bones and joints. Exposure to high levels during formative tooth enamel development may cause dental fluorosis, which can result in tooth discoloration and pitting of teeth.

## EXTENT OF CONTAMINATION

The most recent national survey of the quality of private wells was conducted in 2009 by the US Geological Survey (USGS). It tested private wells in 48 states and found that about 23% of the wells had at least one contaminant at a level of possible health concern. Findings included:<sup>4</sup>

- “The contaminants most often found at these elevated concentrations were inorganic chemicals, such as metals, radionuclides and nitrate; all of these but nitrate are derived primarily from natural sources.
- Man-made organic compounds, such as pesticides and solvents, were detected in more than half (60%) of the domestic wells sampled, but concentrations were seldom greater than human-health benchmarks (less than 1% of wells).
- About half of the wells had at least one “nuisance” contaminant—a compound that impairs taste, odor or other aesthetic considerations—at a level or concentration outside the range of values recommended by the US Environmental Protection Agency.
- Microbial contaminants (for example, bacteria) were detected in about one-third of the approximately 400 wells that had their water analyzed for those contaminants.
- Contaminants found in domestic wells usually co-occurred with other contaminants as mixtures, rather than alone, which is a potential concern because the total toxicity of a mixture can be greater than that of any single contaminant.”

# TESTING AND PROTECTING PRIVATE WELLS

Many owners of private wells fail to get them tested as recommended. This can be due to a lack of awareness about the need to conduct testing, the cost of the tests, or simply the failure to take necessary steps to obtain a test kit and prepare and ship a sample to a laboratory.

Many state and local jurisdictions carry out activities to promote and support testing of private wells. However, there is still work to be done to ensure that private wells are regularly tested, whether on a voluntary basis or mandated by law.

## TESTING PRIVATE WELLS: RESPONSIBILITY

There are no federal requirements to test private wells, although EPA does issue recommendations. Only a limited number of states have regulations on private well testing. Government agencies focus mostly on education and referral of well owners to resources for testing, maintenance and remediation. Thus, the well owner has primary responsibility for assuring the quality of the water.

Property buyers should always test the well prior to purchase. This is often a requirement for mortgages. For rental properties, some states or localities have laws that designate the responsible party. Where no laws exist, an agreement should be reached between the tenant and landlord to ensure the well is maintained and the water supply remains safe. Renters should thoroughly review the rental agreement to make sure the responsibilities are outlined.

## WELL TESTING PROCESS

While there is some variation across jurisdictions in terms of recommended tests, at a minimum, the Centers for Disease Control and Prevention (CDC) recommends that wells be tested once a year for certain contaminants. Well owners should check with their state and/or local health department as there may be additional recommendations for the standard annual test depending on local groundwater conditions.

### Annual Test

CDC recommends that wells be tested each year<sup>5</sup> for:

- Total coliform bacteria
- Nitrates
- Total dissolved solids
- pH levels.

Coliform is a broad category of bacteria, most of which is not harmful to humans. It can result from fecal matter or be naturally occurring in the environment (e.g., soil, vegetation). The occurrence of coliform bacteria can be an indication of declining water quality and indicate the need for additional tests, such as more specific tests for fecal contamination and *E. coli*. The presence of nitrate can also indicate the presence of other contaminants, such as bacteria and pesticides.

## ADDITIONAL TESTS

**Volatile Organic Compounds (VOCs):** VOCs are chemicals that vaporize into air and dissolve in water. They are used in industry, agriculture, transportation and many household products. MTBE, benzene and industrial solvents are the most volatile organic compounds.

**Radiological Elements:** Some naturally-occurring radioactive elements dissolve easily in water (e.g., uranium, analytical gross alpha and radon).

**Synthetic Organic Compounds (SOCs):** SOC are man-made organic, carbon-based chemicals. They are used as pesticides, defoliants, fuel additives and as ingredients for other organic compounds.

**Per- and Polyfluoroalkyl Substances (PFAS):** PFAS are a large group of man-made chemicals that are resistant to heat, water and oil. They are used in a wide range of industrial and household products.

## Additional Tests

Other tests may be recommended at an additional cost. If well owners suspect a problem, they should do additional research and contact their state or local health department with any questions about possible contamination. Considerations that could indicate a need for additional tests include:

- Known problems with groundwater in the area (e.g., uranium, arsenic)
- Local changes that can impact groundwater (e.g., flooding, local development, chemical spill)
- Replacement or repair of well system
- Change in water quality (e.g., taste, odor, color).

EPA has developed an [interactive map](#)<sup>6</sup> on well water issues and resources by state. The map can help users identify water quality concerns in their area.

## Identify Reasons to Test your Water<sup>7</sup>

This table lists common conditions or nearby activities for consideration by private well owners. Not all of the substances listed pose an immediate or long-term health problem, and some may impact only the appearance, taste and odor of well water.

Conditions or Nearby Activities:	Test for:
Recurring gastro-intestinal illness	Coliform bacteria
Household plumbing or service lines that contain lead	pH, lead, copper
Radon in indoor air or region is radon rich	Radon
Corrosion of pipes, plumbing	Corrosion, pH, lead
Nearby areas of intensive agriculture	Nitrate, nitrite, pesticides, coliform bacteria
Coal or other mining operations nearby	Metals, pH, corrosion
Gas drilling operations nearby	Chloride, sodium, barium, strontium
Dump, junkyard, landfill, factory, gas station or dry-cleaning operation nearby	Volatile organic compounds, total dissolved solids, pH, sulfate, chloride, metals
Odor of gasoline or fuel oil, and near gas station or buried fuel tanks	Volatile organic compounds
Objectionable taste or smell	Hydrogen sulfide, corrosion, metals
Stained plumbing fixtures, laundry	Iron, copper, manganese
Salty taste and seawater, or a heavily salted roadway nearby	Chloride, total dissolved solids, sodium
Scaly residues, soaps don't lather	Hardness
Rapid wear of water treatment equipment	pH, corrosion
Water softener needed to treat hardness	Manganese, iron
Water appears cloudy, frothy or colored	Color, detergents

## Selecting a Laboratory

An accredited laboratory should be used to test water samples. This can be the state public health or environmental laboratory or a private lab. Most state websites on testing of private wells have listings of accredited laboratories. Accreditation entities include the National Environmental Laboratory Accreditation Program (NELAP) and/or state accreditation programs. These laboratories can answer questions about testing. They will also provide testing kits.

Considerations in selecting a laboratory include cost—public laboratories may be less expensive than private laboratories—and location.

## Collecting Water Samples

Water samples must be carefully collected in the appropriate containers to ensure that there is no external or cross-contamination. Homeowners should contact their local health, state health or environment departments for sampling and testing guidance specific to their region. Accredited analytical laboratories may also advise on sampling and provide sampling containers.

Prior to collecting a water sample, the owner should ensure that the well water system is clean. A dirty well can harbor contaminants, such as bacteria, even if the water is uncontaminated. If the owner is unsure about the cleanliness of the well, a qualified well water system contractor can determine if the system needs to be cleaned.

In most cases the owner collects a tap water sample. Some laboratories send a technician to collect the sample and some jurisdictions have sanitarians or staff from other public agencies that collect samples.

In collecting a sample, it is important to carefully follow the laboratory's instructions to get accurate water test results. Careful attention should be paid to cleanliness. Nothing but the tap water should come in contact with the opening of the bottle or the inside of the cap.

How to take a sample depends on the test being performed:

- Some contaminants such as lead and copper may require that water remains stagnant in the pipes for a minimum of six hours and is collected upon the first draw of water.
- Some contaminants require that the water be flushed or run for a minimum period of time before collecting the sample.
- Some contaminants require special sample bottles and procedures.

Timeliness is also important. Some contaminants deteriorate or change form with time. Most water samples need to be kept cool when being taken to the laboratory, and some sample kits include coolers. To ensure accurate results, samples should be provided to the laboratory within the time frame specified in the instructions.

## Interpreting Results

A report of test results includes a list of the contaminants that were included in the test, the contaminants identified and their concentrations. The report may note any contaminants that exceed recommended drinking water standards. In many jurisdictions, laboratory or health department staff are available to help owners understand their results. Some jurisdictions have online tools that are designed to help owners understand their results.

Well owners should keep their results for future reference.

## Providing Test Results: New Hampshire’s “Be Well Informed” Online Tool

Understanding the laboratory report that provides the results of a water test can be challenging for well owners. This makes acting on the results and addressing any identified contamination difficult. Prior to launching the “Be Well Informed” online tool (<https://www4.des.state.nh.us/DWITool/Welcome.aspx>), New Hampshire’s Department of Environmental Services (DES) received 300-400 calls per year from private well owners requesting help interpreting their results and determining appropriate treatment. DES was concerned about the accuracy and consistency of the information being provided to owners. In addition, DES had received feedback related to some of their educational materials. The public found them difficult to understand and too long. In response, DES developed an online tool designed to ensure that users receive accurate and easy to understand information about when contamination requires treatment and what treatment steps should be taken.

The “Be Well Informed” online tool is on the DES website. It is an open source XML program housed on the DES server. Since its launch in fall 2015, over 5,000 private well owners have used the tool. Users enter their test results in an online template. The water result summary tells users whether their water meets federal and state health-based standards (Maximum Contaminant Levels) and aesthetic guidelines (Secondary Maximum Contaminant Levels). If the water exceeds or is approaching established federal/state drinking water limits for the contaminants entered, additional health information and treatment options are shown. Users can save their report as a PDF that can be retained for future reference and provided to water treatment professionals. An example of a results report is provided in the appendices.

### Development Process

DES received a grant from CDC in 2013 that included funding for the online tool. While other states had developed online interpretation tools that provided static answers in response to test results, DES wanted a dynamic application that could address multiple contaminants, prioritize responses, and include additional consideration for the owner (e.g., a test for contaminants that are frequently found together if it was not initially conducted).

**Planning.** DES assembled a design team that included staff from the Drinking Water and Groundwater Bureau (including a water treatment engineer and a hydrologist) and staff from New Hampshire’s public health laboratory. The team consulted with industry representatives including water treatment professionals, well drillers, and private laboratories that sample and test water.

**Selecting a Contractor.** While the state had a listing of approved IT contractors, DES opted to release a request for proposals since there was concern the approved contractors might not possess the necessary capabilities to develop the tool. A contractor was selected from multiple applicants.

**Development.** The design team finalized the algorithm and the logic models, which required significant effort and lots of input from team members and stakeholders. A key role for one of the team members was to serve as a program manager and interface with the contractors to finalize logic models. In particular, the team wanted to ensure that users received detailed information on their treatment options and what actions should be taken first.

Writing the narrative (answers that are provided) also required considerable work. The narrative focused on how to interpret the laboratory report, recommended treatment (provided in an infographic), and potential health issues and treatments. Plain language, with limited technical terms and scientific jargon, was used for the narrative to make it as understandable as possible for users.

**Testing.** The state has standard quality assurance requirements for coding projects. In addition, the contractor tested the code to ensure accurate delivery of results. DES tested the tool hundreds of times to ensure it accurately followed the logic model. In addition, focus groups were conducted with members of the public to test ease of use and whether the information provided was understandable and helpful.

**Maintenance.** Since it is coded in XML, DES IT staff are able to maintain the tool and carry out any necessary modifications. This is cost effective in that DES is not dependent on the contractor on an ongoing basis.

**Feedback.** When users receive their report they can opt in to participate in a SurveyMonkey survey. Users who opt in receive an email invitation to participate in the survey about three months after they used the tool. The survey asks if users found the tool useful, whether they were inclined to do something about the results, and if they actually followed the treatment recommendations. While most respondents say that the tool is useful and that they are inclined to act on the information, fewer report having actually taken action.

### **Development Steps**

- Assemble planning group
- Engage other stakeholders
- Develop logic models and algorithm
- Develop specifications and draft request for proposal
- Select contractor
- Develop software
- Conduct quality assurance testing
- Conduct focus groups
- Launch and promote Be Well Informed
- Receive ongoing feedback through online survey

### **Broader Dissemination of “Be Well Informed”**

The EPA E-Enterprise Portal is making “Be Well Informed” available to states. E-Enterprise is designed to promote innovation and collaboration. DES estimates that it cost \$135,000 to develop “Be Well Informed.” Through E-Enterprise, approximately 10 states are in the process of modifying “Be Well Informed” to create their own online tools at a fraction of the cost. More information on E-Enterprise is available at <https://www.epa.gov/e-enterprise/e-enterprise-portal>

## **Treating Contaminated Wells**

There are various treatment options depending on the type of contamination, and local health departments are a good source of information. A well water system contractor can also help to determine the most appropriate option. Once the well has been treated or the new treatment system is in place, it should be retested to ensure that the problem has been addressed.

Before a problem can be addressed, well owners should take precautions to protect the health of drinkers in the short term. This includes drinking bottled water or installing approved water treatment devices at each tap where consumable water is obtained. If water treatment devices are used, the owner should make sure that they filter the contaminant of concern.

# PROTECTING WELLS FROM CONTAMINATION

Owners can take steps to avoid well water contamination.

## Location of the Well Site

The site for a new well should be carefully considered. Wells should be sited at least 200 feet from a landfill, garbage dump or cesspool and at least 50 feet from a septic tank, unless state or local codes or regulations are more stringent. When possible, wells should be located at higher elevations than the surrounding areas to decrease the possibility of contamination.<sup>8</sup> Many states and localities require permits for wells, and have codes and regulations in place to help ensure water safety. There are many resources to help owners identify an appropriate site and engaging qualified contractors should also ensure that an appropriate site is chosen.

## Regular Testing

Many states and counties encourage private well owners to test their well water on a regular basis. Annual testing is often recommended for select contaminants (e.g., nitrate, coliform bacteria). Less frequent testing is recommended for other contaminants.

## Maintenance

The Water Systems Council recommends creation of a well maintenance log and a specific well maintenance schedule for inspection and testing of well water, as well as for water treatment systems.<sup>9</sup>

## Avoiding Contamination

Well owners can take steps to prevent contamination.<sup>10</sup> Some preventive steps include:

- Keeping hazardous chemicals (e.g., paint, fertilizer, pesticides, motor oil) away from the well.
- Inspecting and maintaining septic systems on the property.
- Do not allow driveway, roof or road runoff to collect around the well.
- Ensuring snow or leaves do not collect around the well.
- Keeping livestock and pet waste away from the well.

## Taking Action After a Flood

Flood waters can carry a wide range of contaminants (e.g., sewage, chemicals). Following a flood, a well and pump inspection should be conducted. If the well has been covered in flood water, emergency disinfection is necessary. Following disinfection, the water should be tested.<sup>11</sup>

## Remediation

State and local agencies engaged in activities to promote testing of private wells report that well owners often have difficulty interpreting testing results, identifying appropriate treatment and managing the costs of treatment.

## PREVENTIVE APPROACHES

There are many preventive actions that can be taken to limit the contamination of groundwater. The agricultural community can reduce the use of pesticides and fertilizers. In areas with hard winters, communities are taking steps to reduce the amount of salt on the roads as the chemicals are absorbed by the groundwater. Quickly containing and addressing chemical spills can reduce contamination of groundwater.

# ROLE OF PUBLIC AGENCIES AND LABORATORIES

## STATE AND LOCAL REGULATIONS

There are no federal regulations on private wells, although federal agencies provide recommendations and extensive technical guidance. Regulation is also limited at the state and local levels. A limited number of states have regulations on private well testing. Some of these provisions only apply to landlords or wells serving multiple units. Counties often have provisions in building codes and permitting processes.

One example is New Jersey's Private Well Testing Act. Passed in 2001, it requires sellers or buyers of a property with wells to test the untreated water for a variety of water quality parameters and to review the test results prior to closing of title. Under the law, landlords are required to test the well water once every five years and provide a copy of the results to each tenant. The law was amended in 2018 to include additional contaminants determined to have detrimental health effects. A report<sup>12</sup> by the New Jersey Department of Environment Protection provides details about the law and its implementation.

North Carolina General Statute 87-97 requires counties to have programs for permitting, inspecting and testing private wells. Wells must be tested for bacterial and chemical contaminants within 30 days of completion. Samples are obtained by health department or laboratory staff. Connecticut also requires testing of newly constructed wells.

The Michigan Safe Drinking Water Act only applies to private wells that serve more than 25 people.<sup>13</sup> Michigan has prepared sampling guidance for testing the presence of PFAS in private wells,<sup>14</sup> and also recommends well testing for arsenic.<sup>15</sup>

Florida does not have well testing regulations for single-family homes or individual rental units, but does have requirements for wells that serve multiple rental units or commercial property, under either the state's Limited Use Public Water System rule or the Florida Safe Drinking Water Act. The state's Landlord/Tenant Law places responsibility on the landlords to maintain plumbing in good working condition. Some Florida counties have rules on testing of new well and repairs.<sup>16</sup>

## ROLE OF PUBLIC LABORATORIES

The role of states—and public laboratories—is primarily focused on recommendations and education of well owners, along with support to help them ensure the quality of their drinking water. A 2017 survey<sup>19</sup> by APHL and Private Well Class provides insights into the role of state and local public health and environmental laboratories in private well testing. Distributed to 37 state public health and environmental laboratories and a local laboratory directors' Listserv®, the findings from the survey focus on the capability and capacity of public health and environmental laboratories.

- About 70% of state public health laboratories and 57% of local public health laboratories accept private well water samples from the public.
- Public health laboratories test an annual median of approximately 4,000 (state) and 1,000 (local) private well samples. There was significant variability in the number of tests conducted. One state laboratory tested 50,000 samples and another tested 20,000. A local laboratory reported conducting 4,000 tests.
- Approximately 75-84% of local and state public health laboratories rely on fee-for-service to support the private well testing program.

A 2018 brief by the National Conference of State Legislatures provides additional insights on state regulations and recommendations on private wells.<sup>17</sup> According to the National Association of County and City Health Officials (NACCHO), 56% of local health departments regulate, inspect or license private drinking water in their community.<sup>18</sup> Local jurisdictions may have their own codes and permitting processes. They may also be directly involved in testing activities, such as the county level sanitarians in Iowa.

## Community Outreach: New Hampshire's Community Workshops

Through a collaboration of the New Hampshire Department of Environmental Services (DES), the New Hampshire Public Health Laboratory (PHL) in the Department of Health and Human Services (DHHS), and the Dartmouth Toxic Metals Superfund Research Program (DTMSRP), over 22 well water workshops have been held in the state since 2016. Lack of awareness and inconvenience are significant issues in getting owners to test their private wells. The workshops have proven effective in removing these barriers.

A core team with representatives from the various agencies (DES, the PHL and DTMSRP) work together informally to plan the workshops in cooperation with local organizers. The agencies do not have staff dedicated to promoting testing of private wells. This activity allows for the leveraging of staff and resources across agencies.

Key to holding the community workshops is identifying a local “champion” to organize the event. This is usually a health officer, town planner, member of the local conservation commission or another volunteer who is responsible for identifying the venue and promoting the event. The Well Water Community Engagement Action Toolkit, which was developed by DTMSRP under contract to DES and DHHS with support from CDC, provides information on how to organize workshops in addition to other community-level actions.

- Total coliform, *E. coli* and nitrates/nitrites are the most frequent analytes tested by state and local public health laboratories. Arsenic and lead (state) and fluoride (local) also are frequently tested.

Public laboratories often collaborate with environmental and public health agencies for testing, interpretation of results and education.

## Education and Support

Many public health and environmental laboratories carry out activities to encourage private well owners to test and maintain their wells. There are multiple levels to this education and outreach process, including:

- Creating awareness about why, when and how to test private wells.
- Making it easier to obtain and deliver sample kits (i.e., convenience).
- Helping well owners understand the results of the tests and identify necessary steps to reduce or eliminate the contamination.

Activities include developing and distributing brochures, giving presentations with partners, providing information on laboratory websites, performing outreach at community events and state fairs, newspaper advertisements and the provision of free testing during water-related emergencies (e.g., flooding, bacteria outbreaks). Some public laboratories are prohibited from advertising their services, which limits their ability to engage in these types of activities.

A local health district in Michigan provides an example of how counties and regional agencies may assist private well owners with an explanation of well testing, collecting and shipping of samples, and lists of public and private laboratories that can conduct testing.<sup>20</sup>

Florida refers owners to county health departments for guidance on conducting well testing and provides a listing of the state's NELP certified laboratories. Online information is targeted to well owners, tenants, landlords and business owners and covers

State and local health departments have information on private wells, including basic facts, testing, maintenance of wells, listings of certified laboratories and more. See a complete map-based listing at the US EPA's Private Drinking Water Well Programs in Your State (<https://www.epa.gov/privatewells/private-drinking-water-well-programs-your-state>)

The core team has a prepared presentation on the importance of testing private wells, how to collect samples, interpreting the results, and treatment options. Speakers are pulled from the core team, depending on availability and proximity to the event.

The PHL provides testing kits for the events (and sometimes private laboratories do as well). For most of the workshops, the local organizers coordinate delivery of samples to the laboratory. Several days after the event participants bring their samples to a designated drop-off site. Organizers collect payment and deliver the samples. Some communities even pay for the tests. Results are sent directly to the well owner.

A key consideration in holding the workshops is scheduling. The team needs to ensure that speakers are available. Laboratory capacity is also an issue. Prior to scheduling an event it is necessary to check with the laboratory to make sure that they will not be engaged in another water-related testing activity and will be able to process a large number of samples within the usual turnaround time.

The Well Water Community Engagement Action Toolkit is available at <http://www.dartmouth.edu/~toxmetal/assets/pdf/wellwatertoolkit.pdf>

potential contaminants, how and when to test and well maintenance equipment. The site provides information in English and Spanish.<sup>21</sup>

## Testing and Providing Results

Public health and environmental laboratories, along with private laboratories, test samples of well water and provide results. While EPA has [analytical methods](#)<sup>22</sup> that must be used when testing public water systems, these requirements do not apply to private wells.

Many laboratories use the EPA analytical methods for private well water testing. The laboratory should be certified to perform the methods that they are using.

Laboratories provide results by various methods including mail, email, fax and phone. Laboratories report that they will immediately call the well owner if the contamination constitutes a significant health threat.

Some states provide support for testing via various means. This can help to address the cost barrier for owners.

## Interpreting Results

State and local agencies engaged in activities to promote testing of private wells report that well owners often have difficulty interpreting testing results and identifying appropriate treatment.

Well owners often contact local health departments, state environmental agencies and laboratories for help interpreting their results. Many states now have online tools to help owners understand their results and identify treatment options.

## Surveys

Some laboratories are conducting surveys to determine the extent of contamination in private wells or other water sources on an ongoing basis (see Iowa Well Survey).

## Promoting Water Quality: Iowa's Multilevel Approach

Iowa has approximately 110,000 unregulated private wells that provide drinking water to nearly 300,000 people, primarily in rural settings. It is estimated that less than 7% are tested annually, as recommended, for basic quality indicators.

As the principal environmental and public health laboratory for the State of Iowa, the State Hygienic Laboratory (SHL) at the University of Iowa conducts routine testing, incident response testing and proactive contamination studies to increase awareness about water testing and reduce exposure risks. The laboratory serves as a statewide resource and provides guidance materials, expert consultation services and professional training.

The SHL maintains capacity and certification to test private well water for chemical, microbiological and radiological contaminants using EPA-recommended protocols and methods. Advanced instrumentation includes ion chromatography-inductively coupled plasma-mass spectrometry (IC/ICP/MS) for the determination of metals such as arsenic and metals species such as arsenite, arsenate and mono- and dimethyl-arsenate. High-pressure liquid chromatography-tandem mass spectrometry (LC/MS/MS) provides for the determination of fungicides, pesticides, pesticide degradates, pharmaceutical compounds, hormones and many other environmental contaminants.

The multifaceted private well testing program is sustained through close collaborations with the Iowa Department of Public Health, the Iowa Department of Natural Resources, the University of Iowa Center for Health Effects of Environmental Contamination and county health departments.

### Private Well Water Testing

The Iowa Groundwater Protection Act of 1987 established the Grants-to-Counties Private Water Well program, which subsidizes testing and remediation of private wells and plugging of abandoned wells and cisterns that present a contamination risk to groundwater. Nearly all of Iowa's counties participate in the Grants-to-Counties program, providing discounted or free water sampling and analysis for qualifying private drinking water systems and wells. The program is coordinated by the Iowa Department of Public Health, which provides funding directly to counties. Testing results are publicly available through the Iowa Private Well Tracking System, a statewide database managed by the Iowa Department of Natural Resources.

Each county is responsible for education and outreach activities. Residents can request a test by contacting the county environmental health sanitarian. In many counties, the sanitarian collects the water sample and coordinates delivery to either the SHL or a private laboratory.

The SHL tests between 6,000–7,000 samples each year although it has the capacity to do many more. Typically, results for tests for coliforms and nitrates are available in 2-3 days. Radiological results may take several weeks. Laboratory staff are available to help owners understand results. Sanitarians also help owners interpret results and determine any necessary next steps.

Given that proper sample collection is paramount to testing, the laboratory conducts an annual training for sanitarians with information on testing of private wells, including proper sampling techniques, how to order sample kits, and information on common testing parameters. Laboratory scientists are available to provide consultation for testing needs, as well as explaining analytical results. Experts at the lab work with a multitude of collaborators to determine possible health implications of exposure and mitigation strategies.

It is important to note that even when the barrier of cost is removed and there is professional assistance available for sampling, many well owners still do not have their well tested on an annual basis. This is an indication that greater education and outreach efforts are necessary to increase awareness about the importance of testing private wells.

### Iowa Well Survey

Initiated by the SHL in 2017, the Iowa Well Survey is a sustained, statewide program to reach more private well owners and

present them with an opportunity to have their well(s) tested, free of charge, by leveraging a well-established network of environmental health professionals and dedicated state funding through the Grants-to-Counties program. The survey collects information on the concentration and distribution of existing and emerging contaminants that affect the health of those consuming water from private wells. The goal of the survey is to build awareness in private well owners about the need for annual testing. Since the launch of the survey, water testing through the Grants-to-County program has increased more than four-fold.

Each sample is analyzed for parameters that provide a basic indication of water quality, including total coliform and E. coli bacteria, nitrite + nitrate as nitrogen and total arsenic, which is prevalent in the north central region of Iowa and in other localized geographic formations in the state. Additional compounds of study have included neonicotinoid insecticides, common nitrogen-containing herbicides and associated degradate compounds, glyphosate, manganese, lead and copper.

Since the inception of the program, the SHL has worked with 50 Iowa county environmental health departments to collect samples from private wells across the state. When possible, both untreated and treated water samples are collected in order to evaluate the effectiveness of treatment systems on the targeted contaminants. In the 2018 survey, samples were collected from 961 wells.

Survey results by county and state provide valuable information about the prevalence and distribution of various contaminants for the benefit of both well water consumers, state officials, and researchers. In 2018, concentrations of total coliform bacteria were found in approximately 45% of sampled wells, all exceeding EPA's Maximum Contaminant Level (MCL). Arsenic was found in 36%, nitrate in 12% and E. coli in 11% of wells tested.

Treated samples were collected from 280 homes. The four contaminants were often found in the treated water at levels both above and below EPA's MCL, indicating that treatment systems do not ensure the safety of the water.

The SHL website contains information for well owners about the testing process, how to interpret results, and treatment options. See State Hygienic Laboratory at the University of Iowa. <http://www.shl.uiowa.edu/env/privatewell/ordering.xml>

## KEY RESOURCES

The following section presents information on resources and key stakeholders related to the testing of private wells and their activities in this area.

### CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

CDC's National Center for Environmental Health (NCEH) and its Agency for Toxic Substances and Disease Registry (ATSDR) investigate risks for exposure in drinking water and the health effects from non-infectious contaminants (e.g., metals, pesticides, nitrates, and toxic chemicals). CDC identifies hazardous exposures and makes recommendations to minimize risk for exposure and reduce health-related consequences.

NCEH launched the Private Well Initiative (PWI) in 2010. The first activity was the establishment of a national workgroup made up of federal partners, states and non-governmental organizations to create a national workgroup. The workgroup identified the vision and goals of PWI and will provide guidance on an ongoing basis. The goals are:

- Increase data, information and knowledge about the current status and conditions of private wells and other unregulated drinking water sources (UDWS) nationwide.
- Identify, assess and promote Information about interventions and approaches to address private well and UDWS concerns.

PWI provides funding to state health departments for the development of internal partnerships to identify sources of data on private well characteristics and well water quality.

NCEH's [Safe WATCH](#)—Safe Water for Community Health—program funds state and local health departments to improve their activities on reducing exposure to contaminants from private water sources. Safe WATCH's webpage includes case studies and a wide range of tools and resources (brochures, videos, case studies guides and websites) that can serve as examples to other jurisdictions.

Safe WATCH promotes the Environmental Public Health Performance Standards (EnvPHPS) to help jurisdictions assess and improve the ability of drinking water programs to apply the 10 Essential Environmental Public Health Services. EnvPHPS is a set of standards that describe the optimal performance and capacity for environmental public health systems and programs with the aim to help make environmental public health programs and systems more effective. EnvPHPS is used to assess agencies, systems and programs.

**Private Ground Water Wells.** Sections include: basics, siting and contaminants, testing, treatment, maintenance, emergency treatment and diseases and contaminants. <https://www.cdc.gov/healthywater/drinking/private/wells/index.html>

**Private Well Initiative.** <https://www.cdc.gov/nceh/hsb/cwh/pwi.htm>

**Safe WATCH.** <https://www.cdc.gov/nceh/ehs/safe-watch/index.html>

**Well Testing Resources.** <https://www.cdc.gov/healthywater/drinking/private/wells/testing.html>

**Well Treatment Resources.** <https://www.cdc.gov/healthywater/drinking/private/wells/treatment.html>

**Safe Water Program Improvement e-Learning Series.** For safer well water through stronger public health programs. <https://www.cdc.gov/nceh/ehs/elearn/swpi.html#udw>

## ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA does not regulate private drinking water wells but does provide a wide range of resources for well owners. The agency regulates public water systems through the Safe Drinking Water Act, which includes requirements related to the analytical methods for testing waters. Many public and private laboratories use these same analytical methods to test water from private wells. In addition, EPA establishes MCLs and Human Health Benchmarks for Pesticides (HHBPs). MCLs are the maximum permissible level of a contaminant in the water of a public water system. HHBPs have been developed for approximately 394 pesticides to help jurisdictions and water systems better determine if pesticides found in drinking water may present a public health risk. They are non-enforceable and non-regulatory.

**Prevent Water Well Contamination.** <https://www.epa.gov/privatewells/protect-your-homes-water#preventwellanchor>

**Methods Approved to Analyze Drinking Water Samples to Ensure Compliance with Regulations (Analytical Methods).** <https://www.epa.gov/dwanalyticalmethods>

**Private Drinking Water Well Programs by State (interactive map).** <https://www.epa.gov/privatewells/private-drinking-water-well-programs-your-state>

**Protecting Your Well.** <https://www.epa.gov/privatewells/protect-your-homes-water#preventwellanchor>

**What to Do in a Flood.** <https://www.epa.gov/privatewells/what-do-your-private-well-after-flood>

## UNITED STATES GEOLOGICAL SURVEY (USGS)

USGS analyzes natural hazards related to water, energy, minerals and other natural resources. It researches the quality and availability of groundwater and works with drinking water facilities and municipal suppliers to monitor and assess the quality of

the water used, whether it is from groundwater, lakes, rivers or reservoirs. It also studies the quality of drinking water from private wells and potential issues for concern.

**Resources on Private Wells.** <https://www.usgs.gov/mission-areas/water-resources/science/domestic-private-supply-wells>

**2009 Study on Private Wells.** [https://www.usgs.gov/mission-areas/water-resources/science/domestic-private-supply-wells?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/mission-areas/water-resources/science/domestic-private-supply-wells?qt-science_center_objects=0#qt-science_center_objects)

## US DEPARTMENT OF AGRICULTURE, COOPERATIVE EXTENSIONS

Many cooperative extensions provide information for private well owners. A website directory provides links to cooperative extension programs in each state.

**Land-Grant University Website Directory.** <https://nifa.usda.gov/land-grant-colleges-and-universities-partner-website-directory?state=All&type=Extension>

## POLICYMAKERS

Elected officials, at all levels of government have significant control over the quality of drinking water, as seen by the impact of the Safe Drinking Water Act. A legislative brief released by the National Conference of State Legislatures (NCSL) in February 2018 summarizes recent actions by state legislatures related to unregulated drinking water systems such as private wells.<sup>23</sup> NCSL also tracks recently passed laws and pending legislation.

Another valuable policy resource is *Closing the Water Quality Gap: Using Policy to Improve Drinking Water in Federally-unregulated Drinking Water Systems*.<sup>24</sup> Developed by the nonprofit ChangeLab Solutions with support from CDC, the resource examines policy solutions to improve water quality, including those to ensure the safety of private well water. It discusses the role of health departments and gives examples of state and local policies.

## STATE, LOCAL AND NATIONAL STAKEHOLDERS

Local policymakers, nonprofit organizations and individuals have a long history of getting involved in ensuring the safety of drinking water, from taking on local polluters to placing reminders on storm drains that runoff flows to local water sources. Key stakeholders to include in local outreach and information efforts include local health professionals and hospitals, neighborhood associations, health advocacy organizations, environmental and conservation organizations and other community-based groups.

Community-based organizations and other stakeholders are important because they often have direct ties to the community. They are a trusted source of information and have existing methods of communication (e.g., newsletters, Listservs®, social media). In addition, they often know how to communicate in a language the community understands and have an appreciation for values and issues that will resonate with the community.

At the local level, engaging stakeholders early in the planning process can be very beneficial. They can provide insight into how to reach key target populations and issues that will resonate most strongly with those audiences. They can also help to recruit focus

## LEGISLATIVE RESPONSE: WISCONSIN'S TASK FORCE ON WATER QUALITY

Wisconsin's Speaker's Task Force on Water Quality was formed in early 2019 in response to a request from two representatives concerned about a report showing widespread contamination in private wells in southwestern Wisconsin. The task force, which includes both representatives and senators, is charged with making recommendations on assessing and improving the quality of surface water and groundwater. Members will hold public hearings around the state to gather information on concerns specific to various regions.

See <https://legis.wisconsin.gov/2019/committees/assembly/STF-WQ/>

group participants who can assist with development of materials that are clear, well-designed and address the community's concerns.

**Association of Public Health Laboratories.** <https://www.epa.gov/privatewells/protect-your-homes-water#preventwellanchor>

**ChangeLab Solutions.** [http://www.changelabsolutions.org/sites/default/files/Closing-the-Gap\\_Water\\_Regulation-%26-Policies\\_FACT\\_SHEET-FINAL\\_20170725.pdf](http://www.changelabsolutions.org/sites/default/files/Closing-the-Gap_Water_Regulation-%26-Policies_FACT_SHEET-FINAL_20170725.pdf)

**National Conference of State Legislatures.** <http://www.ncsl.org>

**Well Owner.** This National Groundwater Association website presents information on well water basics, maintenance, water quality/quantity, testing and finding a contractor. The site also presents training webinars and maintains a listserv. <http://wellowner.org/>

**Private Well Class.** A collaboration, funded by EPA, between the Rural Community Assistance Partnership and the University of Illinois through the Illinois State Water Survey at the Prairie Research Institute. The program uses a combination of online and in-person methods to increase the knowledge and competency of private well owners. <http://privatewellclass.org>

**Resources for Communities and People (RCAP) Solutions.** The private well assessment tool and NEHA accredited workshops educate sanitarians, environmental specialists and other stake holders to assist well owners to identify potential water quality issues. Well owners in the Northeast can request a well assessment. <https://www.rcapsolutions.org/private-wells/>

**Water Systems Council.** <https://www.watersystemscouncil.org/>

# APPENDIX 1: NEW HAMPSHIRE “BE WELL INFORMED” REPORT



The State of New Hampshire  
DEPARTMENT OF ENVIRONMENTAL SERVICES  
Results from the NHDES Be Well Informed Guide  
Created Nov 12, 2019



Information provided in this report is for informational purposes only and should not be substituted for direct consultation with a qualified water treatment professional. Other conditions or factors related to your well or home not considered by this online guide may determine the most appropriate water treatment option.

## YOUR DRINKING WATER RESULTS SUMMARY

Based on what you entered from your laboratory report, the Results Summary below indicates whether your water meets federal and state health-based standards (Maximum Contaminant Levels - MCLs) as well as other guidelines (Secondary Maximum Contaminant Levels - SMCLs, health advisory levels, etc.). These standards and guidelines are often referred to as "limits" on your laboratory report. If your water exceeds or is approaching established federal/state drinking water limits or advisory levels for the contaminant(s) entered, additional health information and treatment options will be shown. **Several contaminants, such as radon and sodium, do not have state or federal standards.** Instead, when radon is present in drinking water at 2,000 pCi/L or greater, NHDES recommends homeowners [consult NHDES Fact Sheet WD-DWGB-3-12 \(Revised 3/14/2016\)](#). For sodium, the Be Well Informed tool provides health and treatment information when sodium is present at levels above 20 mg/L, U.S. EPA's federal "health advisory" for persons on a physician-prescribed "no salt diet."

### Results Summary

Value entered meets the Drinking Water Limit.
 Value entered is close to the Drinking Water Limit.
 Value entered is above the Drinking Water Limit.

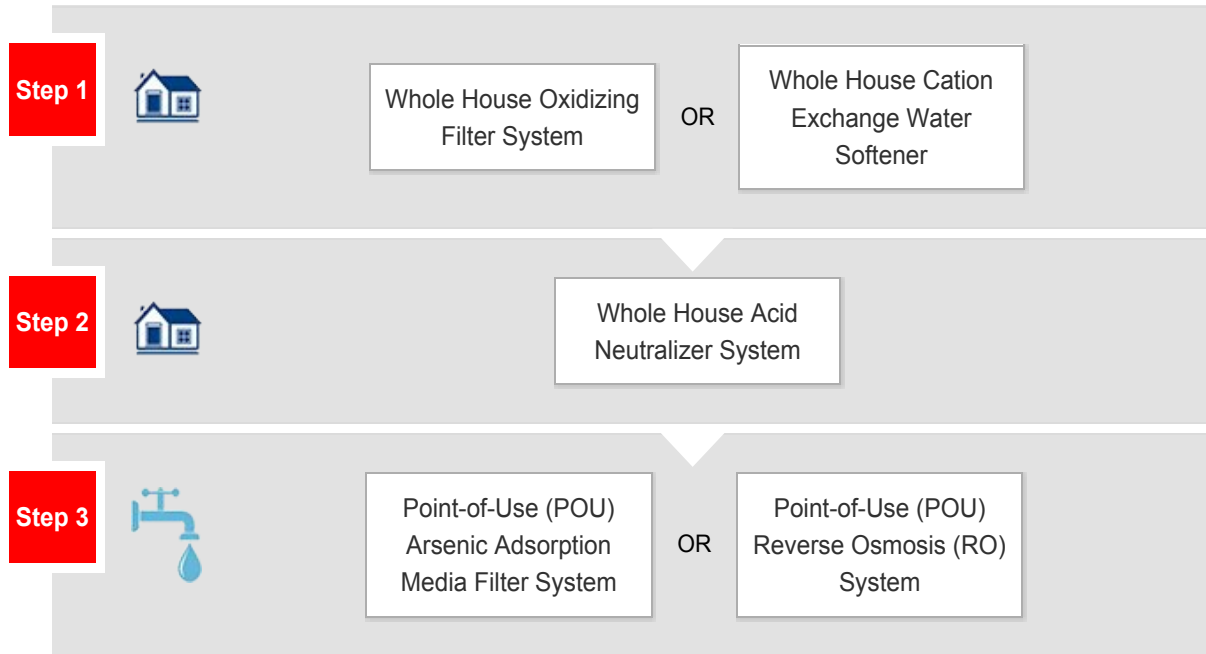
🔍	Routine Analysis	γ	Water Test Value Entered	‡	Drinking Water Contaminant Limit or Radon Advisory Level	Ū	About Your Well Water?
	Arsenic		10 µg/L = (0.01 mg/L)		0.01 mg/L		The value entered exceeds the drinking water standard
	Copper		.2 mg/L		1.3 mg/L		The value entered meets the drinking water standard
	Copper Stagnant		1.2 mg/L		1.3 mg/L		The value entered meets the drinking water standard
	Iron		.07 mg/L		0.3 mg/L		The value entered meets the drinking water guideline
	Lead		.011 mg/L		0.015 mg/L		The value entered meets, but is near, the drinking water standard. Collect another water sample to confirm the results of your first sample.
	Lead Stagnant		.050 mg/L		0.015 mg/L		The value entered exceeds the drinking water standard
	Manganese		.3 mg/L		0.05 mg/L		The value entered exceeds the drinking water guideline
	pH		6 units		6.5-8.5 standard units		See your results for lead and copper.



## Water Treatment Systems That Remove Arsenic, Lead Stagnant, Manganese

The following water treatment is based on the water quality information you entered. [Details concerning water treatment are below.](#)

### Treatment Order



Regardless of water treatment technology, it is essential that system maintenance be performed on schedule to maintain system effectiveness.

**What does “whole house” mean?** The term whole house indicates that the treatment technology is installed at the point where water enters your home to treat all of the water used in your home.

**What does “Point of Use” (POU) mean?** Point of Use technologies are installed and treat water at one specific location in your Home where water is used, like your kitchen faucet.

Print this report and make final water treatment decisions with a qualified [water treatment professional](#).

More Information about selecting appropriate water treatment devices is available from [NSF](#) and [Cooperative Extension](#).

More Information is available from [NHDES](#) and [US EPA](#)



## Results Detail

- Value entered meets the Drinking Water Limit.  
 Value entered is above the Drinking Water Limit.  
 Value entered is close to the Drinking Water Limit.  
 A Value was Not Entered

Ê Routine Analysis	γ Water Test Value Entered	‡ Drinking Water Contaminant Limit or Radon Advisory Level	Ũ About Your Well Water?
Arsenic	10 µg/L = (0.01 mg/L)	0.01 mg/L	The value entered exceeds the drinking water standard



Ê Routine Analysis	ÿ Water Test Value Entered	‡ Drinking Water Contaminant Limit or Radon Advisory Level	Ũ About Your Well Water?
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### Interpretation of Results:

**Does my well water meet the drinking water standard for arsenic?** No, your water does not meet federal and state drinking water standards as it contains more than 0.010 mg/L of arsenic.

### Health Concerns:

**Can consuming water containing arsenic affect my health?** Consuming water containing more than 0.010 mg/L of arsenic is associated with an increased risk of cancer of the skin, bladder, lungs, kidneys, nasal passages, liver, or prostate as well as diseases of the nerves, lungs, heart, and immune and endocrine (hormonal) systems. Your individual health risk depends on the amount of arsenic in your water, how much of the water you drink each day, and the number of years you drink the water. To reduce your exposure to arsenic in your well water, treat the water that you use for drinking and cooking to a level less than 0.010 mg/L. You can continue to use your water for washing food and dishes, brushing your teeth, bathing, showering, and for other uses.

### Treatment Options:

**How can I reduce the level of arsenic in my water?** In addition to arsenic, your test results show that your water also contains more than 0.1 mg/L of iron and manganese, which must be considered in the selection of a water treatment system. Install one of the following water treatment systems to reduce the level of iron, manganese, and arsenic in your water:

1. An NSF/ANSI Standard 42 certified whole house oxidizing filter system that uses chlorine or permanganate as the oxidizing agent to reduce the level of iron and manganese. This type of system will also reduce the level of arsenic in your water, though by how much depends on the levels of iron, pH, and arsenic. You may also need to install one of the following systems if additional arsenic reduction is needed:
  - a. An NSF/ANSI Standard 53 certified arsenic adsorption media filter system. This system may be a point-of-use (POU) system at your kitchen sink designed to treat only the water that you consume, or it may be a whole house system; or
  - b. An NSF/ANSI Standard 58 certified point-of-use (POU) reverse osmosis (RO) system at your kitchen sink designed to treat only the water that you consume.

**OR**

2. An NSF/ANSI Standard 44 certified whole house cation exchange water softener to reduce the level of iron and manganese, in combination with one of the following systems to reduce the level of arsenic:
  - a. An NSF/ANSI Standard 53 certified arsenic adsorption media filter system. This system may be a point-of-use (POU) system at your kitchen sink designed to treat only the water that you consume, or it may be a whole house system; or
  - b. An NSF/ANSI Standard 58 certified point-of-use (POU) reverse osmosis (RO) system at your kitchen sink designed to treat only the water that you consume.

If your arsenic level is 0.025 mg/L or more, request an "arsenic speciation test" from your laboratory to ensure that the treatment method being considered results in the best possible reduction of arsenic. More information about treatment for arsenic can be found in [NHDES' Fact Sheet](#).



É Routine Analysis	ÿ Water Test Value Entered	‡ Drinking Water Contaminant Limit or Radon Advisory Level	Ũ About Your Well Water?
Chloride	None	250 mg/L	A value was not entered
Copper	.2 mg/L	1.3 mg/L	The value entered meets the drinking water standard
Copper Stagnant	1.2 mg/L	1.3 mg/L	The value entered meets the drinking water standard

**Interpretation of Results:**

**Does my well water meet the drinking water standard for copper?** Yes, your water meets federal and state drinking water standards as it contains less than 1.3 mg/L of copper.

**Health Concerns:**

**Can consuming water containing copper affect my health?** Consuming water containing less than 1.3 mg/L of copper is not harmful to most people. However, if you or someone in your household has Wilson’s Disease, you should talk with your doctor about the level of copper in your water. The presence of copper in your water may also indicate that other pollutants, such as lead, may be present in your water.

**Treatment Options:**

**What should I do?** If you haven’t already done so, you should also test your water for lead, which can cause serious health problems, especially for babies, children, and pregnant women.

Fluoride	None	2 mg/L (guideline); 4 mg/L (limit)	A value was not entered
Hardness	None	-	A value was not entered
Iron	.07 mg/L	0.3 mg/L	The value entered meets the drinking water guideline
Lead	.011 mg/L	0.015 mg/L	The value entered meets, but is near, the drinking water standard. Collect another water sample to confirm the results of your first sample.
Lead Stagnant	.050 mg/L	0.015 mg/L	The value entered exceeds the drinking water standard



Ê Routine Analysis	ÿ Water Test Value Entered	‡ Drinking Water Contaminant Limit or Radon Advisory Level	Ũ About Your Well Water?
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**Interpretation of Results:**

**Does my well water meet the drinking water standard for lead?** No, your water does not meet federal and state drinking water standards as it contains more than 0.015 mg/L of lead.

**Health Concerns:**

**Can consuming water containing lead affect my health?** Consuming water containing more than 0.015 mg/L of lead can cause serious health problems, especially for babies, children, and pregnant women.

Babies and children who consume water containing more than 0.015 mg/L of lead could experience long-term problems with physical and mental growth and development, including slowed body growth, kidney problems, hearing problems, seizures, brain damage, lower IQ level, trouble learning, reduced attention span, and behavior problems.

Pregnant women and their unborn babies are especially at risk from consuming water containing more than 0.015 mg/L of lead. Lead exposure can seriously harm the unborn baby, causing premature birth, lower birth weight, and delayed mental and physical development.

Adults who consume water containing more than 0.015 mg/L of lead may be at higher risk for cancer, stroke, and high blood pressure and could develop nervous system problems, kidney problems, anemia, and decreased sperm production in men.

The presence of lead in your water may also indicate that other pollutants, such as copper, may be present in your water.

You can continue to use your water for washing food and dishes, brushing your teeth, bathing, showering, and for other uses, as these are not considered major sources of exposure.

**Treatment Options:**

**What should I do?**

1. If you haven't already done so, you should also test your water for copper.
2. Use only water from the cold-water tap for drinking, cooking, and especially for making baby food and formula. Hot water from the tap is likely to contain higher levels of lead and copper. In most cases, you can reduce the level of lead and copper in the water that you use for drinking and cooking by clearing the water from the pipes before using it. Click [here](#) for instructions on flushing out your plumbing.
3. Lead (and copper) levels may be high in your water because of the materials used in your home's plumbing and how acidic your water is. Metals, such as lead and copper, can leach from pipes and plumbing fixtures when water is acidic. If you haven't already done so, you should also test the pH of your water, which will tell you if your water is acidic.

If your water is acidic (pH is less than 7.0), install a whole house acid neutralizer system, such as a calcite filter, to increase the pH and make the water less acidic, which should reduce the level of lead (and copper) in your water.

Another option is to remove the source of lead by replacing your lead or galvanized iron pipes and fittings, lead-soldered pipes, and brass or chrome fixtures with other approved materials, such as plastic.



⌵ Routine Analysis	γ Water Test Value Entered	‡ Drinking Water Contaminant Limit or Radon Advisory Level	Ũ About Your Well Water?
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In most cases, flushing out your plumbing will reduce the lead (and copper) level in your water. The routine of letting the water run to get the lead (and copper) out should be done each morning and if the water has not been used for more than six hours – for example, overnight or during the day when you have been out of the house. To “flush the tap,” turn on the cold

✘	Manganese	.3 mg/L	0.05 mg/L	The value entered exceeds the drinking water guideline
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**Interpretation of Results:**

**Does my well water meet the drinking water guideline for manganese?** No, your water does not meet federal and state drinking water guidelines as it contains more than 0.05 mg/L of manganese.

**Health Concerns:**

**Can consuming water containing manganese affect my health?** Consuming water containing more than 0.3 mg/L of manganese is not harmful to adults; however, it may be harmful to children. Studies suggest that elevated levels of manganese may affect the brain development of children, possibly causing changes in behavior and a decreased ability to learn and remember.

Pregnant women, babies, and children under three years old should not consume water containing 0.3 mg/L or more of manganese. Extra care should be taken with formula-fed children, as certain formulas contain manganese, and if prepared with water that also contains manganese, the child may get a higher dose than the rest of the family. To reduce your family’s exposure to manganese, treat the water that you use for drinking and cooking to reduce the level of manganese to be less than 0.3 mg/L or use an alternative source of water that contains less than 0.3 mg/L of manganese.

Elevated levels of manganese can cause a metallic taste, bad smell, rusty-colored water, mineral deposits or sedimentation, or brown or black staining on laundry or surfaces that come in contact with the water. None of these effects poses a health risk.

Elevated levels of iron or manganese (commonly found together in water wells) may also cause the growth of iron or manganese bacteria, which produce a slime that can clog filters and plumbing. Although these bacteria can make water unappealing and cause a bad taste or smell, there is no health risk associated with them.

**Treatment Options:**

**How can I reduce the level of manganese in my water?**

Install one of the following whole house water treatment systems:

1. An NSF/ANSI Standard 44 certified cation exchange water softener.

**OR**

2. An NSF/ANSI Standard 42 certified oxidizing filter system that uses chlorine or permanganate as the oxidizing agent.

More information about treatment for manganese can be found in [NHDES’ Fact Sheet](#).



Ê	Routine Analysis	ÿ	Water Test Value Entered	‡	Drinking Water Contaminant Limit or Radon Advisory Level	Ũ	About Your Well Water?
•	Nitrate-N	None		10	mg/L		A value was not entered
•	Nitrite-N	None		1	mg/L		A value was not entered
	pH	6	units	6.5-8.5	standard units		See your results for lead and copper.
•	Sodium	None		60	mg/L		A value was not entered
•	Total Coliform	None		0	CFU/100 mL or Absent		A value was not entered
•	E. coli	None		0	CFU/100 mL or Absent		A value was not entered
•	Radon	None		2000	pCi/L		Test both the air in your home (if you live below the third floor) and in your water (unless it is from a dug well) for radon. More than half of all private wells in New Hampshire have high radon.
•	Uranium	None		30	µg/L		Test your water. Studies show that many private wells in New Hampshire have high uranium.
•	Gross Alpha	None		15	pCi/L		Test your water. Studies show that many private wells in New Hampshire have high gross alpha radioactivity.
•	PFOA	None		12	ppt		Test Your Water
•	PFOS	None		15	ppt		A value was not entered
•	PFNA	None		11	ppt		A value was not entered
•	PFHxS	None		18	ppt		A value was not entered

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