

Chloride Source Reduction

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February 26, 2015

**Madison Metropolitan
Sewerage District**



MMSD Gets TOO Much Salt

225,000 lbs ~**110 tons of salt EACH DAY!**

= 82,000,000 lbs and 41,000 tons EACH YEAR!



Little goes a long way!

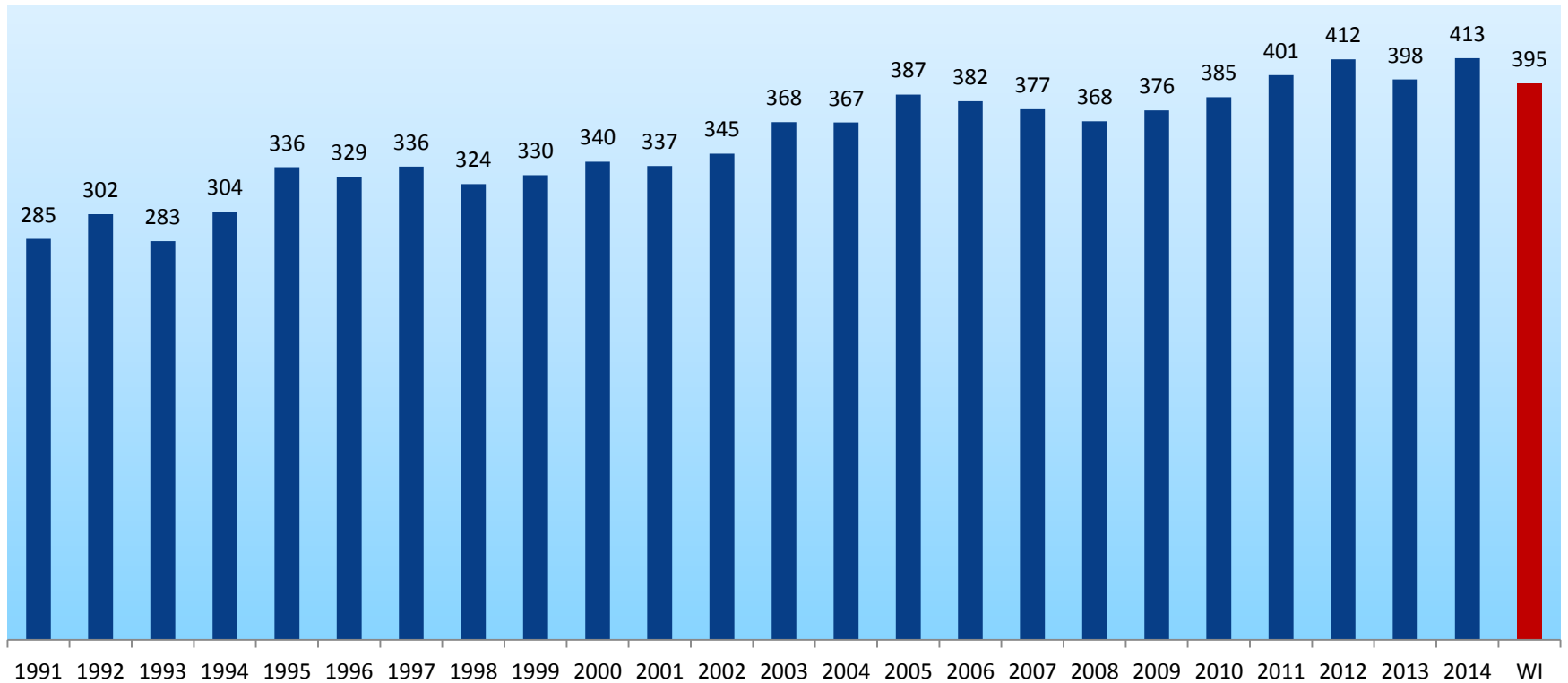


**1 tsp salt dissolved in
5-gal water equals 230
mg/L chloride – EPA limit
for chronic toxicity in
streams**



Effluent Concentration Trend

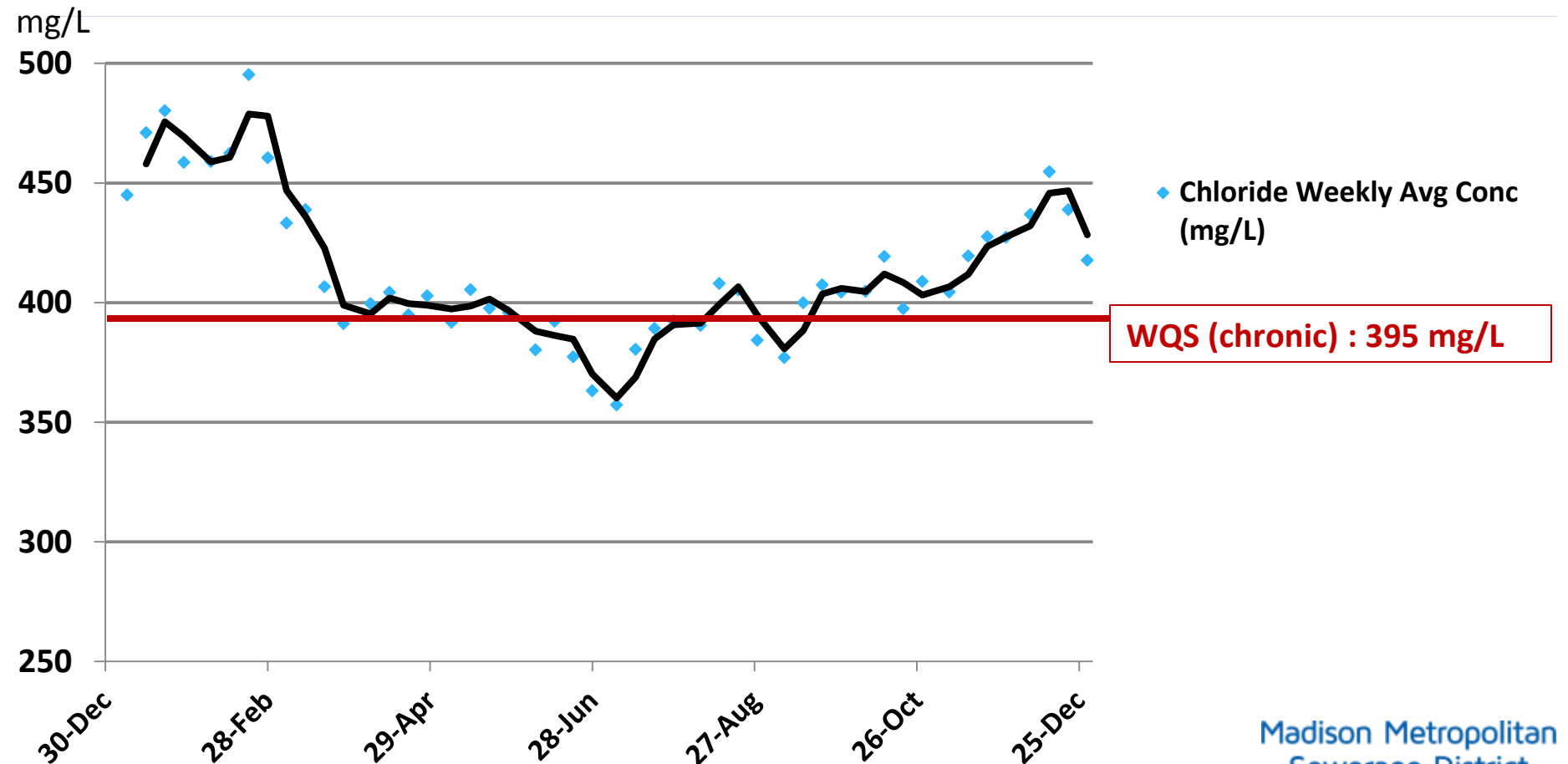
MMSD Effluent Chloride Conc (annual average, mg/L)



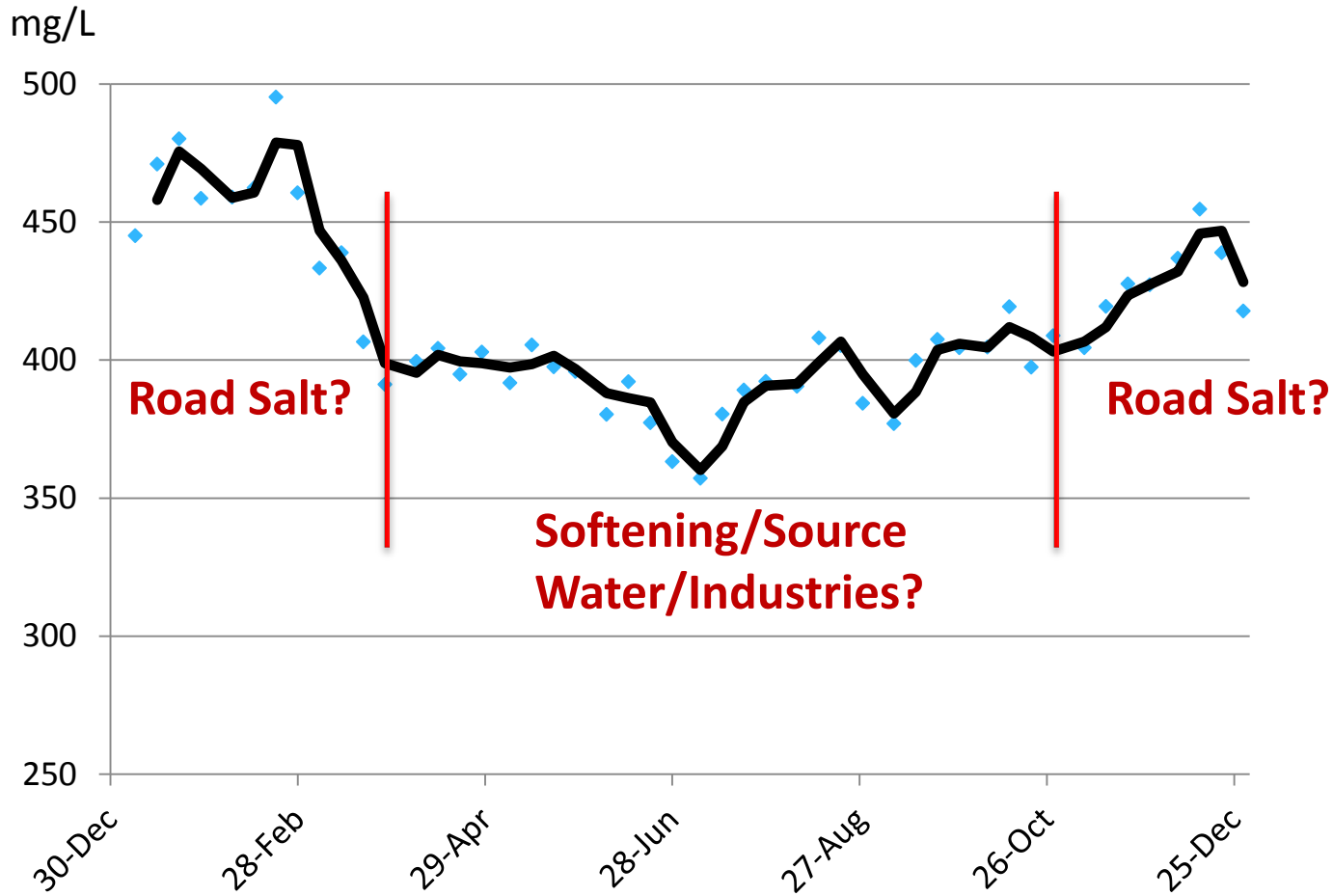
WI
WQS



2014 Weekly Avg Concentration

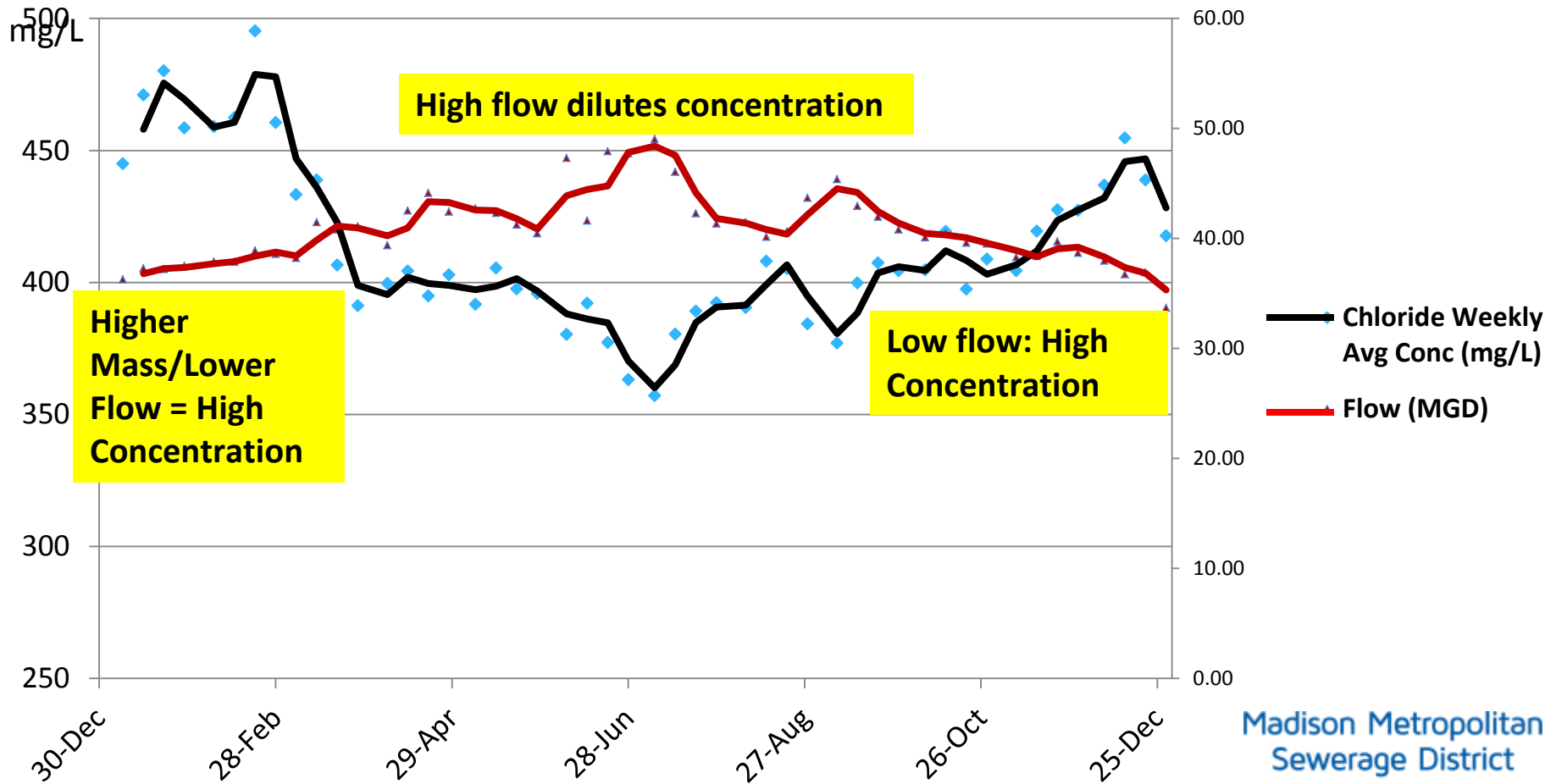


Source Identification



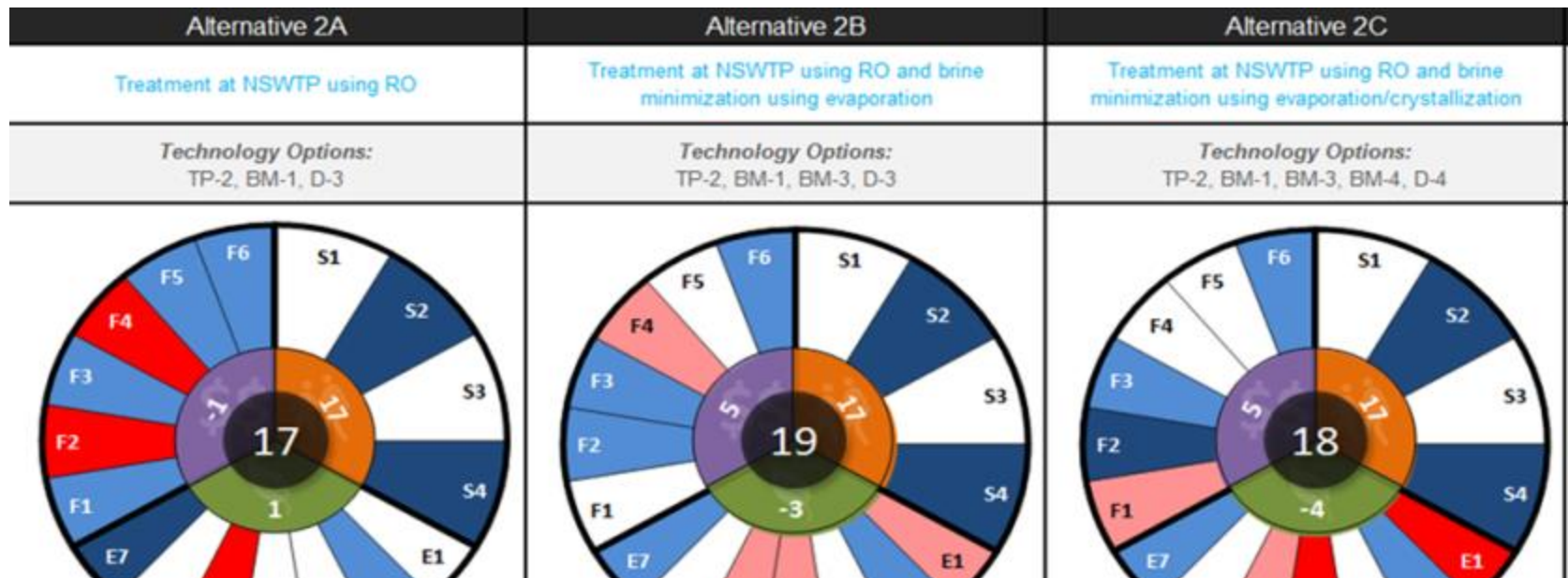
◆ Chloride Weekly Avg Conc (mg/L)

Competing initiatives



Treatment Feasibility Study

- **Consultant evaluated 8-options:**
 - Wellhead hardness reduction (reduce need for softening)
 - Filtration to remove chloride: RO or EDR
- Triple-bottom Line Analysis



tan
ct

Treatment Feasibility

- **Preliminary data:**
 - **Capital costs: \$80 million - \$200 million**
- **Significant brine volume needs to be handled**
 - Equals ~15% of what is treated
 - Impacts construction and operation cost
 - **Operational costs range from \$10m to over \$200-million/year**
- **Challenging:**
 - Treating portion of flow & blending to maintain effluent quality



NOTE:
 SITE PLAN LAYOUT IS INTENDED TO PROVIDE RELATIVE SPACE REQUIREMENTS ONLY. MEMBRANE TREATMENT EQUIPMENT SHOULD BE LOCATED IN CLOSE PROXIMITY TO THE EFFLUENT BUILDING TO FACILITATE SLIP STREAM TREATMENT OF THE SECONDARY EFFLUENT. EVAPORATOR AND CRYSTALLIZER PROCESSES MAY REQUIRE REMOTE PLACEMENT DUE TO SPACE CONSTRAINTS IN THIS AREA.

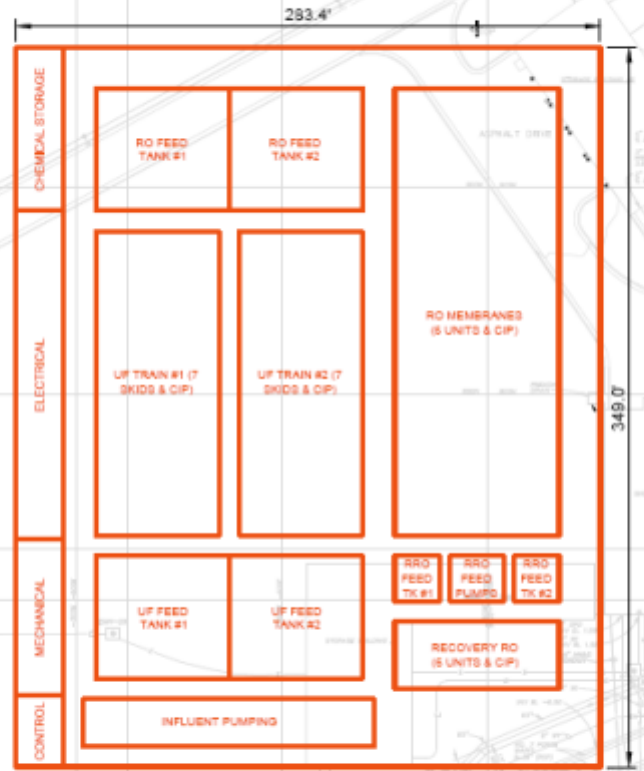
ALTERNATIVES:

- 2A - EDR
- 2B - EDR + EVAPORATOR
- 2C - EDR + EVAPORATOR + CRYSTALLIZER



**2, 2.25 MG Tanks
 (115' dia. each)**

20,000 SF



101,500 SF

Filtration Building



Salt is Cheap, Easy to Use, Works

To Purchase Salt:

- \$60 to \$120/ton
- \$0.03 to \$0.50/pound

Because of this, most people haven't thought about environmental consequences

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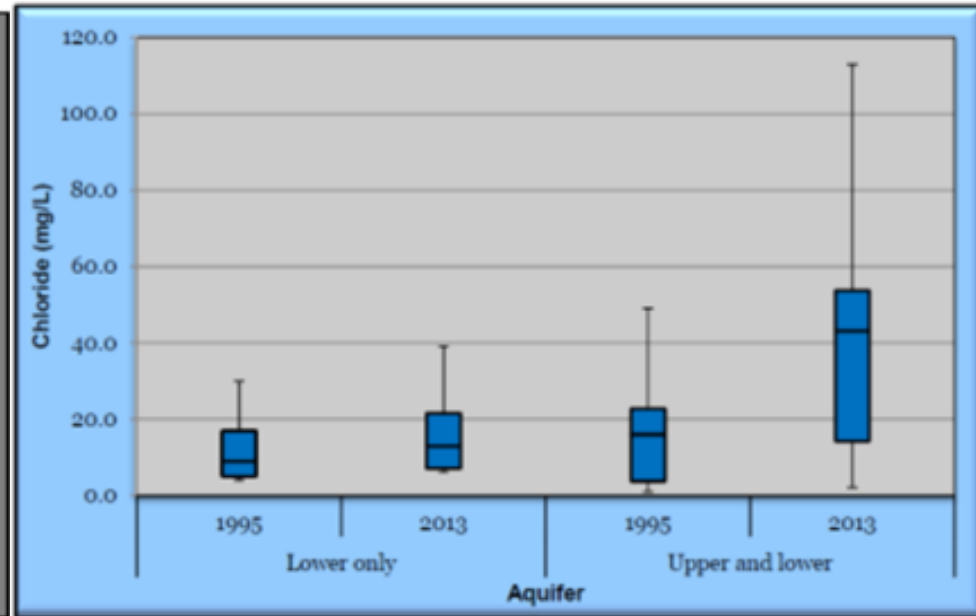
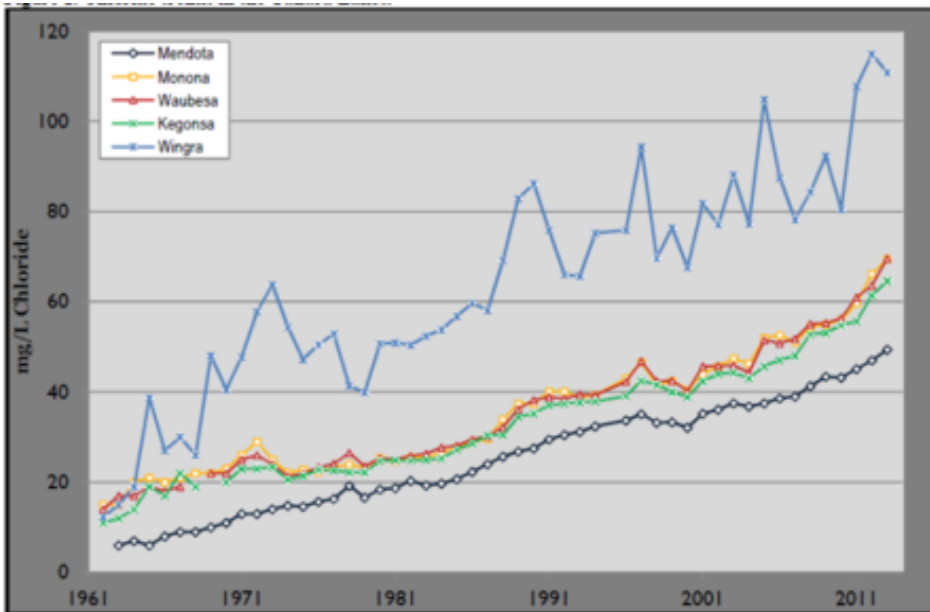
To Remove Chloride:

- Capital Cost: \$2,300/lb to \$23,500/lb
- Operating Cost: \$500 to \$6,700/lb

Because of this, most people haven't thought about environmental consequences

Source Reduction: Opportunities

- Salt Institute indicates 14,000 uses
- Impacts all water - not just wastewater



Variety of Potential Partners

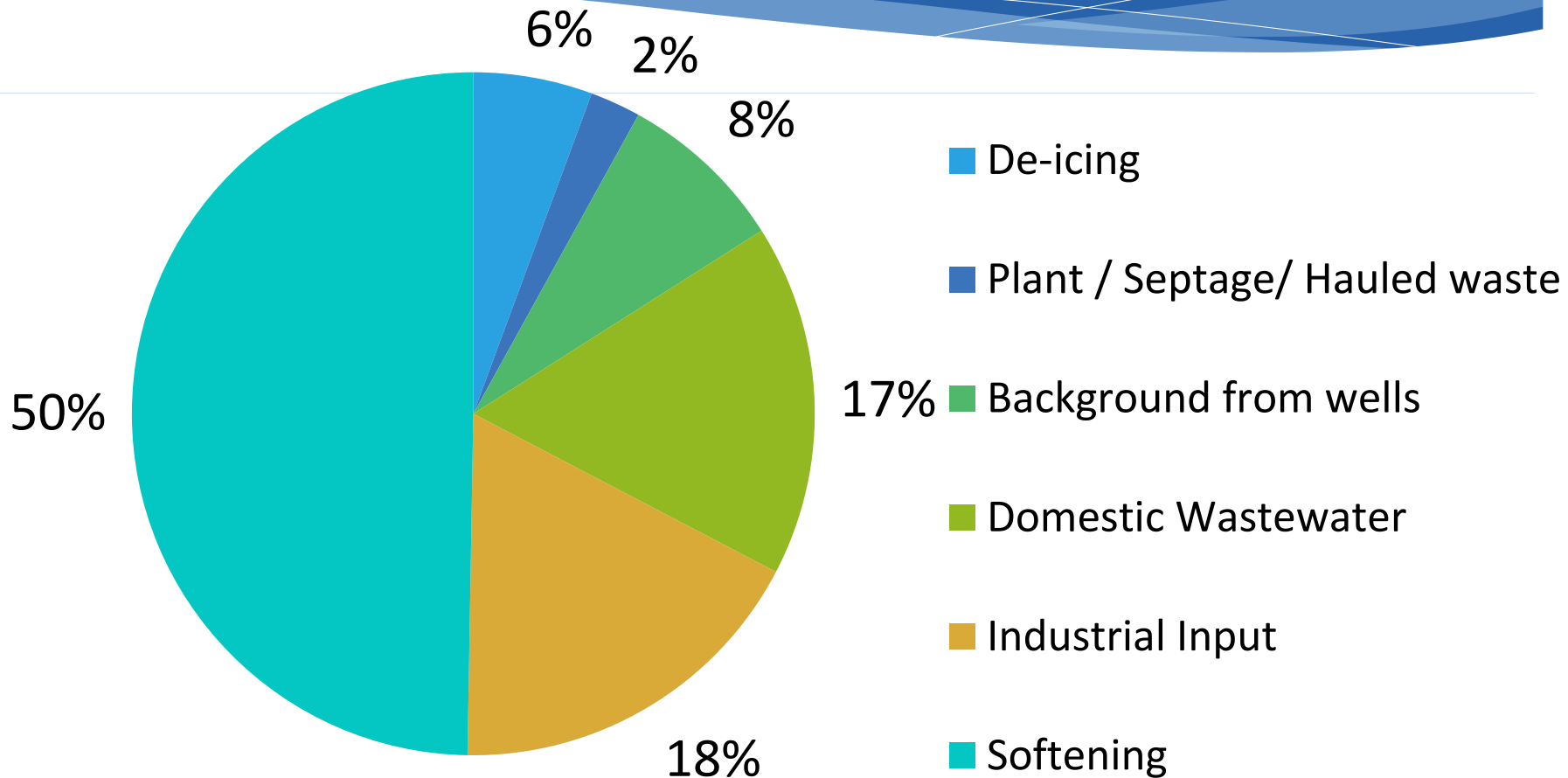
Installers
Manufacturers
Plumbers
Builders
Agencies
Schools
Associations
Businesses
Public health
Public
Water Utility
Stormwater Utility

Source Reduction: Challenges

- **Different kind of risk/lack of control**
- **New skill sets**
 - Collaboration
 - Behavior Change
 - Education/Outreach
- **Non-traditional investment**

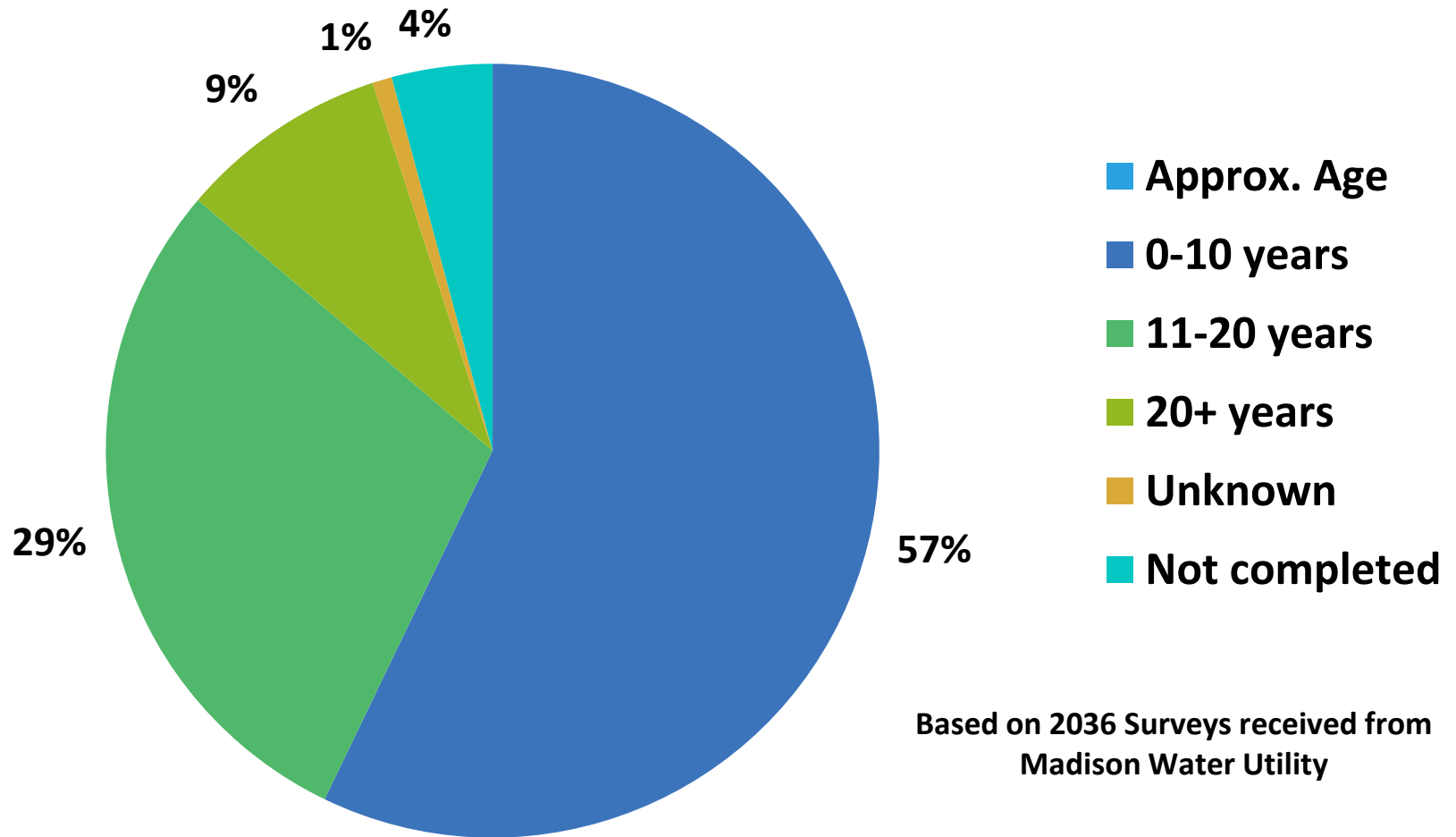


Sources Reduction Requires Understanding Sources and Relative Contributions



MMSD/MWU - Water Softening Survey

- ~100,000 softeners connected to MMSD



Water Softening Study

- Paired-basin study with diverse partnerships/funders
- How much chloride from softeners, how much controllable, how \$
- Apparent chloride reductions:
 - ~53%↓ chloride in replacement area
 - ~16%↓ chloride in optimization area



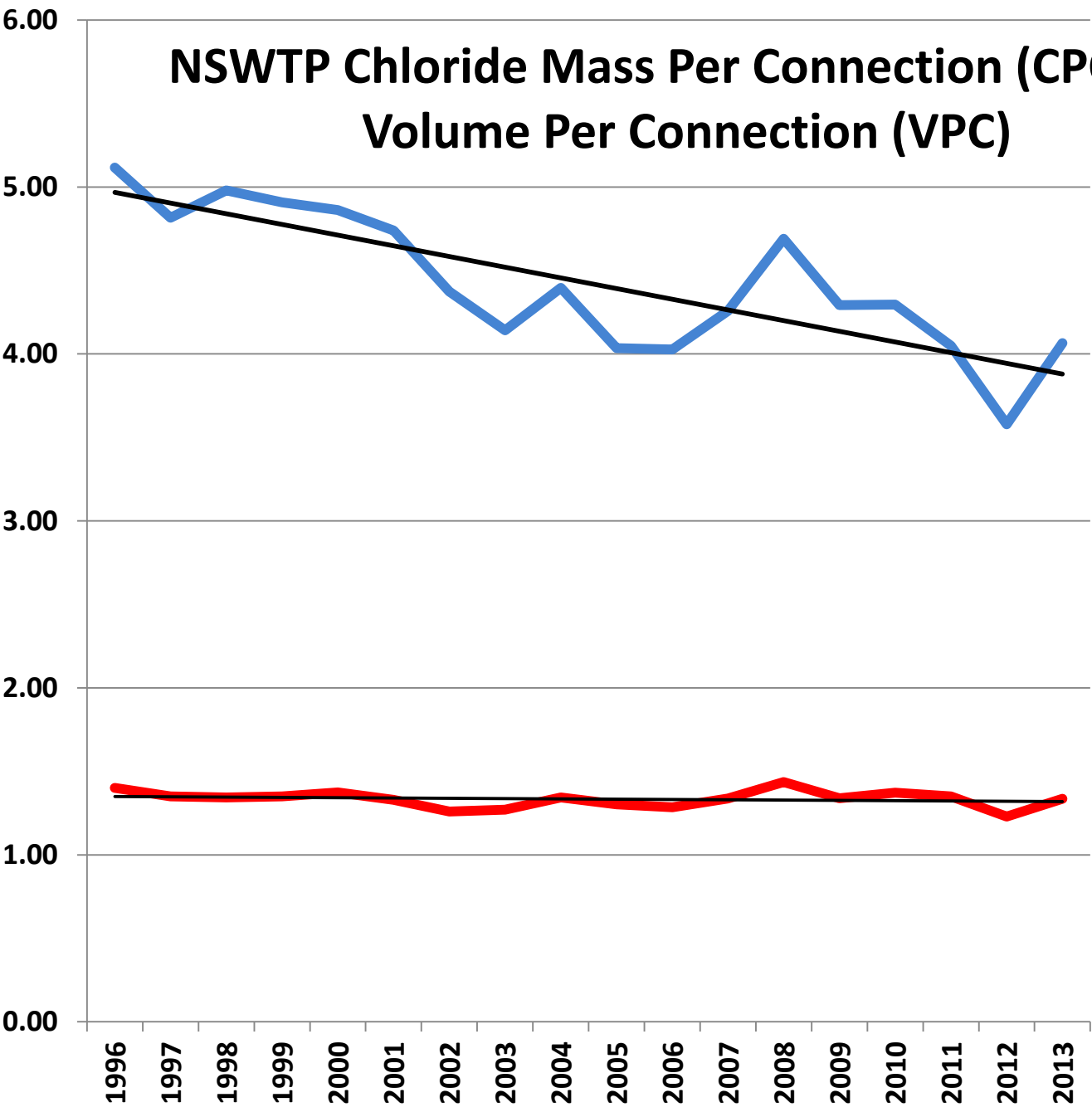
Achieve 20,000 lb/day reduction?

- Replacement
- 53% ↓ (of 0.58 lb/day)
- 0.30 lbs/day
- ~60,000 units

- Optimization
- 16% ↓ (of 0.58 lb/day)
- 0.1 lbs/day
- ~200,000 units



NSWTP Chloride Mass Per Connection (CPC) vs. Volume Per Connection (VPC)



- CPC (lbs)
- VPC (100's gallons)
- Linear (CPC (lbs))
- Linear (VPC (100's gallons))

Water Softening Study

- **Report being developed:**
 - Includes sensitivity analysis for various parameters
 - Criteria for new softeners
 - Approach for improving softening efficiency
- **Arizona Water Quality Association - Training Program**



Mini-Grant Program

- **Examples:**

- Residential Outreach – Postcard
 - Postcard: In 2-months, 28-softeners replaced
 - Estimated reductions ~3300-lbs/year-chloride
- Rebate for Multi-family Replacement Units
 - Commercial reduction ~ 4600 lbs/year - chloride - buildings are part of larger complex

- **Insight:**

- **Outreach, I&E are powerful, incentives are helpful, leverage collaborations/resources, we still have many opportunities.**

MMSD
(Madison Metro Sewerage District)
and
Culligan Total Water
are teaming up to reduce chlorides in the sewer system.

The Culligan® HE.
World's Smartest Water Softener.

- SAVE SALT
46% savings in operating costs
- SAVE WATER
- SAVE THE ENVIRONMENT
with the HE Softener

Reference code MMSD and receive
Installation Credit of \$100
First Year of Salt Free
First Month Rental Free

608-221-2236
www.culligantotalwater.com

**Reducing Chlorides
Starts With You.**

Ask how Culligan can help you
reduce chlorides.

PSRIT STD
US POSTAGE PAID
MADISON WI
PERMIT NO. 589

Footprint graphic: A large green footprint with the word "Track." written inside it.

Culligan logo: Culligan
better water. pure and simple.

Road Salt Education Program

- Education campaign: **WiSaltWise.com**
- Fall training funded by partners:
 - Roads/highways & parking lots/sidewalks
 - 110 applicators trained
- Baseline survey of our customer communities
 - Measure change over time

Brought to you by the WI Salt Wise Partnership:

Dane County, City of Madison, Madison Metropolitan Sewerage District, Madison Water Utility
Public Health Madison Dane County, UW-Madison Department of Environment, Health & Safety, MAMSWaP



Let's be Salt Wise!

We live in Wisconsin, so we know winter. We combat the brutal season by using winter maintenance procedures that keep us safe. But one of these practices, dealing with salt, is costly and destroys our water, vegetation and infrastructure. It's time for Wisconsin to wise up and slow down on speeding salt.

What did WI spend on salt for its highways last year?

\$40,456,343!

And that doesn't include what consultants, businesses and homeowners spend



>>> Learn more <<<

So, how many tons of salt is that?

669,807

That many tons permanently pollutes almost half a trillion gallons of Wisconsin's water.



And costs \$3,304 per lane mile!

>>> Learn more <<<

We can all work together to improve our salt use!
Click below to see what you can do.



Use less than **4 pounds** of salt

Homeowners Salt Resources

© Thinkstock by Getty Images

Homeowners | Municipal | Motorists | EMS | Applicators

Contact us

Salt Goes Beyond the Pavement

Using more salt doesn't make your sidewalks safer — it harms plants and animals, pollutes our water, damages buildings and corrodes vehicles, roads and bridges. Once you put salt down, it doesn't go away. Instead, it travels into our lakes and streams, putting our aquatic life at risk and endangering our freshwater resources. Salt also alters the composition of soil, slows plant growth and weakens the concrete, brick and stone that make up your home and garage. Using the right amount of salt maximizes your family's safety.

1 pound of salt =

12 ounce coffee mug

Hand spreaders are helpful, but if you don't have one, aim for a pattern like this.



Salting for Safety

It's understandable that you want to keep your home safe, especially when a snowstorm hits. Fortunately, there are ways you can improve your salt use and safety:

- Pre-treat walkways with a small amount of liquid deicer before the storm hits to prevent snow and ice from building up. Dissolve salt in warm water until salt no longer dissolves (or take some from your water softener tank), and apply it with a watering can. Learn how to make a brine.

WISaltWise Handouts

GET A GRIP ON SALT



Be Wisconsin

Salt Wise

WISCONSIN TASTES A LITTLE TOO SALTY



Make Your Environment



Your Priority

TAKE CHARGE OF SALT

Take Charge of



Our Environment's Health



Speed up

SLOW DOWN ON SALT

on Safety



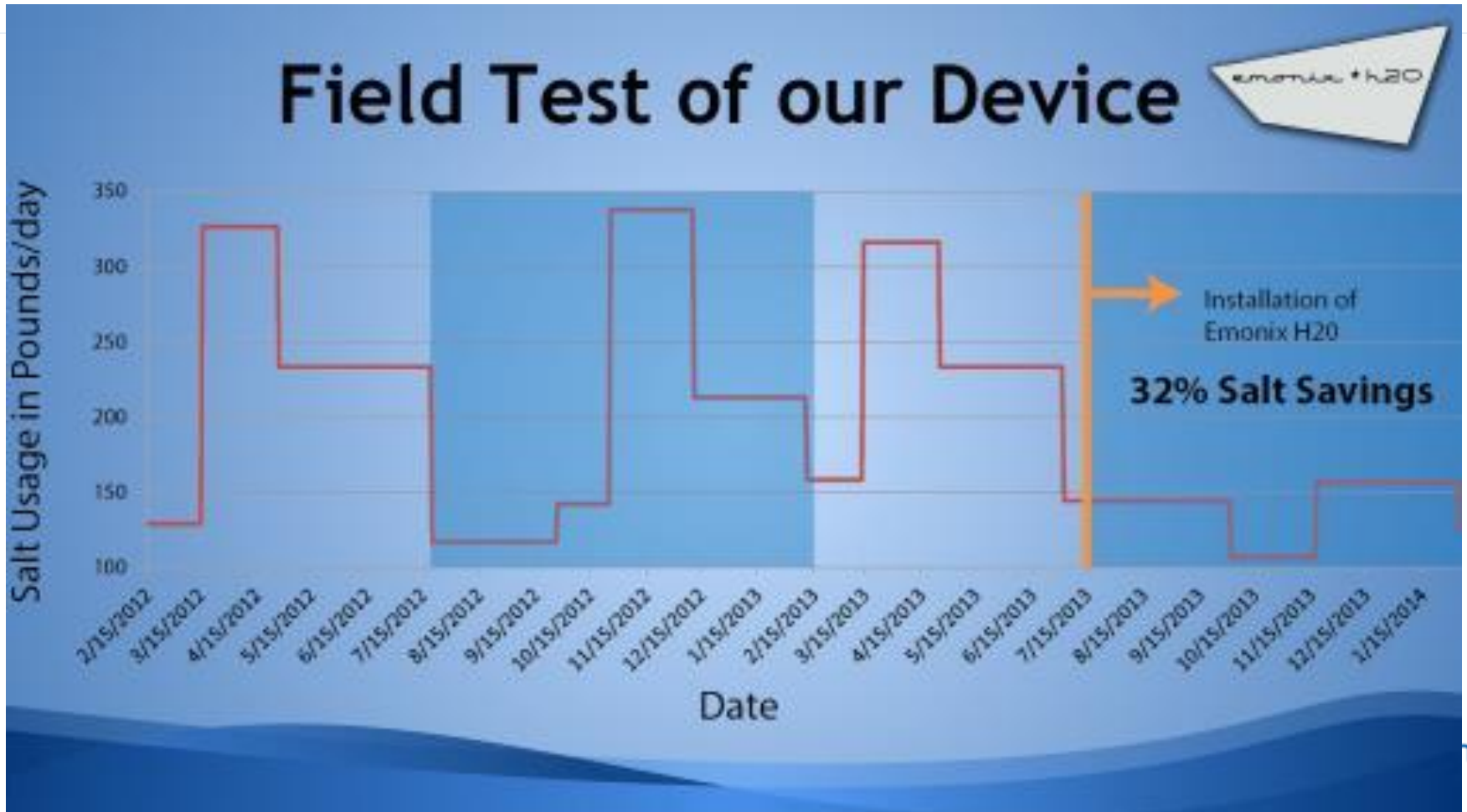
on Safety

Opportunities: Large Softeners



- 5000 grains/lb-salt
- **Brine Reclaim**
- Triplex w/ Upflow regeneration
- ~50% salt savings

Opportunities: Schools/Campus



32% Reduction

Opportunities: Large Users/Industry

Hospital:

Replaced softening for cooling tower with descaling system.

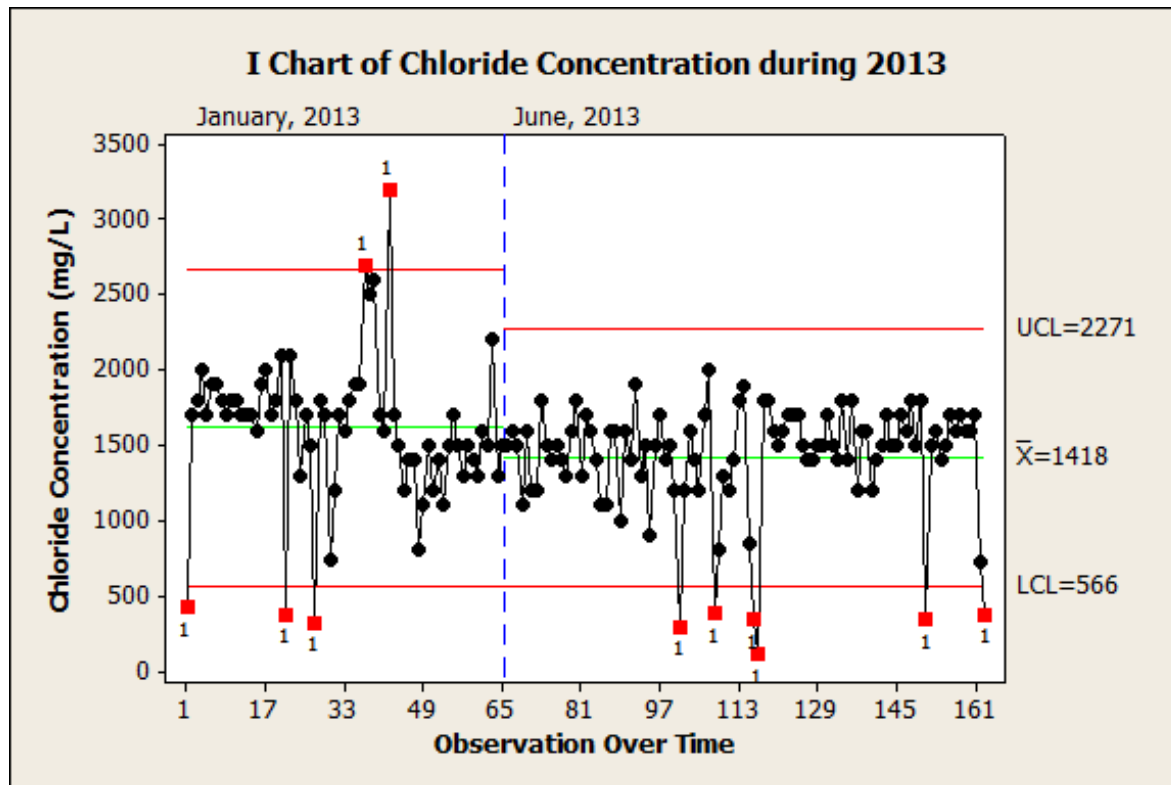
Eliminate salt and saved **\$130,000/year** in operating costs.

Industry:

Implemented maintenance program for valves on brine lines – **reduced chloride 14%**

Industrial Permit:

Issued our first chloride-only permit in 2014



Opportunities: Outside Assistance

- **Hunter's Curve Revisions**
 - Accounts for water-efficiency improvements
 - May help encourage replacements for larger units
- **Certification for salt-free softening systems**
 - Currently in WI, all softening systems have to meet ion-exchange criteria
- **Arizona Water Quality Assoc. - Training Program**
 - Water softener installers



MMSD Chloride Strategy

- **Multifaceted-approach with PPSR playing a major role**
- **Leverage partnerships/collaborations**
- **Likely to recommend investments in non-traditional areas:**
 - Water softener rebate, cost-share to industries, etc.
- **Communication/messaging will be critical**
- **Sufficient Staffing**
- **Look at regulatory changes that could play a role (site specific criteria, different approach to calculating criteria, future District SUO revisions)**



Final Thoughts

- **Leverage Opportunities:**
 - Understand your sources
 - Work collaboratively – joint “wins”
 - Cooling Tower/Industrial options/Large Users
 - Brine Reclaim >2-inch meter
 - Develop softener criteria
 - **Training programs (applicators/installers)**
- **Investigate alternatives**
 - SUO, Billing Parameter...
- **This issue isn't going away**
 - Treatment is expensive
 - Groundwater levels increasing/water conservation
- **Chloride impacts more than permitted wastewater facilities.**

