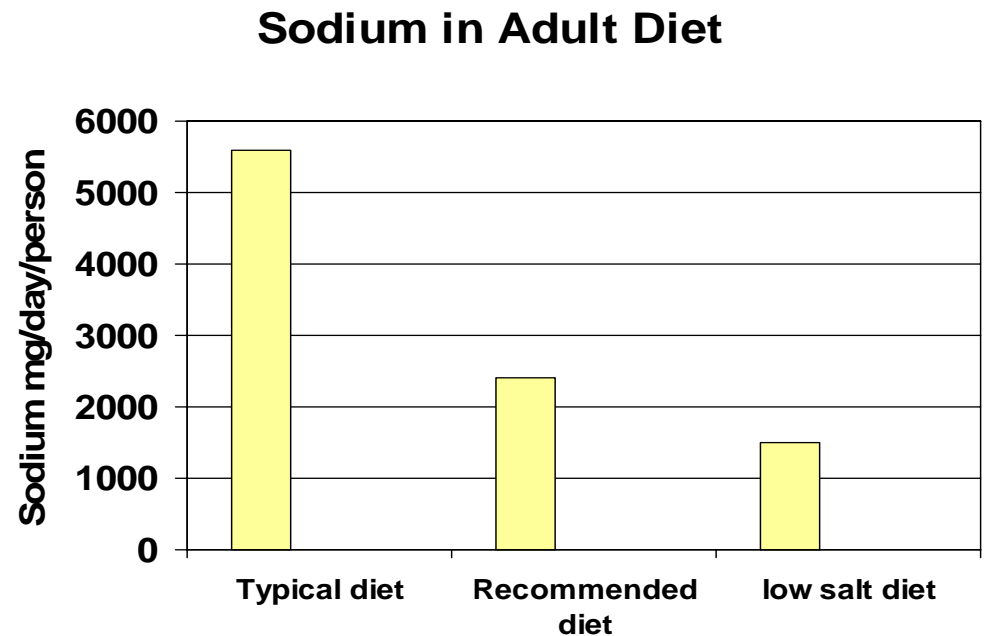

April 15 Agenda

- Health and Cost Considerations
 - Sodium health impacts overview
 - Cost of sodium hydroxide expansion
- Potential Benefits from Softening
- Community Engagement
 - Feedback on web pages
 - Review and feedback on Focus Group approach
- Optional plant tour of softening process and discussion of softening chemistry

Sodium and Health

- Amount of sodium recommended
 - 1,500 to 2,400 mg per person per day for healthy adults (Mayo Clinic)

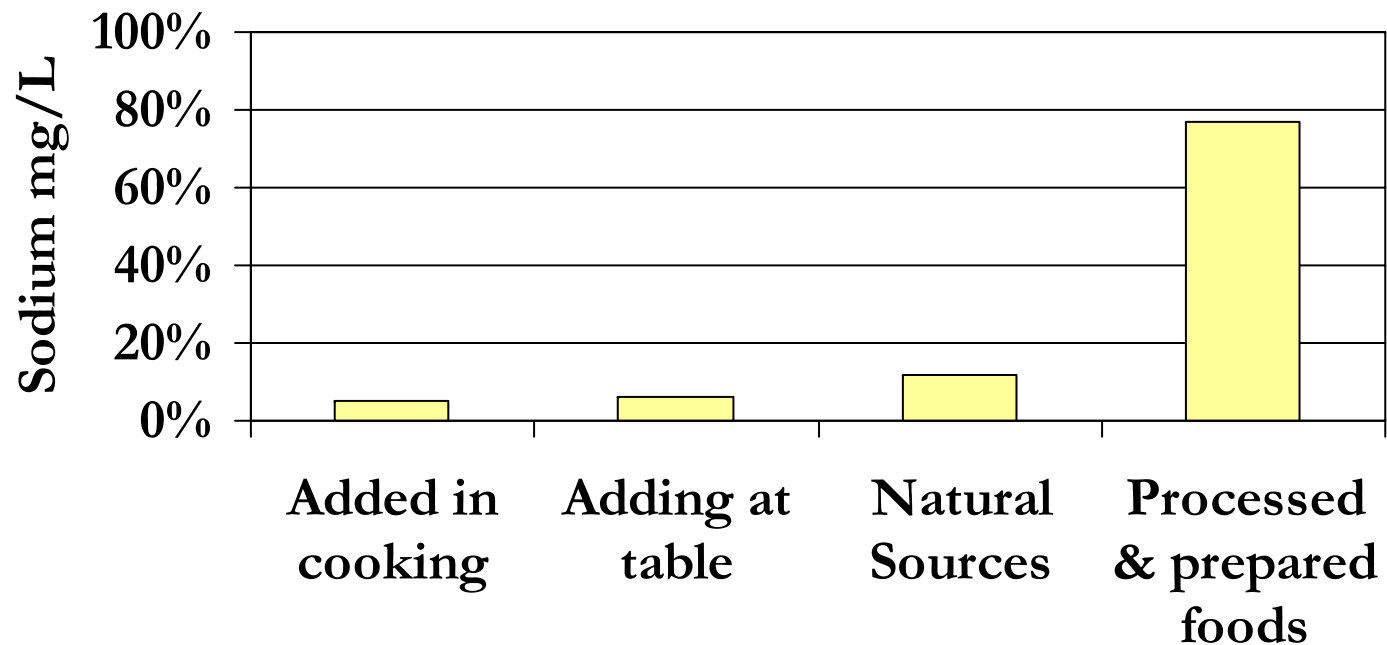


Sodium and Health

- 20% of the US population has high blood pressure
 - About half of that population is sensitive to sodium
 - A minimum amount of sodium is required for good health

What Contributes to Sodium?

Relative Contribution of Sodium from Different Sources (Mayo Clinic)



Sodium in Foods

Food	Amount of sodium (mg)
Breakfast	
■ Scrambled eggs, 2 large	342
■ Bacon, 1 slice	192
■ Whole wheat bread, 1 slice	148
■ Butter, 2 teaspoons	54
Total sodium for meal	736

Sodium in Foods

Food	Amount of sodium (mg)
Lunch	
■ Orange	0
■ Ham, 1 slice	350
■ Whole wheat bread, 2 slices	296
■ Mayonnaise, 1 tablespoon	105
■ Pretzels, 1 ounce	486
■ Dill pickle	385
Total sodium for meal	1,622

Sodium in Foods

Food	Amount of sodium (mg)
Dinner	
■ Spaghetti noodles, 1 cup	179
■ Spaghetti sauce, ½ cup	601
■ Parmesan cheese, 1 tablespoon	76
■ Green beans, canned, ½ cup	177
■ Garlic Bread	200
Total sodium for meal	1,233

Sodium in Water

- Survey of 2,100 water utilities found a range from 0.4 to 1,900 mg/L
- Ann Arbor sodium level is currently 56 mg/L on average, ranging from 44 to 70 mg/L (2007)

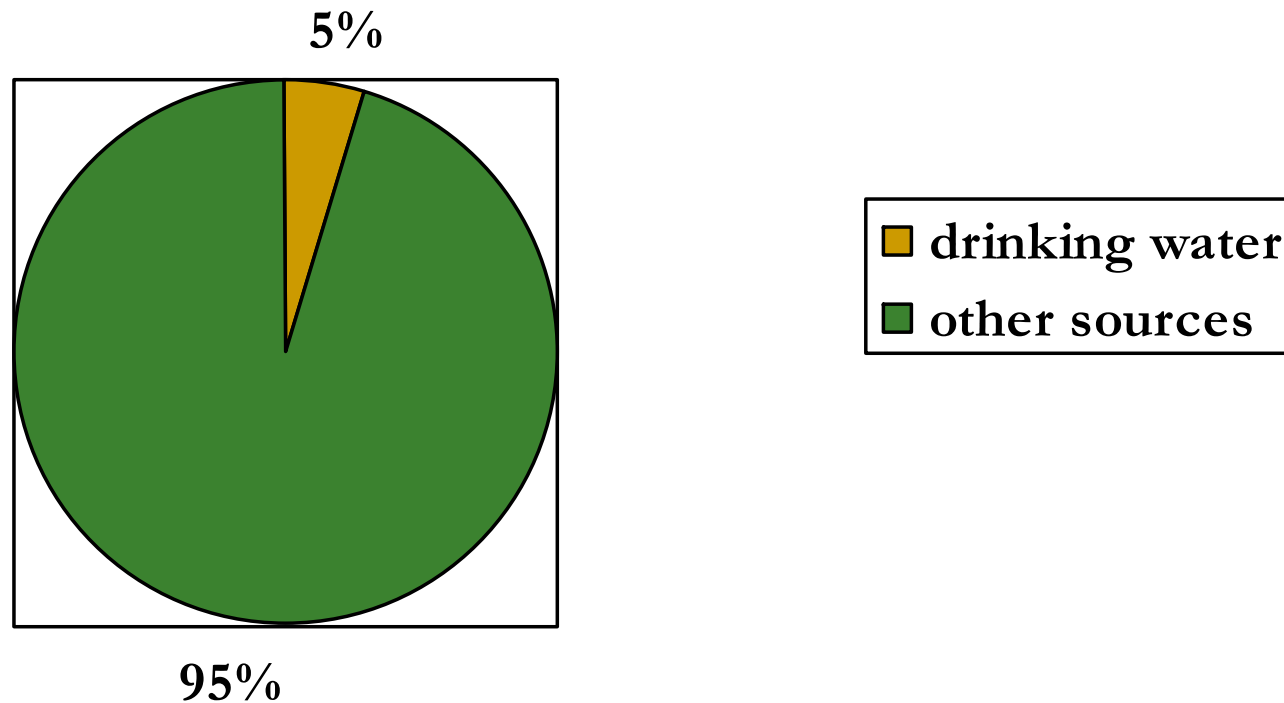
Sodium in Water

Ann Arbor Drinking Water	Typical volume of water consumed per person per day	Mg of sodium per person per day from Ann Arbor drinking water
Current sodium level of 56 mg/L (range 44 – 70 mg/L)	2 liters	112 mg average Range 88 – 140 mg
Potential sodium level with increased softening 70 mg/L (range 58 – 84 mg/L)	2 liters	140 mg average Range 116 to 168 mg

Ann Arbor Drinking Water Contribution to Overall Sodium

2,400 mg/day total dietary rec.

Current sodium level in A2 water of 56 mg/L



Bottled Water and Sodium

- Bottled water sodium depends on source and is expressed as a percentage

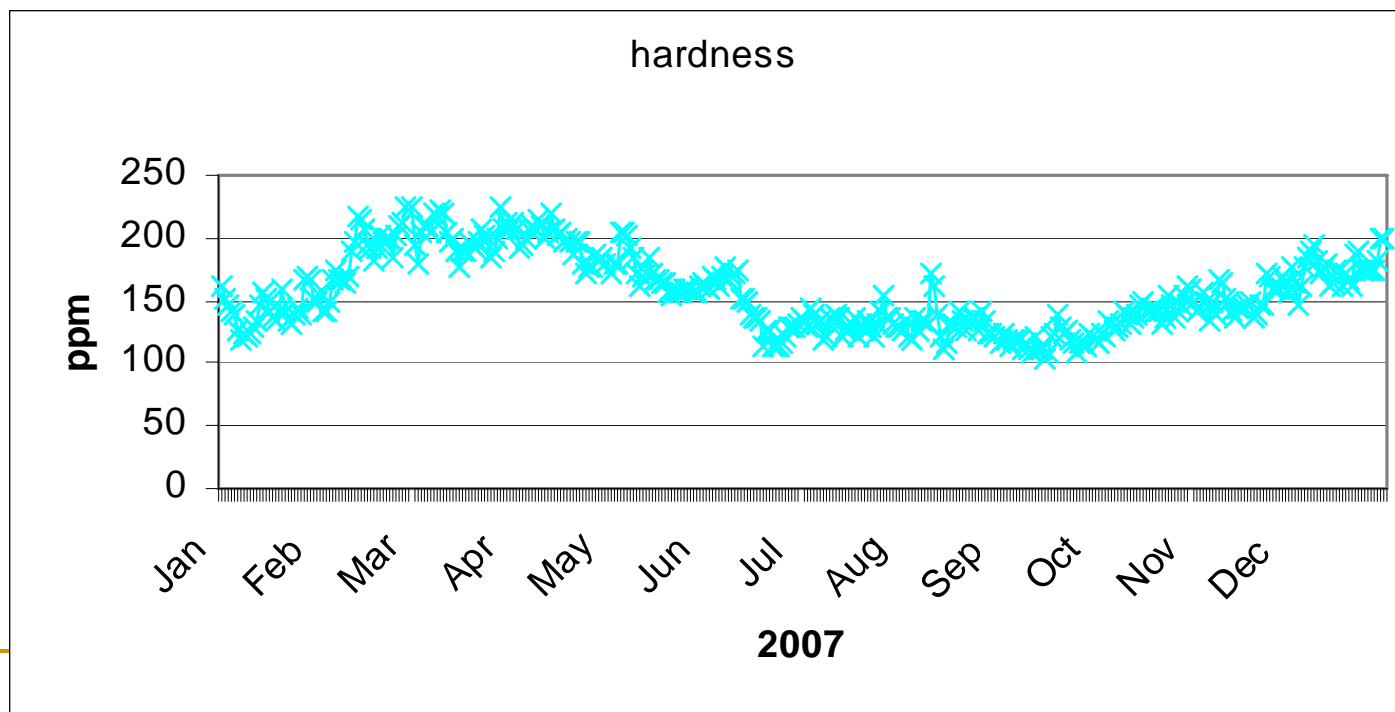
Aqua Fina	0 %	Bottled water
Dasani	0%	Bottled water
Evian	6% or 600 mg/L	Spring water
Ice Mountain	1% or 100 mg/L	Spring water
Poland Spring	3% or 300 mg/L	Spring water

Sodium and Water Regulations

- ❑ EPA recommendation: 20 mg/L
- ❑ Ontario regulatory limit: 200 mg/L
- ❑ Ontario medical notification limit: 20 mg/L
- ❑ Florida regulatory limit: 160 mg/L

Water Hardness

- In water, hardness typically ranges from 10 – 500 mg/L
- In Ann Arbor, hardness averages 157 mg/L (range 104 – 225 mg/L)



Input From Other Communities

- Surveyed 10 water utilities in upper Midwest who also soften their water
 - Hardness goals, customer involvement
 - Sodium concentration, public interest
 - Softening chemicals used, considered

Utility Survey Results

Treatment for Reducing Hardness

- All use lime
- Two utilities did some evaluation of alternatives (membranes)
- One utility used sodium hydroxide in the past
- One utility currently uses sodium hydroxide intermittently
- Mixed response on ability to further soften water – generally not desired

Utility Survey Results

Hardness Goals

- Typical hardness ranges from 65 -145 mg/L
- Minimal, if any, public involvement in water hardness issues
- Water Quality Goals are:
 - Compliance with turbidity regulations
 - Control of corrosion/precipitation in distribution system
 - Compliance with lead and copper regulation
 - Hardness is a secondary goal relating to the above parameters
 - Historical

Utility Survey Results

Use of Sodium Hydroxide for Softening

■ Advantages

- Easy to use
- Reliable & easy to control process
- Producing consistent water quality

■ Concerns

- Employee safety (hazardous chemical)
- Expensive chemical

Utility Survey Results

Sodium

- One utility with limited public interest in sodium
- Sodium concentrations range from 5 to 92 mg/L

Utility Survey Results

Water Rates

- Typical rates for a residential customer ranged from \$0.09 to \$3.70 per ccf (100 cubic feet)
- Ann Arbor rate is approximately \$1.07 per ccf
- Utilities were mixed on the importance of cost in determining softening
 - Utilities with highest water rates were concerned over chemical costs

How Does Ann Arbor Compare with Other Utilities?

- Within the sodium range of concentrations seen by others
- Hardness is currently higher than typically observed at other utilities
- Cost is within the range charged by other softening plants
- Ann Arbor more active in public involvement on hardness issues
- The use of sodium hydroxide for softening is not typical

Impact of Reduced Hardness

Potential Benefits

	Potential Benefit
Residential hot water heaters, other home appliances	Extend life TBD
Customer soap use	Reduce soap in dishwashers, other uses
Phosphorus	Reduction in use of soap could lead to reduction in phosphorus to WWTP
Home softeners, POU's, bottled water	Decrease use
Large water users	Decrease softening requirements

Dishwasher Soap Use

Water Hardness	Theoretical Soap Use per load	Annual residential cost (one load per day at average price of \$4.66 for 45 oz)	Annual cost for 25,000 residences	Total customer cost savings
160 mg/L	9 teaspoons	\$56.80	\$1,412,792	0
130 mg/L	7.5 teaspoons	\$47.25	\$1,177,327	\$235,465 \$9/year per residence
100 mg/L	6 teaspoons	\$37.80	\$941,862	\$470,931 \$18/year per residence

Phosphorus In Dishwasher Detergent

Dishwasher Detergent	Percent Phosphorus
Electrosol	4.9%
Cascade	4.0%
Palmolive Gel	1.6%
Seventh Generation	0%
Sunlight Powder	4.5%

With an average phosphorus content of 3% and same assumptions as for soap use, this amounts to a reduction in phosphorus of:

- ❑ 4,262 lbs. phosphorus at 130 mg/L hardness
- ❑ 8,523 lbs. phosphorus at 100 mg/L hardness

Appliance Life

Appliance	Typical Life Expectancy	Ann Arbor Life Expectancy
Dishwasher	5 – 12 years	?
Washing Machines	8 – 12 years	?
Gas hot water heater	8 – 12 years	?
Electric hot water heater	10 – 15 years	?
Galvanized water pipes	30 – 50 years	Likely already replaced

Impact of Reduced Hardness

Potential Concerns

	Potential Concern	Potential Outcome
Pipe corrosion	Reduction in scale formation	This may be positive as water is currently excessively scale forming, but may require water quality assessment
Sodium concentrations	Increase sodium in drinking water	
Beer Brewers?		

Your Thoughts

Feedback on Web Content

1. Understandable?
2. Provide Adequate Context?
3. Address Most Important Issues?

Suggested Edits?

Water Softening Project Focus Group Health Professionals



Agenda

- Welcome, Introductions
- Project Overview
- Potential Benefits from Softening
- Health Considerations

Project Scope

- Complete rehabilitation of lime softening system
 - Replace equipment which has exceeded its useful life
 - Improve worker safety
- Investigate and make recommendations regarding desired water hardness
 - Customer input
 - Cost/benefit analysis



Customer Issues with Hardness

- Scaling of appliances and pipes
- Potential for reduced life of hot water heaters
- Spotting on dishes in dishwashers
- Quantity of soap use
- Use of residential and business softening units

Considerations

- Daily operations
 - Plant
 - Customers
- Rates
- Life cycle costs
 - City
 - Customers
- **Health**

Hardness Goals

- Hardness goals can be set anywhere
- Recommended 100 – 130 mg/L as best balance between hardness, distribution system pipe condition, and cost
- With the use of **sodium hydroxide** for additional softening, lower hardness can be achieved

Sodium Levels in Ann Arbor

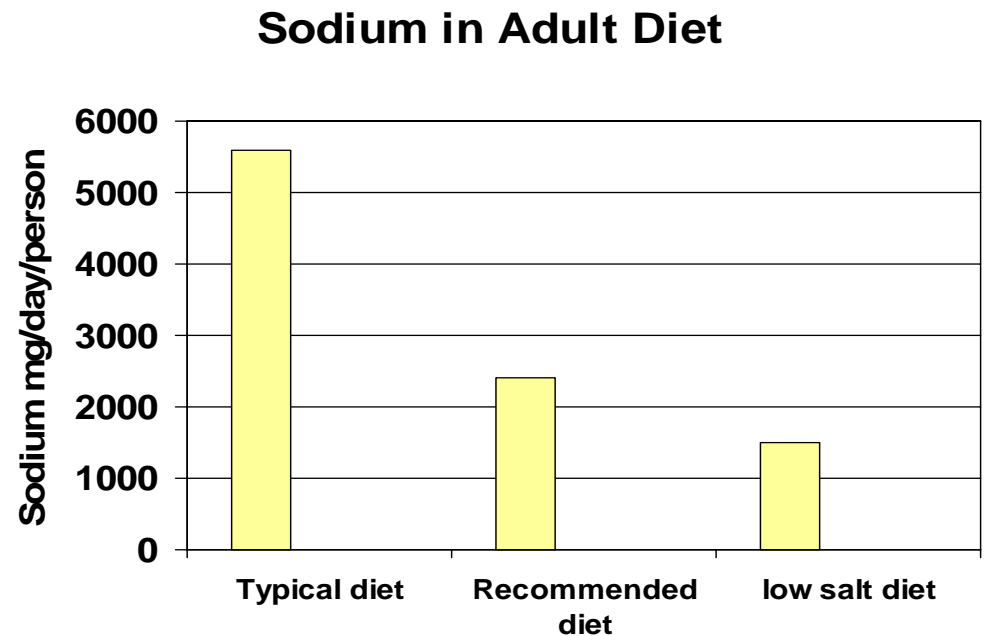
- **Current** sodium (average) 56 mg/L

If softened to 100 – 130 mg/L

- **Projected** sodium (average) 70 mg/L

Sodium and Health

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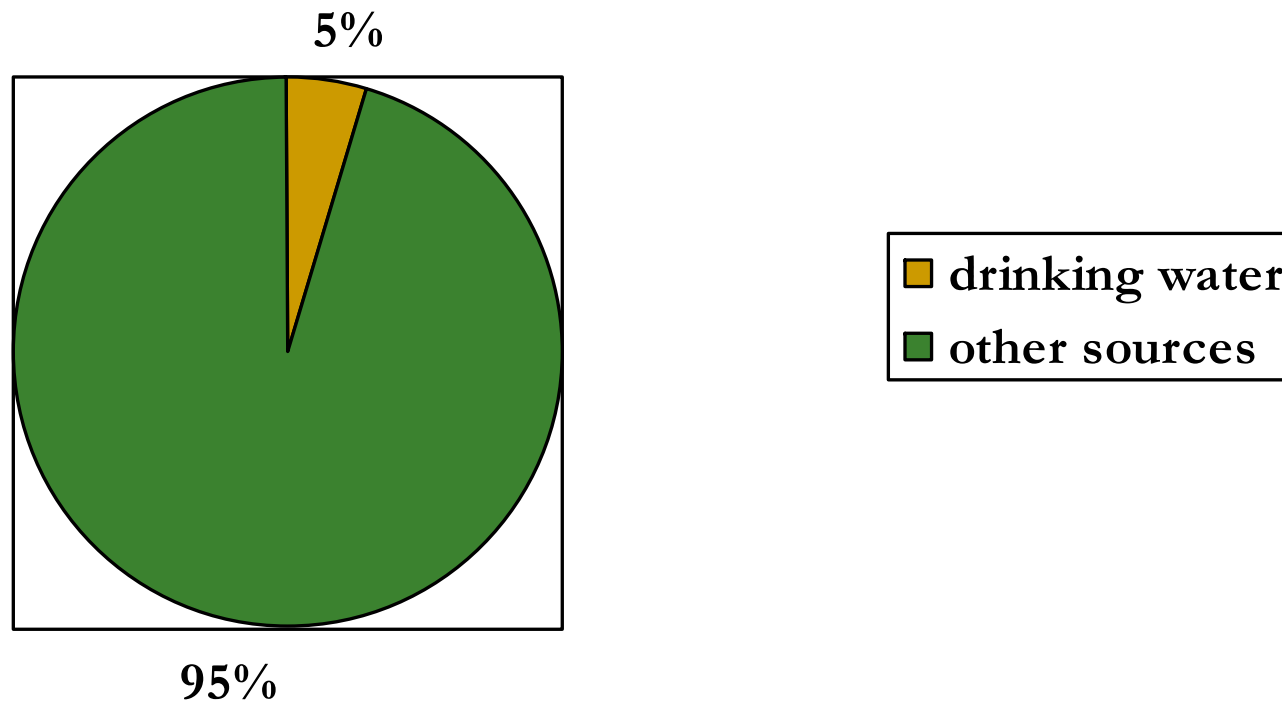


Sodium and Health

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Ann Arbor Drinking Water Contribution to Overall Sodium

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Current sodium level in A2 water 56 mg/L



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Large water users	Decrease softening requirements

Your Thoughts

Written Feedback

- Level of health concern this raises for you?

1 2 3 4 5 (very high)

- If you have low to no health concerns, would you want your Ann Arbor tap water softened?

no undecided yes

- Other studies or data you would suggest accessing?

Water Softening Focus Group Large Customers



Agenda

- Welcome, Introductions
- Project Overview
- Potential Benefits from Softening
- Operational and Cost Considerations

Project Scope

- Complete rehabilitation of lime softening system
 - Replace equipment which has exceeded its useful life
 - Improve worker safety
- Investigate and make recommendations regarding desired water hardness
 - Customer input
 - Cost/benefit analysis



Customer Issues with Hardness

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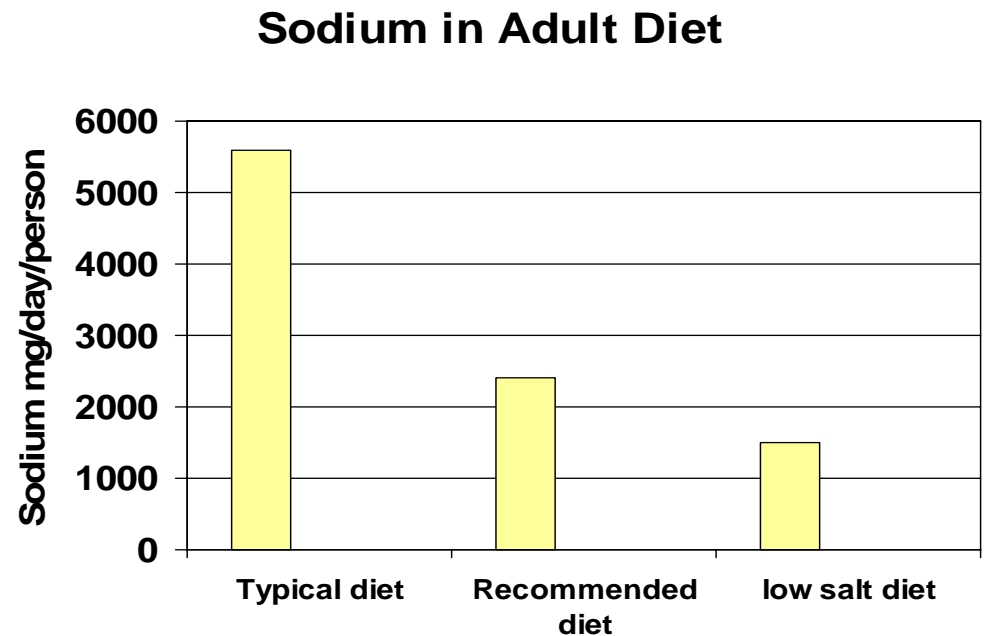
- **Current** sodium (average) 56 mg/L

If softened to 100 – 130 mg/L

- **Projected** sodium (average) 81 mg/L

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Sodium and Health

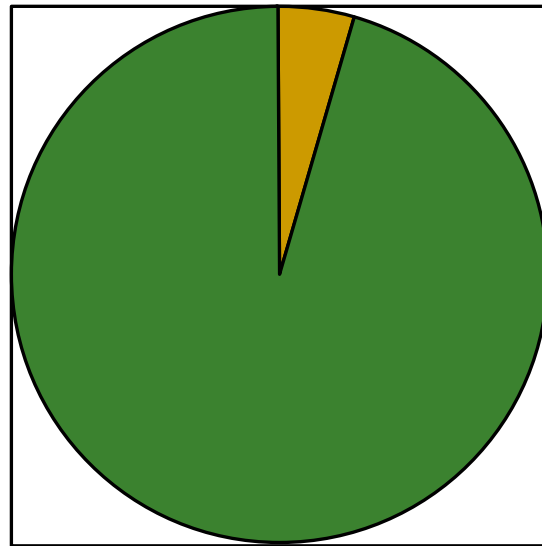
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Ann Arbor Drinking Water Contribution to Overall Sodium

2,400 mg/day total dietary rec

Current sodium level in A2 water 56 mg/L

5%



■ drinking water
■ other sources

95%

Cost Comparisons: *include examples of projected impact at customer level*

- Decreased cost of softening
- Extended pipe life (TBD)
- Increased cost of water

Impact of Reduced Hardness

Potential Benefits

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