Plumbing strategies to reduce chloride pollution

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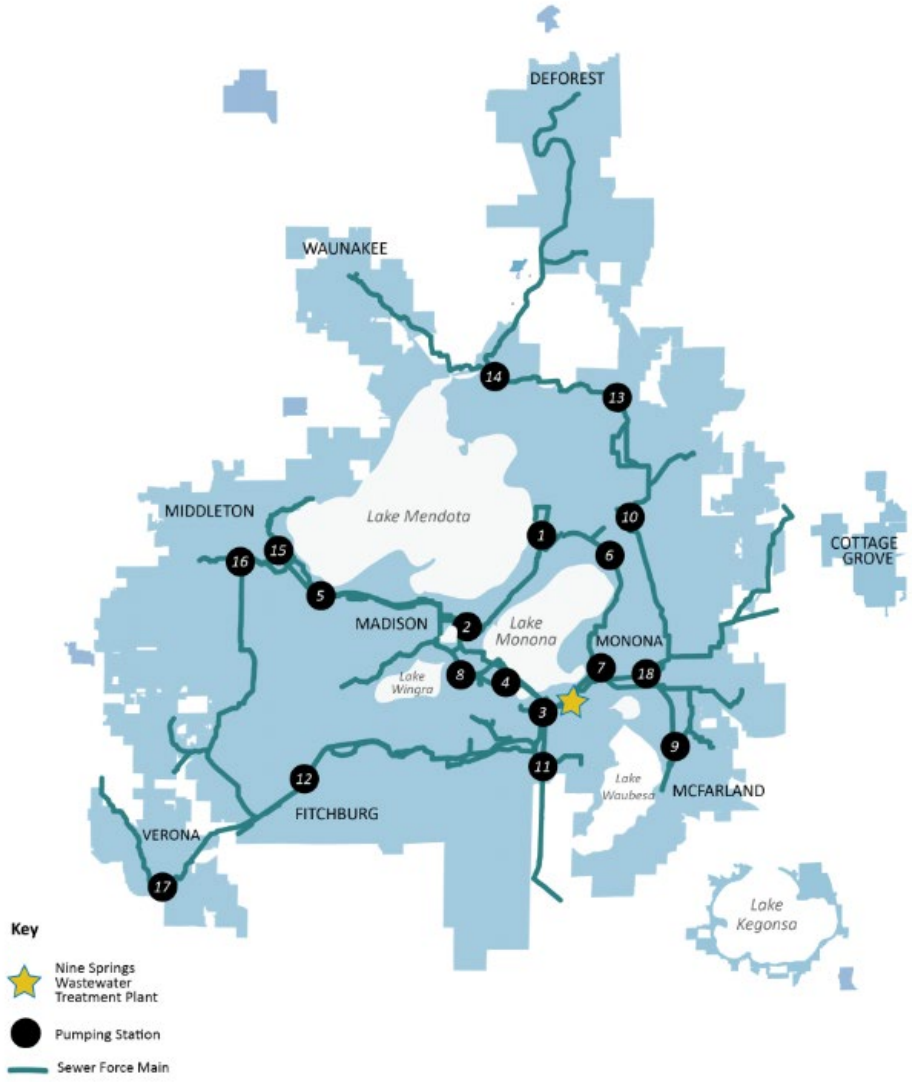

- Provides wastewater collection and treatment for 24 communities
- ~400,000 people served
- 40 million gallons per day, on average, are treated at Nine Springs Wastewater Treatment Plant (WWTP)

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Like most treatment plants, Nine Springs WWTP is not designed to remove chloride

Water hardness

- Higher water hardness = more minerals = more chance for scale buildup to form
- Water Quality Association defines “very hard” water as a concentration of 10.5 grains per gallon (180 mg/L) hardness
- In MMSD service area, source water ranges from 15-32 gpg
- Water softeners are the norm

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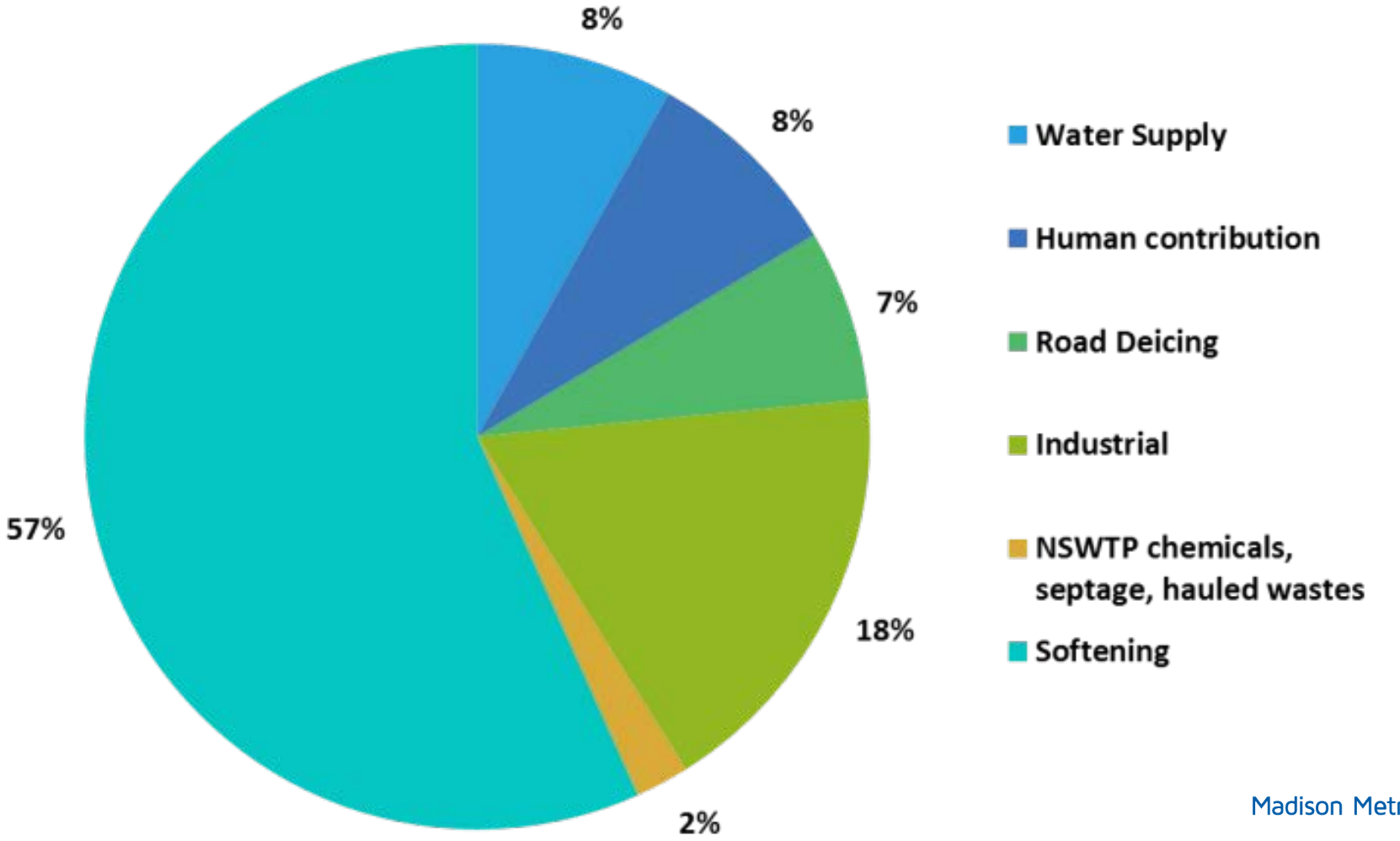
Sources of chloride to Nine Springs WWTP



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~120,000 pounds of chloride per day pass through the plant into freshwater streams
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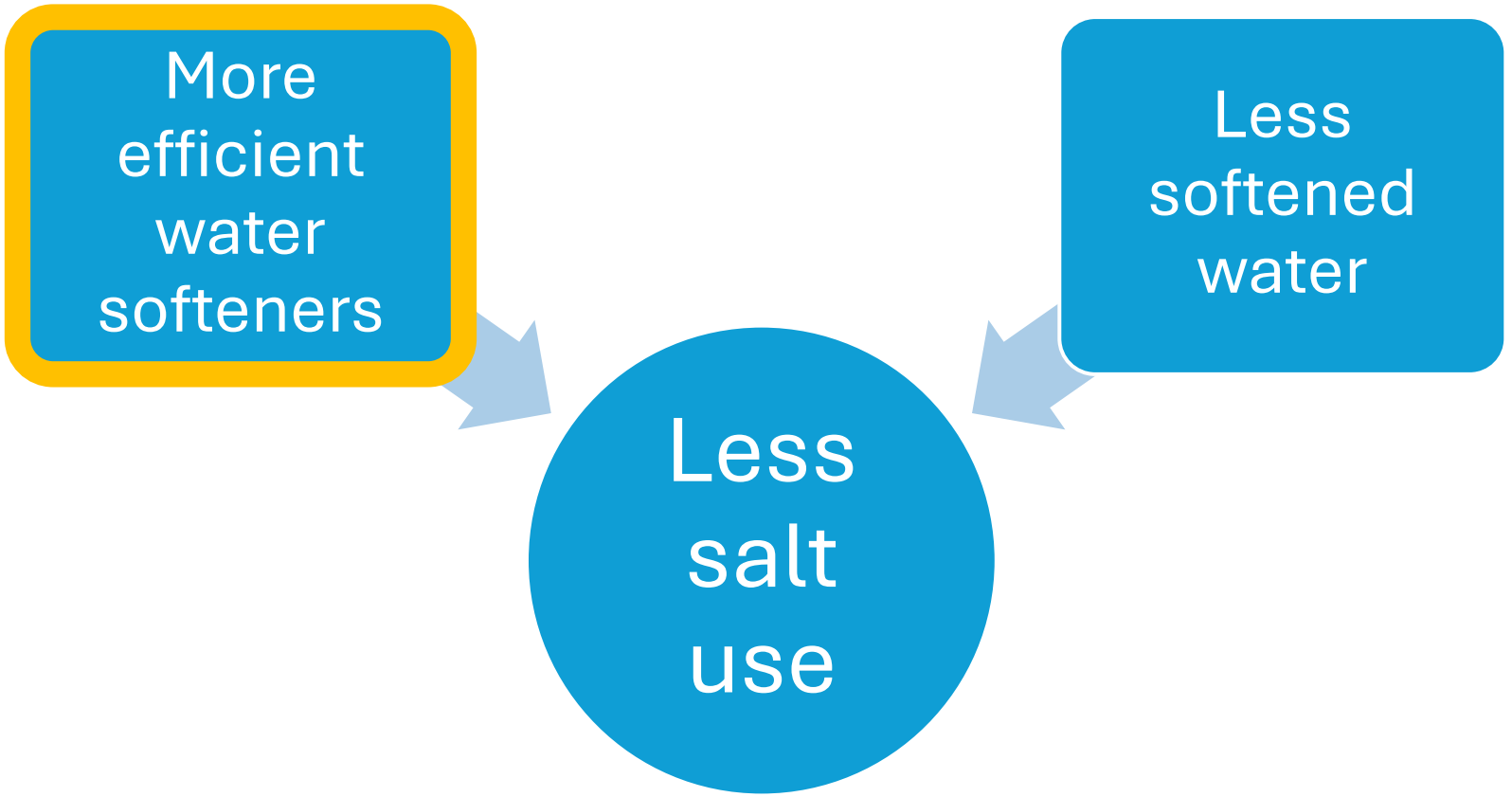
Paths to reducing sources of chloride



Softening efficiency

- Higher-efficiency softeners use less salt to remove hardness
- Many chloride reduction programs have focused on increasing softening efficiency through optimization or replacements

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Where can softening efficiency get us?

EPA criterion: 230 mg/L

Percent water softened

Average softening efficiency	50%	70%	90%
3500 grains/lb.	208	291	374
4000 grains/lb.	182	254	327
4500 grains/lb.	162	226	291

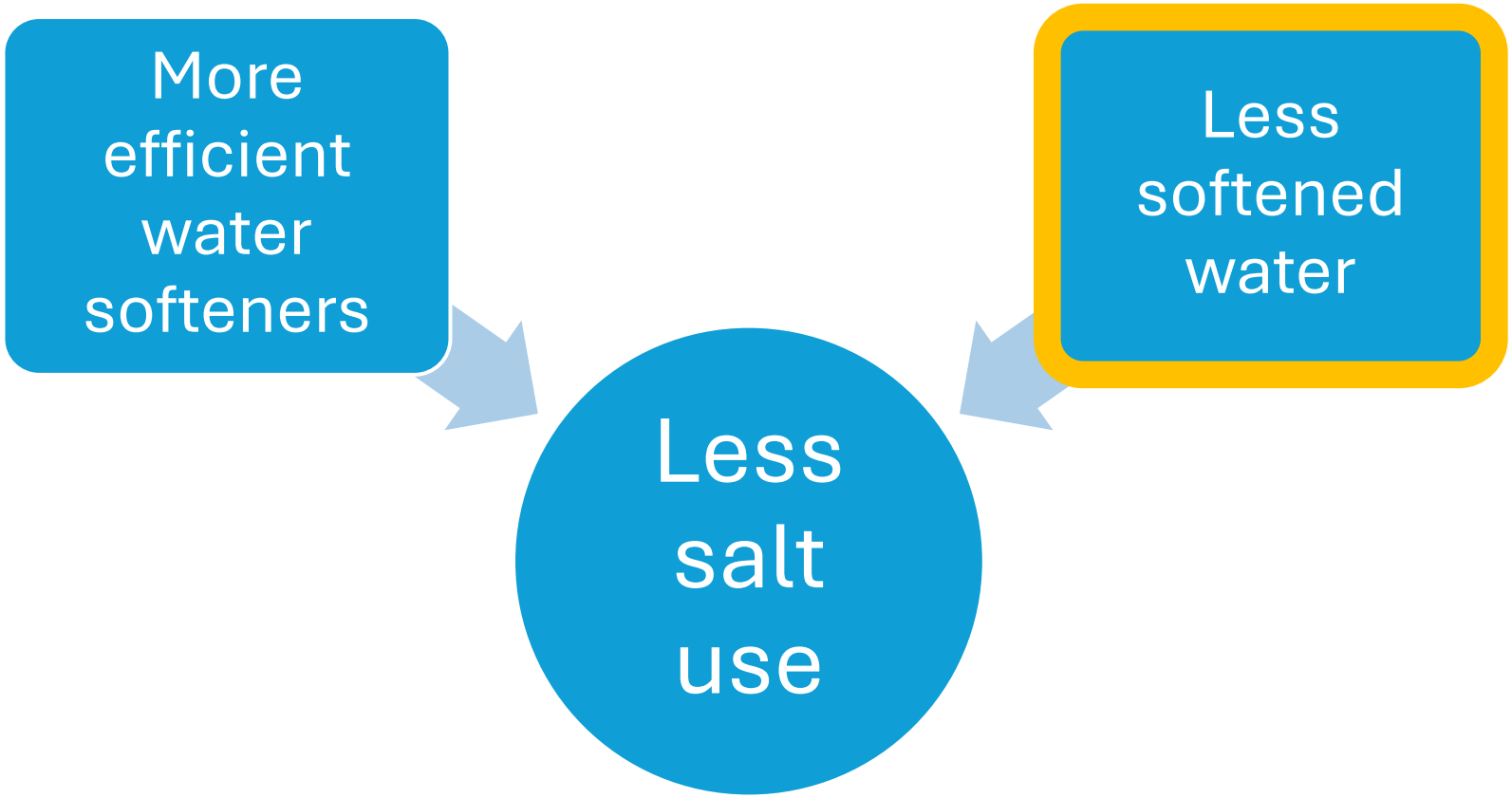
Calculations assume average source hardness of 20 gpg

Challenges of reaching goals with softener efficiency

- **Adoption:** Consumers have not responded to voluntary upgrade incentives on a large scale

- **Maintenance:** How will chloride reductions from increased softening efficiency be maintained as new softeners age?

Paths to reducing chloride pollution



Softening less water

- In the Madison area, where all source water is very hard, we don’t recommend that people stop softening/conditioning their water

- But is there a middle ground between totally soft and totally hard water?

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Manitowoc

Q. Do I need to use a water softening system?

A. Determining if you need a water softener is a personal preference. The hardness or softness level of water is determined by the amount and type of minerals found in it. The water provided to the communities by Manitowoc Public Utilities (MPU) has a typical hardness level of 130 ppm, or 7.6 grains. For many consumers, the water provided meets their softness requirements. Some consumers like to have softer water and choose to install a water softening unit. Again, it's personal preference and completely up to the individual consumer. **Important reminder:** If you have a water softener and plan on not using it, remember to put the unit into bypass mode.

Q. What are the grains of hardness for setting my water softener?

A. Lake Michigan water has 7.5 grains of hardness. Prior to switching to Lake Michigan water, area ground water wells supplied residents with water that had a range of 13-16 grains of hardness.

Milwaukee

FAQs - Water Quality and Public Health

Water hardness

Water is said to be hard if the minerals calcium and magnesium are in the water. The more these naturally occurring minerals are present, the harder the water is considered. It is "hard" for soap to lather or make suds.

Milwaukee's water is considered moderately hard, and water softeners are not necessary for residential use. Milwaukee water hardness can be reported in different measurements:

- 8.01 grains per gallon
- 137 milligrams per liter (mg/L) with a range of 112-142 mg/L

Moderately hard water

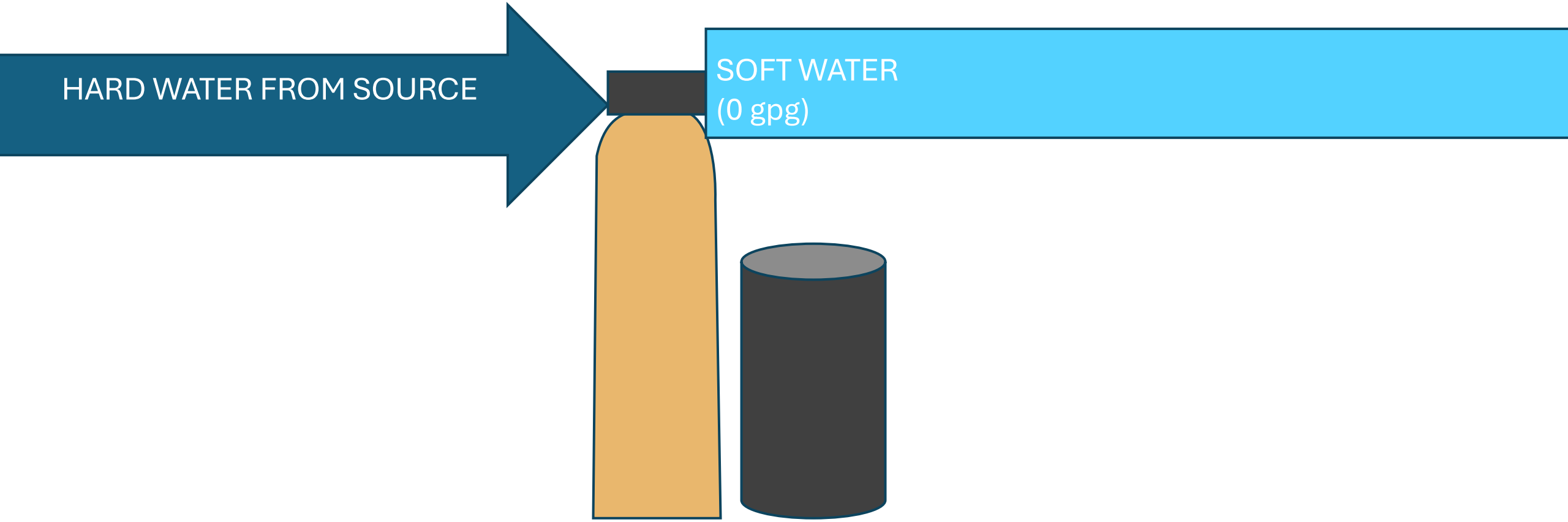
Communities that use surface water as source water have less natural hardness minerals in their water, but not zero hardness

Water softeners are optional, but not seen as a necessity in these communities

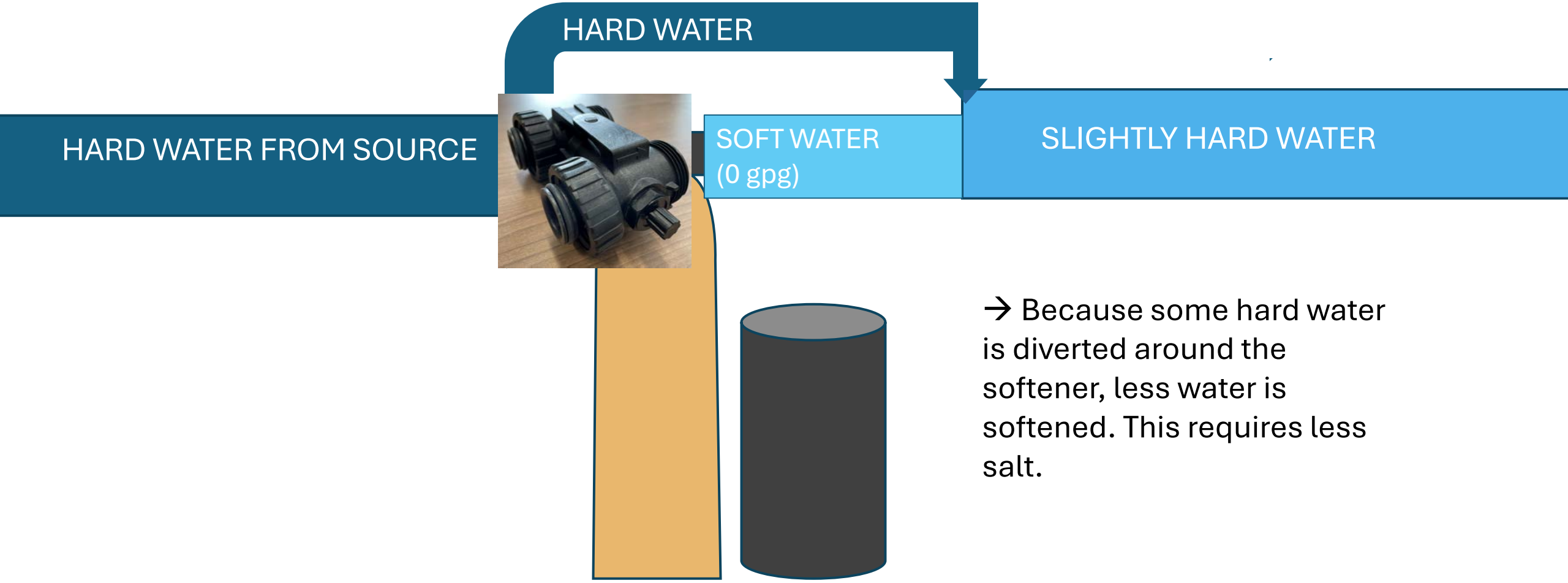
Blending valves

- Simple, inexpensive, quick plumbing add-on to water softener
- Divert some hard water around the softener and blend it back into softened water – overall, the water is mostly soft, but has some hardness

Typical softener operation



After a blending valve is added



→ Because some hard water is diverted around the softener, less water is softened. This requires less salt.

Advantages

- Inexpensive
- Provide flexibility in treating water to consumers' preferences
- Low-risk – can be shut off if consumers want fully softened water
- Possible longer-term solution compared to softener replacements

Benefits of slightly hard water

- Can be preferable to customers who aren’t used to the feeling of totally softened water
- Can protect water heaters from corrosion by creating a protective film

Effect of softening less water

Assume four neighboring homes each use 6000 gallons of water per month (total).
They all get water from a well with 20 grains per gallon hardness.

	House 1	House 2	House 3	House 4
Softener efficiency	3000 grains/lb.	4500 grains/lb.	3000 grains/lb.	4500 grains/lb.
Percent water softened in home	90%	90%	60%	60%
Salt used/month	36 lbs.	24 lbs.	24 lbs.	16 lbs.
Average chloride discharge	436 mg/L	291 mg/L	291 mg/L	194 mg/L

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Blending valves in new construction

- Dave Jones plumbing, Tim O'Brien Homes
- Tim O'Brien Homes agreed to install blending valves as a default feature on new softeners after staff tested valves
- Standard blending level: 10% (about 2 gpg hardness)

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Progress so far

- 66 blending valves installed in new homes so far; 10% salt reduction compared to baseline
- No customer complaints about water quality
- Plans to continue valve installation as a standard feature in new homes

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Next steps

- Raise awareness about blending valves among consumers and service providers
- Pilot installation of blending valves on existing softeners and gauge users' experiences
- Encourage softener vendors and builders to make them a standard feature

Ways to soften less water

- Use blending valves to achieve a mix of hard and soft water
- Soften only hot water, leaving cold water hard
- Ensure outdoor water is not softened
- Use rainwater/gray water when possible

Madsewer.org resources