Connecticut Department of Public Health

Keeping Connecticut Healthy

CT Environmental Health Association (CEHA)
Fall Chloride Workshop: November, 14, 2018

Sodium & Chloride in CT, from a Private Well Water Perspective

Connecticut Department of Public Health Environmental Health Section

Private Well Program
Sodium & chloride standards for private well water:

- **Sodium (Na):** CT DPH Guidance Level for Private Well water, **100 mg/L** (ppm)

- **Chloride (Cl):** CT MCL, **250 mg/L** (ppm)
Sodium & Chloride in Connecticut: Understanding the Standards

- Sodium and chloride are commonly found in nature and in the human diet.

- Sodium: Potential health concerns for those on a medically restricted sodium diet because of certain heart, kidney or blood pressure conditions.

- Standards also help keep water from:
  - Tasting salty
  - Harming household plants and gardens
  - Having a corrosive effect on plumbing and appliances (lead & copper)
**Sodium & Chloride in Well Water: Health Considerations**

**Introduction**

Sodium and chloride are elements that are not highly toxic and comprise the basic components of common table salt. However, they can create concerns when they appear at elevated levels in drinking water. This fact sheet describes the potential sources, health risks and target levels of sodium and chloride in drinking water.

There are no enforceable federal or state standards for the level of sodium in drinking water. However, there is a CT DPH guidance level of 100 mg/L for sodium that reflects current scientific and medical opinion on sodium dietary restrictions in those at risk for high blood pressure. The amount of sodium in a normal diet is 10 to 20 times higher than this guidance level. Adhering to this level ensures that drinking water does not become a substantial source of daily sodium, even for those on a sodium-restricted diet.

The Connecticut Maximum Contaminant Level (MCL) for chloride in public water system and private wells is 250 milligrams per liter (mg/L). Aside from the potential health concerns with sodium and high blood pressure, these sodium and chloride limits are intended to keep the water from tasting salty and from having a corrosive effect on plumbing.

**How Does Sodium & Chloride Get Into Wells?**

Sodium and chloride are elements that are very common in nature and in the human diet. They occur naturally in groundwater, typically at low concentration. However, sources such as road salt, both its storage and application to roads in winter, can be a significant source to groundwater. Other potential sources include industrial waste, sewage, fertilizers, water softener discharge, and living in coastal areas where sea water can influence the quality of groundwater.

In certain cases, the elevated sodium may come from a water softener as most softeners allow some sodium to enter the filtered water. The CT DPH guidance level of 100 mg/L applies to that case and any other reasons why sodium becomes high in a water supply well. Some water softeners use potassium chloride as the exchange agent to remove water hardness instead of sodium chloride. If this is the case, it is also important to monitor for potassium in tap water and inform your physician of the results.

**Testing for Sodium Chloride**

To determine if sodium and/or chloride are present, test your water. Follow the laboratory instructions and obtain a good sample. Take precaution to not cross contaminate the sample and properly handle and store it.

**Corrective Action**

If chloride is present at levels above the state MCL of 250 mg/L, you should take steps to limit exposure. The level health department and the state Department of Energy and Environmental Protection (DEEP) can help determine whether the sodium or chloride concentrations may be coming from. If your doctor has prescribed a sodium-restricted diet, the level of sodium in your water exceeds the recommended level, you should consider identifying the source and take corrective action.

Water with elevated sodium or chloride can increase the risk of kidney disease, heart disease, and stroke. The levels of sodium and chloride in your water can influence the quality of your water supply.

**Protecting Your Private Well Water**

You can protect your water by paying careful attention to the land use activities that occur near your well. Regular testing and monitoring practices can help ensure that your well supplies you with good quality water.

Connecticut Department of Public Health
PO Box 340308, Hartford, CT 06134-0308
http://www.ct.gov/dph

**Environmental & Occupational Health Assessment Program**

860-509-7740 • http://www.ct.gov/dph/epha

**For More Information:**

Treatment Questions:
Protective Wells: 860-594-7333
Public Wells: CT DPH Drinking Water Bureau: 860-509-7333
Private Wells: CT DPH: http://www.ct.gov/dph/epha

Health Questions:
860-509-7740

Source Investigation: CT DEEP, contact the District Manager for your region, go to http://www.ct.gov/deep/cwp/view.asp?a=7715&u=14994&v=2&x=0&y=0

What Health Effects Are Caused by Drinking Sodium & Chloride Every Day in Tap Water?

There have been many studies on the potential effect of dietary sodium on blood pressure. Epidemiology studies show that in some cases lowering sodium intake to the official American Heart Association goal of 1500 mg per day can have a beneficial effect on blood pressure. In many cases, the typical diet delivers greater amounts of sodium than this goal. For most people, sodium in a water supply well does not present a substantial or unique health risk because the level obtained from the diet is much less than from the tap water. However, certain individuals may be at particularly high risk for sodium or chloride intake. Such individuals should test their water and chloride concentrations to determine if it is above 100 mg/L. Testing is recommended for private wells. For public supplies, CT DPH has a notification level of 28 mg/L that requires supplies to notify their customers at that level or for higher levels. However, that value is dated and the new 100 mg/L target can be used in discussion with your doctor regarding sodium in your drinking water.

As noted above, adults at risk for high blood pressure and related conditions are the sensitive group. We have no evidence that exposures to children at a school or day care center would lead to a health risk. Further, workplace exposures may tend to be of less concern than sodium in a residential supply given that most people consume more tap water at home than at work.

Chloride has a state MCL of 250 mg/L due to its presence in salty water and higher concentrations. While the level is elevated in concert with sodium.

Elevated levels of sodium and chloride can also increase the corrosive effects, which can lead to the development of cavities and increase the risk of tooth decay.

Testing for Sodium Chloride

To determine if sodium and/or chloride are present, test your water. Follow the laboratory instructions and obtain a good sample. Take precaution to not cross contaminate the sample and properly handle and store it.
Sodium & Chloride increases the conductivity of water, which can promote corrosion of copper plumbing and appliances. This may cause metals like lead and copper to leach from plumbing.

- Lead can cause adverse health effects to the brain, kidneys, nervous system, red blood cells and blood pressure. The severity of these effects varies upon the exposure concentration and the individual’s developmental stage at exposure. Young children and infants are especially vulnerable to lead poisoning.

- Copper is needed in the body in very small amounts, but at very high levels it can cause nausea, vomiting and diarrhea, and may cause damage to the liver and kidneys. People with Wilson’s Disease may be at greater risk of adverse effects of consuming drinking water with elevated levels of copper.
Sodium & Chloride in Connecticut: Potential Sources

Potential Na & Cl sources in groundwater:

✓ Natural sources in bedrock and soils
✓ Salt water intrusion (coastal areas)
✓ Road salt, storage and application to roads in winter
✓ Water softener treatment backwash discharge
✓ Water softener treatment
✓ Industrial waste
✓ Sewage
✓ Fertilizers
Sodium and Chloride in CT private wells:

✓ Increase in Na & Cl related inquiries and complaints from private well users and professionals

✓ Elevated Na & Cl levels can range widely

✓ Elevated levels sometimes present slightly higher after winter, in spring, then in other months

✓ Sometimes, levels of other naturally occurring minerals and metals are also increased such as, manganese, iron and hardness
Sodium & Chloride in Connecticut: Private Well Contamination Coordination Protocol

1. Critical Pollution Screening Levels. When a LID or DPH becomes aware of a single well with a significantly elevated level of a natural chemical in well water, they should contact the DPH PW program and inform them of the result. For purposes of this protocol, a significant elevation (as defined by the Water Quality Bureau) is an elevation of:
   - Arsenic > 100 ppb
   - Uranium > 500 ppb
   - Radon > 150 pCi/L
   - Fluoride > 3.7 ppm
   - Manganese > 500 ppb
   - Radium > 40,000 pCi/L

   Significant levels for zinc, copper, chromium, and selenium are based on the CT DPH Drinking Water Standards for Public Water Systems.

   The list of contaminants with respective elevated levels above is not intended to list a LID’s discretion to respond to any water quality test result at any level of detection, but rather provides general guidance on when action should be taken.

   The DPH PW program will then discuss follow-up options with the LID, as described below.

2. Whenever the LID or the DPH PW program become aware of any single well that is “significantly” elevated or if two or more wells with close proximity are over an MCL or action level, the drinking water advisory will notify the other agency. The DPH PW program will consult with the LID to discuss response options. The DPH PW program may also notify DPH if the LID has reason to believe these conditions are the result of surrounding land use or other nonmanc-made sources of pollution.

   The response options may include:
   - The LID will inform nearby residents about the elevated result and suggest they have a private lab test their well for chemical analysis.
   - The LID may install sampling wells in the vicinity and collect samples to the DPH lab. The LID may consult with the LID until they have tested from the area.
   - The town government may add the chemical in question to the LID.
   - Informing the entire town and recommending all private wells be tested through a private lab: fail.
   - If elevations in a town are very widespread, then a town compliance testing for new wells should be considered.

3. If testing undertaken by the LID indicates well water is contaminated:
   - Expanding the area where water sources are tested.
   - Consulting with the United States Geological Survey (USGS) or the CT State Geologist to consider geologic factors.
   - Informs the entire town and recommends all private wells be tested through a private lab: fail.
   - Expanding the area where water sources are tested.

   If elevations in a town are very widespread, then a town compliance testing for new wells should be considered.

4. Prompt labs are required to report testing data to the LID and DPH when the test was conducted in connection with the sale of a property, no later than thirty days after the completion of the test. This data should be reviewed promptly by DPH and LID to see if any elevations in naturally occurring chemicals have been documented. Private labs should be encouraged to alert LIDs and DPH when wells with significantly elevated test results are identified.

5. If elevated levels of naturally occurring chemicals are documented in a well area of a town, then the DPH PW program will consult with the State Geologist and the United States Geological Survey (USGS) to get an understanding of the underlying geology and its possible correlation to the elevated conditions. If a suspected geologic factor is determined in a neighboring town, the DPH PW program will notify that town of the possible follow up.

6. The DPH PW program will keep a database with all reported deviations for future analysis and reference.

   Cross Contaminants:

   Introductory: Cross-contaminations may often be detected when sampling a water supply well. When they do not exceed health criteria, they may warrant further evaluation or monitoring, but additional actions are necessary to protect human exposure when criteria are exceeded. The LID is typically the first for problems of bacterial contamination, and may also assume the lead for communication with the state sanitary engineer, as necessary. DEEP’s Subsurface Disposal and Agriculture Program may also be involved in evaluation of these issues associated with an activity under their jurisdiction. For most state-managed contamination, DEEP’s Remediation Division is involved.

   Whenever private well sampling results are above federal or state contaminant levels (MCL) or action levels, the agency conducting the results first should notify the other agencies. The local agency of discovery may seek additional information to substantiate the report before referring to the other two agencies.

   2. If the LID conducts any further investigations of contaminant emissions, they may use the general approach outlined in 1) and 3) above for progressive expansion of the study area. If this sampling identifies the source of the contamination, they should notify the owner of the property under the provisions of CGS 22a-63 (b) or (c).

   3. In the absence of a viable responsible party conducting an investigation, DEEP will often be the lead in investigating sources of manmade pollution, including sampling of nearby wells. DEEP will communicate with the LID on who will be collecting additional samples. Agency-ultimate sampling results should be shared with the other agency. Results of removals should be sent to DEEP but obtained by responsible parties sampling under DEEP’s Remediation Programs (i.e., Significant Environmental Hazard Programs, Potable Water Program, Pollution Abatement Order, Waste Supply Order, etc.) will be shared with the LID as they may require. However, if these results include contaminants of concern, follow-up approach in 4 below. Also, if DEEP identifies the source of the pollution, they will inform the LID if the contamination impacts or more private wells above established criteria, the DPH PW program will be advanced of DEEP’s investigation results.

   4. If testing of a private supply well by a responsible party is ordered by DEEP and identifies contaminants elevated above MCLs in Action Levels, the responsible party must notify the owner of the well, DEEP. DEEP then refers the LID within 24 hours. In addition, if not an occupant-occupied dwelling, the well (property owner must notify each lessee and each tenant in each rental unit within 24 hours. The LID is required to respond within 3 days of the notification by the owner has been made. (Reference CGS 22a-63 (c)) If testing is done by DEEP or the LID a similar notification to well owners and occupants of rental units should be made.

   5. The LID or DEEP can contact the CT DEP Private Well (PW) Program if there are questions about relevant treatment technologies and the extent of the problem. If there are health concerns around the residents impacted, the DEEP will refer concerns to the DPH Environmental and Occupational Health Program, which will then coordinate health notification with the LID. When necessary, DEEP will also coordinate with DEEP’s Drinking Water Section about the potential to connect affected houses with private wells to public water supplies if such supplies are nearby.

   All well owners with elevated test results should be referred to the DPH PW program to discuss relevant treatment technologies.

   Appendix Materials:
   - CT DPH, Action Level List for Private Wells
   - CT DPH, Sampling and Monitoring Guidance for Private Wells
## Sodium & Chloride in Connecticut: Private Well Contamination Coordination Protocol

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Maximum Contaminant Level (MCL)* mg/L</th>
<th>Action Level (AL)* mg/L</th>
<th>Guidance</th>
<th>Significant Elevation</th>
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<tr>
<td>Nitrate</td>
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<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite</td>
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<td>1</td>
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<td></td>
</tr>
<tr>
<td>Sodium</td>
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<td></td>
<td><strong>100</strong></td>
<td><em>(PRIVATE WELLS)</em></td>
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<td>Chloride</td>
<td>250 <em>(State of CT MCL)</em></td>
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<td>MCLs, ALs and significant elevations will vary per individual contaminant</td>
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<tr>
<td>Pesticides</td>
<td>MCLs, ALs and significant elevations will vary per individual contaminant</td>
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</table>

All levels in mg/L (ppm) unless specified otherwise

- Notify the other agencies
- Seek additional information
- Notify those potentially impacted
- Investigate and evaluate
  - Potentially identify source
- DPH Private Well Program can assist with treatment questions, etc.
- DPH Environmental and Occupational Health Program can assist with health concerns and questions
Sodium and Chloride may fall into either category. At high levels it is more likely the result of salt water intrusion or man made activity:

- Road salt, storage and application
- Water softener treatment & backwash
- Industrial waste
- Sewage
- Fertilizers
CT Department of Energy & Environmental Protection (DEEP) has primary responsibility to investigate private wells contaminated by **man made** sources of pollution and to identify responsible parties:

- DEEP does not investigate naturally-occurring pollution, **unless** it was mobilized by manmade activity

- Suspected man made contamination cases of sodium & chloride in private well water are generally referred to DEEP for follow up
Sodium & Chloride in Connecticut: Options When Levels are High

- Alternate Sources
  - Temporary use of bottled water
  - Replacement well
  - Other well related options
  - Connect to a public water supply (*if available*)
Sodium & Chloride in Connecticut: Options When Levels are High

- **Remove or mitigate** the contaminant source
  - Identify potential pathways, what may be causing the problem?
  - Mitigate vulnerability points
Proper wellhead maintenance may help make private wells less vulnerable to Na & Cl contamination.

Sodium & Chloride in Connecticut: Ways to Mitigate Vulnerabilities


In Connecticut, there are currently no maintenance requirements for private well water systems. Private well owners are responsible for the quality of their private well water and maintenance of their well water systems. Poorly maintained well water systems can act as a conduit for pollutants to enter your home drinking water.

Proper maintenance and operation of your well water system is an essential component to protecting the water quality supplied by your well. Even with proper maintenance, well water system equipment will eventually need repair or replacement. Consider performing the following items to be proactive in promoting the health and longevity of your well water supply and system:

- Test the quality of your well water; refer to Publication #24: Private Well Testing
- Keep the area around your well accessible
- Limit activities around your well that may contaminate your water supply, such as over applying fertilizers, pesticides and herbicides and store these products in watertight containers or in secondary containment
- Keep hazardous chemicals, such as paint, lawn chemicals, or other chemicals away from your well and store these products in watertight containers or in secondary containment
- Be aware of local land use activities that may affect your well water quality
- At least annually, inspect the exposed well casing and the area around it:
  - Is the exposed well steel casing in good shape?
  - Look for cracks, holes or signs of corrosion
  - Is the well cap watertight?
  - Check Bolts, rubber gasket, seals
  - If there is an electrical conduit at the well cap, is it watertight?
  - Is the top of your well casing at least six inches above the ground?
  - Does the ground around the well casing slope away from the casing?

- DUG WELLS:
  1. Well cap is in good condition and watertight to the well casing; 1a. 4-inches thick, 1b. 2-inch overlap
  2. Dug well casing or side wells, made of 4-inch thick watertight concrete, or other CT DPH approved material
  3. Top of the well casing is at least 6-inch above ground
  4. Ground should slope away from the well casing
  5. Watertight joints between well casing tiles or other approved material to a minimum depth of 10-feet below the ground surface
  6. Water line from the well to the home should be sealed watertight

- Take precautions to prevent the well from being struck by motorized machinery, such as lawn mowers or vehicles
- Prevent cross connections by installing hose bibb vacuum breakers on outdoor spigots
- Never place a water hose inside any type of container when mixing chemicals or solutions
- If there are old unused wells on your property, have them properly abandoned by a registered well driller
- If your well, well pump or water system requires repair or maintenance be sure to use an appropriately licensed individual
- Have your well water system inspected every five to ten years by a licensed professional well driller
  - Well pump and its components
  - Well tank and its components
  - Well head integrity
- Keep all well records, such as well completion and water quality reports in a safe, accessible place

Remember that private well owners are responsible for their private well water systems. When you routinely care for your well water system you improve your chances of avoiding a catastrophic problem in the future.

For more information regarding private wells please contact: CT Department of Public Health, Private Well Program, (860) 509-8401
Sodium & Chloride in Connecticut: Options When Levels are High

- **Treatment**
  - Point of Use vs. Whole House...
  - Things to consider
Sodium & Chloride in Connecticut: Residential Treatment Options

Point of Use (POU) vs. Whole House...

✓ Reverse Osmosis
✓ Distillation

Effective treatment options, however, whole house applications can be challenging or impractical due to efficiencies and cost
Reverse Osmosis (RO)

Pressure is used to force water through a semi-permeable membrane filter. Treated water is collected in a storage tank and a stream of concentrated contaminated water is sent to waste (reject water). --- POU and Whole House
Distillation

Uses evaporation and condensation. Water is boiled and vaporized, then condensing coils cool vapor back to water which is collected in a reservoir.

--- Generally POU