

## INTRODUCTION

### **Get Involved, Stay Involved**

This handbook is a guide to aid communications with government officials and other interested parties regarding chlorides. It is a collection of resources and information designed to support members, as well as to provide an education and solid grounding on chlorides for all interested parties, including industry members, customers, residents, legislators, regulators, water supply officials, state and local governmental units, engineering firms and political, public health and environmental leaders. Water softeners do contribute chlorides to the environment during regeneration. It is not the only source and not the largest. Holistic discussions of reducing chlorides in the environment are important. This handbook focuses on the critical role of water softeners and how optimization of water softeners can play its part in reducing chlorides.

Getting involved in the community and staying involved is the best way to be at the table when discussing approaches to reduce chlorides. Or any issue. For industry members, understand that your business and the industry at large can be part of the solution by getting to know your city representatives and mayor, demonstrating your business is involved in the community, and connecting with those who oversee the public water system and wastewater system. Follow public meeting notices.

Chloride levels from wastewater treatment systems are tracked and reported. Monitoring these reports can help identify communities that may be having discussions on how to reduce the chloride contributions from their wastewater treatment plants to the environment.

When a city begins discussions around chloride reduction specific to its wastewater treatment system, optimizing water softeners can be part of the solution. Uninformed decisions can cause water softener removal directives or bans instead. This is not in the best interest of the city or its residents. You need to be at these meetings and participate in discussions to provide education on the many possible options.

When addressing chloride reduction from wastewater treatment systems, there are typically four main stakeholders:

- City/Municipality
- Engineering Firms, if Contracted Already, to Focus on a Centralized Proposal
- Existing Customers
- All Residents, Including Other Businesses

This Handbook provides talking points, template letters, messaging, media campaign templates, frequently asked questions, and other resources to help engage with all four stakeholder groups.

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## MESSAGING PRINCIPLES:

### **CITY/MUNICIPALITY OFFICIALS**

#### Messaging Principles

As a part of the community, a strong message to city officials is the desire to work together to help the city and residents. Water treatment at the home may be considered essential to their well-being by residents with installed devices. Working to achieve the city's goals while continuing to allow residents access to their water treatment technologies can be accomplished together. By being a part of the conversation, the city will learn of more effective solutions and can call freely on industry experts volunteering their time to discuss the feasibility and costs of options the city may be considering.

Furthermore, communications to the community need to be accurate. If any message includes information on residential water treatment units, technology professionals in the field are willing to review and provide expertise and education to make sure misinformation is avoided.

#### *Key Points:*

- o Want to work together; be part of the conversation; provide expertise
- o Want the city to have information on all possible solutions
- o Want to achieve city's goals and continue providing residents with essential water treatment
- o Want to help the city avoid misinformation on messaging going out to residents

### **ENGINEERING FIRMS**

#### Messaging Principles

An engineering firm's objectives and approaches may differ from those of the city and its residents. In past experiences, the principal objective of engineering firms has been to address the city's wastewater treatment plant chloride discharge levels by proposing the city add necessary but also costly central hardness reduction (CHR) to the public water system. This is what they do best, but it requires much more input.

It is imperative to the integrity and success of any proposal for reducing chloride from the wastewater treatment plant that the city avoid taking in misinformation. To this end, central hardness reduction can be one effective component to a chloride reduction plan if planning, messaging, and execution are done in tandem with local water treatment experts and their solutions as another component to a comprehensive chloride reduction plan. By working together, the lower hardness levels achieved through new central hardness reduction will be augmented by water treatment professionals reoptimizing water softeners to increase salt efficiency. Although optimization of water softeners can happen without the new central hardness reduction to reduce chloride and vice-versa, collectively they can make even greater reduction possible.

Since central hardness reduction and residential water softening are not the same thing and do not provide the same benefits to the city or particularly to its residents, it is fundamentally unfair to the community to push a tactic of banning or suggesting the removal of water softeners when adding central hardness reduction. Too often central hardness reduction, because it is so very expensive, is pitched as a one stop shop when reality is that it is but one important step in the solution for the city and its residences.

Proper communication is key. Messaging on proposals of central hardness reduction must address what it can deliver and what it cannot deliver to the city and the community. Central hardness reduction can reduce hardness, however, not to the same extent as cation exchange water softening which can reduce hardness to below 1 grain per gallon of hardness, providing residents with soft water with all of its benefits. On its own, the addition of central hardness reduction will not reduce chloride discharge sufficiently unless there is a partnership with local water treatment experts to capitalize on the benefit central hardness reduction

provides, a decrease of hardness, and optimize the water delivered to residents while effectively reducing chloride discharge. The city, engineering firm, and local water treatment professionals working together on the project can reoptimize water softeners to increase its salt efficiency. This is where the chloride reduction from central hardness reduction can be truly maximized.

### *Key Points:*

- Want to work together
- Want to help avoid misinformation
- Do not support messaging to remove household treatment to lower a proposal's economic impact

## **EXISTING CUSTOMERS**

### Messaging Principles

To address possible misinformation on proposals for central hardness reduction that do not clearly state what it can and cannot provide to the community and/or messaging suggesting that the removal of water softeners will reduce costs to existing customers, it is critical that water treatment professionals and experts provide effective education on what water softeners are and the needs they address.

Existing customers already experience the benefits of soft water from water softeners but might not know the difference between the water delivered by central hardness reduction alone and the water delivered by their water softeners because of a confusing similarity and much imprecision in the language used. Remind existing customers that water softeners provide soft water, i.e., water with 1 grain per gallon or less of hardness. Central hardness reduction reduces some hardness but does not provide soft water.

Provide background on the benefits your customers most value. [See Talking Points for a list of water softener benefits.] Teaching existing customers about water softeners and soft water will help them ask the right questions and understand the difference between what central hardness reduction can provide vs. what a water softener provides.

Demonstrate environmental stewardship by providing existing customers with support on how they can improve their salt efficiency by having their water softener optimized by a trained technician. This will also save the customer money on salt. This message is important at any time. It shows a business's commitment to the environment and community. It may also become part of an optimization plan with the city.

### *Key Points:*

- Explain what soft water is and the benefits of water softeners
- Proactive education prevents harmful misinformation
- Help optimize salt efficiency

## **ALL RESIDENTS**

### Messaging Principles

Educating all residents on what soft water is and the benefits of water softeners will help them ask the right questions and understand the difference between what central hardness reduction can and cannot provide. Your education also helps them to understand what a water softener can provide. [See Talking Points for a list of water softener benefits.]

### *Key Points:*

- Explain what soft water is and the benefits of water softeners
- Proactive education prevents harmful misinformation
- Offer expertise

## TALKING POINTS

*Always keep in mind your audience, tone, and messaging. WQA is available to assist you in preparing for meetings, presentations, and other advocacy and educational activities. Also see FAQs.*

Build on your story. Below are notes from brainstorming sessions to help get started.

- Your business:
  - Supplies a need.
  - A part of the community.
  - Strives to provide effective, efficient, innovative solutions to water problems.
  - Environmental stewards who are conscious of sustainability and the environment; who encourage and embrace new technologies; and who support life-long learning to continue innovation.
  
- Background on water softeners:
  - Ion exchange water softeners are among the most common ways of softening water. The typical ion exchange system consists of a pressure tank filled with sulfonated resin beads. The system removes hardness ions from water and replaces them with softer ions, such as sodium. The system includes a connected brine tank holding salt, which periodically regenerates the resin beads. The unit's tiny beads attract and bond to calcium and magnesium ions as water passes through them. Regeneration occurs when the beads are saturated with calcium and magnesium ions. The system rinses them with salt, which scrubs off the mineral deposits and prepares the beads to adsorb hardness ions again.
  - Water softeners may also be installed to remove barium, strontium, iron or other divalent cations.
  - Systems that measure and meter water use, and regenerate accordingly are called demand-initiated regeneration (DIR) and are more efficient because they only regenerate as needed.
  - Systems that automatically regenerate on set time intervals are called time clock units. Sometimes time clock systems regenerate more often than necessary, using salt needlessly, or alternatively, they leave users with hard water when water demand is higher than anticipated on the time clock schedule.
  
- Benefits of a water softener:
  - A water softener addresses a number of user issues in residential, commercial, and industrial settings caused by hard water. These include the following in households:
    - Hard water can lead to stiff, dingy laundry; mineral deposits on dishes and glassware; high or excessive soap usage and the expanded need for fabric softeners; extra cleaning and the use of more cleaning products to remove soap curd on bathtubs and shower stalls; higher energy costs, possibly due to scale build-up in pipes and on appliances; problematic scale buildup in sinks, faucets, and appliances.
    - Hard water can compromise or void warranties on certain water using appliances (check specific warranty for hardness level limits and stated warranty terms, conditions and limitations).
  - A water softener helps water heaters and major appliances operate more efficiently by preventing clogs in showerheads, faucets, and drains from scale build up, thus extending the useful life of appliances.
  - A water softener provides hot water energy savings.
  - A water softener can address certain contaminants in drinking water, including the reduction or removal of barium, strontium, iron or other divalent cations.

- A water softener can aid a household member with eczema.
- Independent research shows that softened water has a positive impact on certain skin issues. See the following studies:
  - *Association Between Domestic Water Hardness, Chlorine, and Atopic Dermatitis Risk in Early Life: A Population-Based Cross-Sectional Study* (2016).
  - *Prevalence of Atopic Dermatitis in Infants by Domestic Water Hardness and Season of Birth: Cohort Study* (2016).
  - *The Effect of Water Hardness on Surfactant Deposition after Washing and Subsequent Skin Irritation in Atopic Dermatitis Patients and Healthy Control Subjects* (2017).
- Independent research also supports a number of the broad benefits of residential water softening [see research citation section]:
  - *Benefits of Removal of Water Hardness From a Water Supply* (Battelle Memorial Institute 2009) funded by the Water Quality Research Foundation (WQRF).
  - *Detergent Savings Study* (Scientific Services S/D, Inc. 2010) funded by WQRF.
  - *Laundry Savings Study* (Scientific Services S/D, Inc. 2010) funded by WQRF.
- Optimizing Water Softeners:
  - Sustainability and environmental impact are shared priorities.
  - Support a holistic approach to discussing sources of chloride and engage on solutions.
  - Support a process for prompt professional review by a trained technician and proposed unit adjustments to optimize water softener salt efficiency.
  - Consider small or no cost programs for salt use efficiency visits to customers (which might be included in maintenance plans, rental unit trade outs, etc.).
  - Educate customers as to how improving the salt efficiency of water softeners will reduce chloride discharge, save homeowners salt expense; support a city's decision to permit access to the benefits of softened water.
  - Note that rigorous independent research has been conducted on chloride reduction through softener optimization undertakings and softener upgrade programs [see research citation section]:
    - *The Reduction of Influent Chloride to Wastewater Treatment Plants by the Optimization of Residential Water Softeners* (Madison Metropolitan Sewerage District, Wisconsin 2015) funded by WQRF.
      - The MMSD Study can be used as a model approach for other municipalities addressing chloride discharge challenges. It importantly concluded that on average, softener optimizations for existing in place units could reduce the concentration of chloride by approximately 27% while replacement with systems meeting a 4,000 grains/lb. salt efficiency benchmark could reduce the concentration of chlorides by approximately 47%.

## MEDIA

*Below are resources for media outreach to personalize and use as needed. To review templates on letters to stakeholders, news releases, social media posts, or print media ads, go to APPENDIX E-G.*

*Please contact WQA to notify us of new local issues or developments, to coordinate outreach and/or to learn if the association has ongoing initiatives.*

*You can also touch base with WQA's Communications Team to request assistance on social media posts or for help on social media video segments. To prepare for a radio interview with Wes Bleed @ WQA, contact him at [wbleed@wqa.org](mailto:wbleed@wqa.org).*

### **How to Find the Press**

Review WQA's recorded webinar on How to Find Your Local Media:

<https://wqa.wistia.com/medias/unxx835e17>

Connect with WQA's Communications Team for local print and other media guidance.

### **Social Media Messaging Tips**

See APPENDIX F for examples of social media graphics sized for Facebook, Twitter, and Instagram. The Facebook graphic also will work on LinkedIn and other social media platforms.

Each graphic has a blue bar or rectangle where you can add your business logo. Refer to WQA's [Social Media Toolkit Instructions](#) for guidance on preparation of a social media graphic (WQA member login required).

Consider personalizing one of the following messages to use for your post:

- Call us at (xxx) xxx-xxxx for ideas on how to optimize your water softener to reduce chloride discharge.
- Hard water can cause problem scale buildup in pipes, on cooking pans and in water-using appliances. We're working with the [CITY COUNCIL OR OTHER GROUP] to make sure residents can continue to benefit from soft water even as we reduce chlorides in our environment.
- Did you know that using hard water in some of your water-using appliances potentially can compromise or void their warranties? Better check the user's manual or with the manufacturer for details and limitations. Let us help you find a water softening system that is sustainable, will help protect appliances and is economical.
- Demand-initiated regeneration reduces chloride discharge from your water softener and saves you money on salt, too! Call us at (xxx) xxx-xxxx for information.
- Consumers can be good environmental stewards without losing all of the great benefits of water softening. Call us at (xxx) xxx-xxxx for ideas on how we can help.

## RESOURCES FOR A SOFTENER OPTIMIZATION PROGRAM

### **Potential Steps for Carrying Out Optimization**

A water softener optimization program can be overwhelming. Focus is typically on softeners discharging into the municipal sanitary sewer system. In Waukesha, Wisconsin, for example, optimization program undertakings were broken it down into phases: 1. Optimize rentals; 2. Optimize installed units during scheduled service appointments; 3. Conduct outreach and schedule optimization appointments with existing customers without pending service appointments; 4. Work with the City to coordinate communications to water softener users who do not fall under phases 1-3. Also, understand that each of the phases can start all at once or in a staged order depending upon individual circumstances. And keep in mind that this is one example of an optimization approach and other solutions may be appropriate on a case-by-case basis.

### **Optimization Worksheet Softener Elements**

Defining what optimizing individual water softeners will mean given the many variations is essential to establishing an optimization program. There will be differences across ages/models/makes. However, many of the same elements can be addressed with common benchmarks. Below are myriad of factors to consider as well as an exemplar of a worksheet or checklist on optimization by elements.

General information to enter and record securely in hard copy and electronic file for safekeeping:

- Date of visit
- Optimization conducted by (company name)
- Are there other water treatment devices (point of entry "POE" systems (iron filter/other)/point of use "POU" systems (RO/UV/filter/other)
- Are the other treatment devices before or after the water softener
- Site address
- Technician's name and identification
- Family size
- Water softener identifying information (serial number/approx. age/make/model/downflow brining or upflow brining/cubic feet of resin/time clock or demand-initiated regeneration (DIR)/if DIR, is it based on flow or sensor)
- Site contact (name, phone, email)
- License
- Plumbing configuration (hot soft only/hot and cold soft, except for outside hose bibs & kitchen sink/other)
- Water source (public water system identification/private well)

Optimization worksheet to capture optimization facts and calculations to enter and record securely in hard copy and electronic file for safekeeping:

	Initial	Optimized	Target EXAMPLE
Hardness Setting (Grains/Gallon)			
Salt Efficiency (Grains/Lb. Salt)	With age factor:	Without age factor:	4,000 grains of hardness removed per lb. of salt, or higher <u>without</u> age factor. With age adjustment factor of 2% per year, calculate: (Capacity in grains / salt dosage) - ((Capacity in grains / salt dosage) x age x 2%)
		With age factor:	
Salt Dosage (Lbs.)			Max. target of 5 lbs. per cu. ft. resin. For example, if optimized to 5 lbs. per cu. ft. of resin and if actual resin volume is 1.5 cu. ft., then enter 7.5 lbs. Use lowest salt dose recommended by manufacturer based on valve, salt curve, injector size, etc.
Injector Size			Based on manufacturer recommendation
Capacity (Grains)	N/A		Calculated by the manufacturer based on valve, optimized salt setting and injector
Capacity (Gallons)	N/A		Calculate: (optimized capacity in grains) / (new hardness setting in grains per gallon)
Reserve Capacity Gal. - Mechanical			Hot soft only - set to 30 gallons per person Hot & cold soft - set to 60 gallons per person
Reserve Capacity Gal. - Electronic			Program in the new salt dosage, capacity/grains. Refer to mechanical reserve capacity if system allows the programming of total gallons and reserve.
Add Resin Cleaner	N/A		Apply based on cleaner instructions
Time Clock Override	On or Off		If there is a time clock override for a DIR system, record initial settings then <u>turn off</u> override and set basis for regeneration to be demand
Notes			
For time clock systems, complete the table above in the same format and responding with the same inputs as demand-based systems. Calculate regeneration timer settings based on actual water usage rate if recent water bills are readily available and provided by customer. If not, based on: Hot soft only - set to 30 gallons per person or Hot & cold soft - set to 60 gallons per person.			

- What time does the water softener regenerate?
- Is the time shown on the water softener the same as the action time? If not fix or note the time shown on the softener and the actual time
- Does the water softener in place appear to be in good working order?
- If repairs are needed, or an upgrade to the water softener in place is suggested, list and describe recommendations

## EXCERPTS FROM WQA'S GLOSSARY OF TERMS

Below is a partial list of key definitions from WQA's Glossary of Terms. These are industry accepted definitions, based on accepted professional and technical usage and vetted through a rigorous review process within WQA, including by key committees with the participation and concurrence of numerous water technology experts. The complete listing of WQA's Glossary of Terms is publicly available and may be found at <https://wqa.org/resources/glossary-of-terms/glossary-of-terms1>.

<b>Soft Water</b>	Water which contains less than 1.0 grain per gallon (<17.1 milligrams per liter (mg/L) or parts per million (ppm)) of total hardness.
<b>Softened Water</b>	Water which has been treated by any method that reduces its total hardness content to less than 1 gpg (17.1ppm).
<b>Water Softening</b>	A water treatment process for hard water whereby the concentration of hardness minerals is decreased. The process, itself, does not necessarily produce soft water or softened water.
<b>Water Softener</b>	A device, product, or equipment that reduces the presence of water hardness to less than 1gpg expressed as calcium carbonate equivalent via chemical, physical, or other means. In residential and commercial applications, the most common water softener consists of a pressurized water treatment device in which hard water is passed through a bed of cation exchange media (ether inorganic or synthetic organic) for the purpose of exchanging calcium and magnesium ions for sodium or potassium ions, thus producing a softened water which is more desirable for laundering, bathing, and dishwashing. This cation exchange process was originally called zeolite softening or the Permutit Process. Most modern water softeners use a sulfonated bead form of styrene/divinylbenzene (DVB) cation resin. Distillation, electrodialysis, nanofiltration, deionization, and reverse osmosis water treatment systems are also capable of measurably removing calcium and magnesium ions from water and therefore act as water softeners.
<b>Lime Softening</b>	A water treatment process done to reduce the hardness of hard water that is often used by municipalities and larger industrial water users. Slaked lime [Ca(OH) <sub>2</sub> ] is added to the water to precipitate the hardness ions as calcium and magnesium carbonate or hydroxide. The precipitate is then filtered. The residual hardness may exceed 6-10 gpg depending on the treatment design. This does not produce soft water.
<b>Hardness</b>	<p>Hardness is a measurable property of water brought about by the presence of calcium and magnesium ions (and other multivalent metallic ions) that can cause scale formation, soap curd, water spotting, and harshness in fabrics laundered in such water. The term was colloquially used to describe certain waters that caused difficulty in using soap; i.e. "this water makes soap hard to lather".</p> <p>Hardness is expressed in grains per US gallon (gpg) where 1 grain equals 17.1 ppm as calcium carbonate equivalent. The degree of hardness expressed in gpg that is generally accepted:</p> <ul style="list-style-type: none"> <li>• Less than 1 gpg is termed as soft water</li> <li>• to 3.5 gpg is slightly hard</li> <li>• 3.5 to 7.0 gpg is moderately hard</li> <li>• 7.0 to 10.5 gpg is termed as hard</li> <li>• Above 10.5 gpg is very hard.</li> </ul> <p>While many divalent and trivalent metallic cations can potentially contribute to "hard water" symptoms, the most commonly referenced "hardness" contaminants are calcium and magnesium ions in water, expressed as calcium carbonate (CaCO<sub>3</sub>).</p> <p>In practice, when sizing a water conditioner for the removal of hardness in residential applications, it is common to count only the calcium and magnesium content in calculating the hardness load. "Total" hardness would include iron, manganese, strontium, barium and radium plus the common hardness. In certain applications requiring very low hardness residuals, if the total hardness exceeds the common hardness by more than 1 percent, specific design treatment or pretreatment and/or regeneration schemes are employed to prevent fouling of the system as a result of the marginal solubility of the heavier elements.</p>

## FREQUENTLY ASKED QUESTIONS

### **1. What are chlorides?**

Chlorides are widely distributed in nature as salts of sodium (NaCl), potassium (KCl), and calcium (CaCl<sub>2</sub>). [https://www.who.int/water\\_sanitation\\_health/dwq/chloride.pdf](https://www.who.int/water_sanitation_health/dwq/chloride.pdf) (WHO, 2003)

Chlorides can affect the taste of water, among other impacts. Chloride concentrations in excess of about 250 mg/L can give rise to detectible taste in water. However, consumers can become accustomed to taste in concentrations in excess of 250 mg/L. (WHO, 2003)

The taste of coffee is affected if it is made with water containing a chloride concentration in excess of 400 mg/L as sodium chloride or 530 mg/L as calcium chloride. (WHO, 2003)

There currently is no health effects-based guidance value proposed for chloride in drinking water. In the United States, the EPA has published as guidance a recommended secondary drinking water standard for chloride of 250 mg/L for odor, taste, and corrosivity.

<https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals>. The EPA has also advised that high levels of chloride in bodies of water can be harmful to the ecosystem. <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table>. (EPA)

### **2. Where do chlorides come from?**

Chloride naturally leaches from various rocks into soil and water by weathering. It can enter closed basins or open waters. (WHO, 2003)

Researchers at the University of Minnesota have estimated the volumes of chloride that enter the environment annually from major sources (road salt, synthetic fertilizer use, livestock excretion, household water softeners, atmospheric deposition, drinking water, permitted industrial sources, dust control, human excretion, household appliance use). Road salt was found to be the largest contributor of chloride into the environment annually within the State of Minnesota, contributing over 400,000 tons of chloride per year to the environment. Road salt was followed by synthetic fertilizers and livestock excretion. Fourth on the list was household water softeners, contributing less than one-fourth of the chloride to the environment as road salt, but being the principal chloride source discharging to wastewater treatment plants.

(<https://www.wrc.umn.edu/chloride>)

### **3. Why are wastewater plants, in general, addressing chlorides?**

Chloride is not easily removed from source water. For the protection of freshwater fish and aquatic life, EPA recommends, for wastewater discharge: a maximum concentration of 860 mg/L (acute effects) and a continuous concentration of 230 mg/L (chronic effects) (U.S. EPA, 2006; National Recommended Water Quality Criteria, Office of Water, Washington, D.C. DCN DW01149). However, removing chloride from the discharge of wastewater treatment plants is challenging. Technologies to address chlorides are expensive as capital items and energy intensive – hence also expensive -- in operation. In a few extreme cases, water utilities struggling to meet chloride discharge permit limits have reviewed possible chloride contributors and worked with experts and the community on optimization plans.

## 4. What are everyday household indicia of hard water?

- Stiff, dingy laundry
- Mineral deposits on dishes and glassware
- High soap usage and the need for fabric softener
- Extra scrubbing or expanded use of more intense chemical cleaners for the removal of soap curd on bathtubs and shower stalls
- High energy costs, possibly due to scale build-up in pipes and on appliances
- Scale buildup in sinks, tubs, faucets, and appliances

## 5. What is central hardness reduction (CHR)?

Central hardness reduction plants are deployed by municipalities to reduce the hardness of water at a centralized treatment plant for a community rather than at the household level. These plants add slaked lime  $[\text{Ca}(\text{OH})_2]$  to the water to precipitate hardness ions as calcium and magnesium carbonate or hydroxide. The precipitate is then filtered in a process described as lime softening.

## 6. Is this the same as my water softener at home?

No. A water softener is an in-home device, product, or technology (there are commercial applications as well) that reduces the presence of water hardness to less than 1 grain per gallon (gpg) of hardness. Lime softening does not reach this efficiency and does not produce soft water.

In residential and commercial applications, the most common “water softener” consists of a pressurized water treatment device in which hard water is passed through a bed of cation exchange media (either inorganic or synthetic organic) for the purpose of exchanging calcium and magnesium ions for sodium or potassium ions, thus producing a softened water which is more desirable for laundering, bathing, and dishwashing.

## 7. What is soft water?

In the United States, soft water is defined by the American National Standards Institute NSF/ANSI 44 as having less than 1 grain of hardness per gallon. This is a requirement in the standard for residential (at-home) water treatment systems, which are certified to deliver soft water. This standard and the definition of soft water were established by a committee of subject matter experts and public officials who considered the benefits of softening, and the amount of hardness that needs to be removed from water in order to achieve those benefits.

Scale deposits from hardness buildup affects fixtures and appliances found throughout the entire home or business. For this reason, hardness is typically addressed with treatment of water for the whole house or building rather than at a specific faucet. Hardness minerals can be reduced in water for the whole house to deliver soft water.

## 8. What are some of the benefits of a water softener?

Per the Energy Savings Study (*study on benefits of removal of water hardness (calcium and magnesium ions) from a water supply*) released in 2009 by the Battelle Memorial Institute and funded by the Water Quality Research Foundation:

- **Showerheads:** Showerheads on hard water lost 75% of the flow rate in less than 18 months of simulated normal operation. Faucets on hard water could not maintain the specified 1.25 gallons per minute flow rate because of scale collection on the strainer.
- **Carbon Footprint:** The carbon footprint increases 18% for gas storage tank water heaters when operated on 25 grains per gallon of hard water for a simulated 15 years as compared to the same operation on softened water.
- **Gas Storage Tank Water Heaters:** Each 5 grains per gallon of water hardness causes 4% loss in efficiency and 4% increase in cost of energy in gas storage tank water heaters when using 50 gallons of water per day.
- **Tankless Water Heaters:** The economic savings of softened water with instantaneous tankless water heaters can lead to recovery of the cost of the water softener and operating supplies in a period as short as one year.
- **Electric Water Heaters:** Up to 30 pounds of calcium carbonate rocklike scale deposits can accumulate in electric water heaters over their lives. Each 5 grains per gallon of water hardness caused 0.4 pounds of scale accumulation each year in electric storage tank water heaters.

Per the Dishwasher Savings Study (*evaluation of the effect of water hardness on performance of automatic dishwasher detergents and savings possible by softening water*) released in 2011 by Scientific Services S/D and funded by the Water Quality Research Foundation:

- **Detergent Savings - Dishwasher:** Detergent savings up to 70% were observed for dishwashing when softened water was used compared to hard water. Depending on the dish soil, hardness reduction was found to be up to 12 times more effective at soil removal than increasing detergent dose. Hardness reduction was 6 times more effective at reducing spotting and twice as effective at reducing filming as increasing detergent usage.
- **Dishwasher Degradation:** Reduction of hardness is significantly more effective on stain removal than increase in either temperature or detergent dose.

Per the Laundry Savings Study (*evaluation of relative effects of hardness, detergent dose and temperature to evaluate stain removal efficacy*) released in 2011 by Scientific Services S/D and funded by the Water Quality Research Foundation:

- **Detergent Savings - Laundry:** Stain removal performance increases dramatically when hardness is removed even when dose and temperature are also lowered. Depending on the stain, hardness reduction was up to 100 times more effective at stain removal than increasing temperature or increasing detergent dose.
  - Softening water will allow use of less detergent and save energy by lowering water temperatures while still maintaining or improving performance.
  - When water of any hardness is softened prior to its use in washing, the detergent use can be reduced by 50% and the washing can be carried out in 60°F cold water instead of 100°F hot water and achieve the same or better stain removal yielding whiter clothes.
- **Laundry Stain Removal:** Reduction of hardness is significantly more effective on stain removal than increase in either temperature or detergent dose.

## 9. Does softened water adversely affect my pipes?

No. There is a misconception that softened water is the same as naturally occurring soft water that is associated with corrosion in pipes and appliances. To learn more about the difference, please review:

<http://wcponline.com/2019/03/15/water-softeners-and-corrosion/>

## **10. At what concentration of hardness do I need a softener?**

The product performance standard for water softeners is NSF/ANSI 44. This standard defines the quality of water that a water softener must provide as water which has less than 1 grain of hardness per gallon. This standard is maintained by a committee of subject matter experts, public officials, and users who consider the benefits of softening, and the water quality which must be delivered by the product for consumers to enjoy those benefits. The standard is referenced in many plumbing codes as a requirement for residential (at-home) water treatment systems that claim to deliver soft water.

However, the softening benefits and water quality parameters that prompt a purchasing decision on a water softener are probably unique for each consumer. You may want to avoid any hard-water scaling on your dishes, shower doors, and fixtures, while your neighbor is not bothered by some hard-water scaling. Energy efficiency might be very important to your neighbor, and less important to you. Or you may have purchased a softener as a final barrier against radiological contaminants in the drinking water, while your neighbor is not concerned with this risk.

## **11. How can I test for hardness?**

If you pay a water bill, you can contact your public or private water system to ask for the water hardness level. If you are on a private well or want a hardness test taken from the water coming out of your tap, you can contact a water treatment professional. Some states require such professionals to hold a state license.

WQA: <https://www.wqa.org/find-providers>

## **12. How can I improve my overall chloride impact?**

The following are strategies to reduce your overall chloride impact:

- Have your water softener optimized by a water treatment professional so that it is more efficient and uses less salt.
- Have your water softener regularly serviced by a water treatment professional to maintain equipment efficient over the long term.
- Consider replacing an older water softener with a newer, more efficient softener that meets the NSF/ANSI Standard 44 efficiency requirement of 3,350 grains/lb. of salt.
- Conserve water and look for EPA WaterSense labeled products. These products are certified to use at least 20% less water and save energy.

## **13. Where can I find a water treatment professional?**

WQA: <https://www.wqa.org/find-providers>

## APPENDIX A

### SUPPLEMENTAL RESOURCES

#### **WQA Technical Factsheet on Ion Exchange**

[https://www.wqa.org/Portals/0/Technical/Technical%20Fact%20Sheets/2015\\_IonExchange.pdf](https://www.wqa.org/Portals/0/Technical/Technical%20Fact%20Sheets/2015_IonExchange.pdf)

#### **Chloride Levels Reported By State**

The National Pollutant Discharge Elimination System has a dashboard to show state and permittee reported wastewater discharge data. You can access the discharge monitoring report online and search by location and specifically select chloride: <https://echo.epa.gov/trends/loading-tool/water-pollution-search>

NPDES is working to add state and permittee reporting to its national data system. For more information on and an overview of the system of reporting, see: <https://echo.epa.gov/trends/npdes-erule-dashboard-public#Overview>

#### **Chloride Calculation Tool**

This tool is meant as a guide when looking at softener efficacy and chloride output. There are several factors to be considered in these calculations. Contact WQA Technical Department to request the chloride calculation tool built in excel.

#### **Softener Optimization Training Resources**

WQA has a number of resources for those interested in training on optimizing currently installed water softeners:

- Presentation by industry personnel in Madison, WI on several case studies from the Madison Municipal Sanitary District softener optimization program: <https://wqa.wistia.com/medias/qci45w1bfm>
- WQA's information and training page for the softener optimization program in Waukesha, WI: <https://wqa.org/programs-services/education/seminars-webinars-workshops/city-of-waukesha-ion-exchange-softener-salt-optimization-program-general-training>
- WQA general training on softener operation including upflow vs. downflow brining, effect of salting levels on capacity, and calculating exchange capacity: [WQA members](#), [nonmembers](#)
- Recommended training outline for manufacturers training dealers on optimizing softeners in the field: <https://wqa.org/LinkClick.aspx?fileticket=cMJAW-HMKvM%3d&portalid=0>
- WQA listing of approved optimizers for Waukesha, WI: [https://wqa.org/waukesha\\_optimizers](https://wqa.org/waukesha_optimizers)
- WQA Knowledge Base articles and videos on softener optimization [This list will continually be updated]
  - Optimizing Resin Performance: <https://www.wqa.org/knowledge-base/treating-water-treatment-methods-optimizing-resin-performance>

## APPENDIX B

### RESEARCH CITATIONS

Water Quality Research Foundation Completed Studies on [www.WQRF.org](http://www.WQRF.org)

- **Softened Water Benefit Studies** Executive Summary:
  - [https://www.wqa.org/Portals/0/WQRF/ResearchStudy\\_BenefitsOfSoftenedWater\\_ExecSummary.pdf](https://www.wqa.org/Portals/0/WQRF/ResearchStudy_BenefitsOfSoftenedWater_ExecSummary.pdf)
    - Two-page summary:
      - [https://www.wqrf.org/uploads/8/3/5/5/83551838/watersoftenerbenefits\\_2pagesummary.pdf](https://www.wqrf.org/uploads/8/3/5/5/83551838/watersoftenerbenefits_2pagesummary.pdf)
    - Energy Savings Study (aka Battelle Study): focused on efficiency improvement in household water heaters from the use of softened water, and the subsequent effect on performance of fixtures. Download full report (WQA member):
      - <https://www.wqa.org/LinkClick.aspx?fileticket=E2iaG5ExhVM%3d&portalid=0>
    - Dishwasher Study: quantified the relative effect of hardness and detergent dosage to show savings possible by softening hard water. Download full report (WQA member):
      - <https://www.wqa.org/LinkClick.aspx?fileticket=JaBIChzGYxg%3d&portalid=0&timestamp=1571174432016>
    - Laundry Study: compared the effects of detergent dose, water hardness, and wash temperature on the stain removal performance of five household laundry detergents. Download full report (WQA member):
      - <https://www.wqa.org/LinkClick.aspx?fileticket=ElFrGoU3SZQ%3d&portalid=0&timestamp=1571174191193>
- **Reduction of Effluent Chloride to Wastewater Treatment Plants:**
  - Final Report on the Madison Metropolitan Sewerage District's (MMSD) website:
    - <https://www.madsewer.org/Portals/0/ProgramInitiatives/ChlorideReduction/Water%20Softener%20Study%20Final%20Report%20111615.pdf>
  - The study can be used as a model approach in areas struggling with chloride discharge. The final conclusions were that, on average, softener optimizations could reduce the concentration of chloride by 27% while replacement with systems meeting 4,000 grains/lb. salt efficiency could reduce the concentration of chlorides by 47%
  - Electronic toolkit:
    - [https://www.wqrf.org/uploads/8/3/5/5/83551838/2018\\_mmsd\\_softeneroptimization\\_toolkit.pdf](https://www.wqrf.org/uploads/8/3/5/5/83551838/2018_mmsd_softeneroptimization_toolkit.pdf)
- **Association Between Domestic Water Hardness, Chlorine, and Atopic Dermatitis Risk in Early Like: A Population-Based Cross-Sectional Study published in 2016**
  - <https://pubmed.ncbi.nlm.nih.gov/27241890/>
- **Prevalence of Atopic Dermatitis in Infants by Domestic water Hardness and Season of Birth: Cohort Study published in 2016**
  - [https://www.jacionline.org/article/S0091-6749\(16\)32464-2/fulltext](https://www.jacionline.org/article/S0091-6749(16)32464-2/fulltext)
- **The Effect of Water Hardness on Surfactant Deposition after Washing and Subsequent Skin Irritation in Atopic Dermatitis Patients and Healthy Control Subjects published in 2017**
  - [https://www.jidonline.org/article/S0022-202X\(17\)32938-X/fulltext](https://www.jidonline.org/article/S0022-202X(17)32938-X/fulltext)

### ADDITIONAL REFERENCES

- **Corrosion Myth**
  - WQA Position Paper on Cation Exchange Softened Water and Corrosion, 2020. Contact WQA Technical Affairs Department for a copy of the position paper.
  - Article: Water Softeners and Corrosion: <http://wcponline.com/2019/03/15/water-softeners-and-corrosion/>

## APPENDIX C

### POTENTIAL STAKEHOLDER ASSOCIATIONS

*Associations listed below may also be stakeholders on addressing chloride reduction. Please contact WQA to coordinate any outreach and to learn more about each association and possible ongoing initiatives.*

#### **National Ground Water Association (NGWA)**

- Website: <https://www.ngwa.org/>
- Description: NGWA is a community of groundwater professionals. Their mission is to work together to advance groundwater knowledge and the success of their members through education and outreach; advocacy; cooperation and information exchange; and enhancement of professional practices.
- Affiliate State Organization Directory: <https://www.ngwa.org/connect-with-your-state/Affiliate-Organization-Contact>

#### **National Rural Water Association (NRWA)**

- Website: <https://nrwa.org/>
- Description: NRWA has 49 affiliated State Rural Water Associations. The organization is dedicated to training, supporting, and promoting the water and wastewater professionals that serve small and rural communities across the country. Rural Water training and technical assistance covers every aspect of operating, managing and financing water and wastewater utilities.
- State Association Directory: <https://nrwa.org/about/state-associations/>

#### **American Society of Plumbing Engineers (ASPE)**

- Website: <https://www.aspe.org/>
- Description: ASPE is the international organization for professionals skilled in the design, specification and inspection of plumbing systems. ASPE is dedicated to the advancement of the science of plumbing engineering, to the professional growth and advancement of its members and the health, welfare and safety of the public.
- Regions & Chapters Directory: <https://www.aspe.org/membership-global-community/chapters/>

#### **National League of Cities (NLC)**

- Website: <https://www.nlc.org/>
- Description: NLC serves the interests of 19,000 cities, towns and villages in the US as well as professionals working in municipal government. There are also state-level League of Cities.
- State Municipal Leagues Directory: <https://www.nlc.org/state-municipal-leagues>

#### **American Council of Engineering Companies (ACEC)**

- Website: <https://www.acec.org/>
- Description: ACEC is a federation of 52 state and regional councils representing more than 600,000 engineers, architects, land surveyors and other specialists. Their primary mission is to strengthen the business environment for their member firms through government advocacy, political action, and business education. Members join the ACEC through their State ACEC organization.
- State ACEC Member Organization Directory: <https://www.acec.org/state-sites/states-mos/>

#### **National Association of Wastewater Technicians (NAWT)**

- Website: <https://www.nawt.org/>
- Description: NAWT represents the sanitary liquid waste management industry. Provides education for industry members and the public. NAWT also supports development and national representation of individual, state, and regional chapters.
- State and Local Association Directory: <https://www.nawt.org/state-associations.html>

## APPENDIX D Template Letter

[Put letter on Company/Association Letterhead]

Name

Title

Address zip

Email address

Re: (Issue)

Dear Name,

### **Issue (Possible bans, legislation, regulation, Study or ordinance)**

I am (name) and I (own/manage/work for) (name of company) and have been in the water treatment business in (city, county, state) for more than (years). We employ (number of employees) and provide solutions to all types of drinking water issues including (nitrites/lead/arsenic/PFAS etc.). (name of company) is a member of the Water Quality Association (WQA) and the (State WQA name).

WQA's mission is to facilitate water quality improvement to enhance lives sustainably and is the recognized resource and advocate for the betterment of water quality; maintaining and promoting ethics and integrity. These values are shared by (name of company).

We have some concerns regarding the (issue/ordinance/legislation/public meeting) that is (proposed/being discussed) and would appreciate the opportunity to meet with you to better understand the goals you are trying to achieve. Being a member of WQA, which is a science-based association, we can bring technical experts and provide real life examples of what WQA has worked on across the country.

(name of company) would like to offer to work with and assist (organization of addressee) on the (purpose of issue). WQA would be able to bring several resources to (organization of addressee), including, but not limited to its research arm, the Water Quality Research Foundation (WQRF), as well as their Gold Seal product certification program and laboratory, which is a scientific method to assure the safety and efficacy of water treatment technology solutions.

We are more than ready to assist (organization of addressee) at such a critical time when it comes to water quality. Please let us know how we can begin to work together.

Sincerely,

Name

Title

Company

APPENDIX E

Contact: NAME  
Email: XXX@XXX.com  
Telephone: (XXX) XXX-XXXX

FOR IMMEDIATE RELEASE – DATE GOES HERE

YOUR COMPANY LOGO OR LETTERHEAD

XYZ Company urges comprehensive chloride approach

Optimizing water softeners reduces environmental effects while preserving great benefits for (name of city or region) households

CITY, STATE. – XYZ Water company said today it urges a comprehensive approach to reducing chloride discharge while allowing consumers to reap the benefits of a home water softening system. Improving softeners’ salt efficiency can reduce environmental impacts while helping homeowners save money, prevent scale buildup in the home and operate appliances efficiently.

“We want to work together to develop a sustainable approach to reducing chloride,” said XYZ Water title & name. “Water softeners do contribute chlorides to the environment during regeneration, but they are not the only source of chlorides and not the largest. If we work together, we can be good environmental stewards while still providing soft water in local homes.”

“Hard” water contains dissolved compounds of calcium and magnesium and sometimes other minerals. Hard water can cause buildup in pipes, cooking pans and water-using appliances; can reduce efficiency of appliances; and prevents soap from lathering properly. It also can aggravate some skin conditions. Hard water can void the warranties on some water-using appliances (consumers should check their warranty for specifics).

Among the most common types of water softeners are ion exchange systems, which do release chlorides into the local wastewater supplies. However, a trained technician can optimize the softener so that it uses less salt and reduces environmental waste. For example, demand-initiated regeneration measures water quality and only regenerates as needed, which is more efficient and environmentally friendly.

XYZ company has been serving the community for (X) years and continues to offer innovative, effective and efficient solutions for consumers concerned about their home’s water quality. The company is a member of the Water Quality Association, which created the Chloride Task Force, with the objective of collecting data on the issue by state and working with other agencies to reduce chlorides in the environment.

[Company Sign Off] WQA Example:

WQA is a not-for-profit [trade association](#) representing the residential, commercial, and industrial water treatment industry. WQA’s [education and professional certification programs](#) have been providing industry-standardized training and credentialing since 1977. The [WQA Gold Seal certification program](#) has been certifying products that contribute to the safe consumption of water since 1959. The WQA Gold Seal program is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC).

###

## APPENDIX F

Below are example social media graphics sized for Facebook, Twitter, and Instagram. The Facebook graphic also will work on LinkedIn or other social media platforms.

[Chlorides - Facebook](#)

[Chlorides - Instagram](#)

[Chlorides - Twitter](#)

## APPENDIX G

Below are examples print ads.

[Half Page Ad](#)

[Quarter Page Ad](#)



**KEEP THE BENEFITS OF SOFT WATER WHILE REDUCING CHLORIDES.**  
Learn about softener optimization.  
Let's work together: [XYZWater.com](#)



**KEEP THE BENEFITS OF SOFT WATER WHILE REDUCING CHLORIDES.**  
Learn about softener optimization.  
Let's work together!  
[XYZWater.com](#)



**KEEP THE BENEFITS OF SOFT WATER WHILE REDUCING CHLORIDES.**  
Learn about softener optimization. Let's work together!  
[XYZWater.com](#)