


# CITY OF MARSHALL CHLORIDE ISSUES

September 26, 2017


- \* The MPCA issued the City of Marshall Wastewater Facility a Chloride limit in its NPDES Permit issued in 2014.
- \* The limit has a compliance schedule to meet this limit by 2024.
- \* The new limit is 261 mg/l and we are currently discharging about 560 mg/l.



Chloride (salt) is used in water softeners to recharge the media so the media attracts the hard water chemicals as the water passes through the media.

This process produces the soft water for use in our homes.

As the media gets full of hard water chemicals, the media needs to be recharged and the brine (salt) solution flushes the hard water chemicals with the brine solution into the sanitary sewer.



This is how chlorides get into the wastewater. Once salt is added to water, it is very difficult to remove.

Salt passes through the wastewater plant and is discharged into the river and may cause toxicity to fish and aquatic life. The City of Marshall discharges 13,000 pounds of salt into the Redwood River every day.


Road salt is also a cause of non-point pollution in rivers.



Marshall has very hard water, and softening is necessary.

Marshall Municipal Utilities (MMU) currently partially softens its raw water using lime.


MMU has a proposed upgrade design to further soften the raw water using lime and soda ash.



This would allow MMU to treat the raw water to a much softer level where home softening could be greatly reduced or eliminated.


The proposed upgrade would be very expensive. Current estimates are in the \$9 million range.

We have investigated the potential for some grant money from State agencies to help offset the cost.




MMU is hoping to receive a Point Source Implementation Grant from the Minnesota Clean Water Legacy Fund in the amount of \$7,000,000 towards the project in 2019.

MPCA has said our chances of getting grant funding awarded in 2019 are the highest if we have the project designed and ready to bid by June of 2018.




The increased costs to reduce chlorides is a wastewater permit issue. Reduction of chlorides is easier and more cost-effective at the raw water treatment plant by further softening, resulting in the reduction of water softener needs.



The capital costs for improvements for elimination of chlorides to permit levels should be funded through wastewater user charges and grant funds.


Increased O&M costs for the enhanced softening at the water plant can be supported as Bolton & Menk suggests, is by a surcharge on the utility bill.





The WWTF Fund should pay 90% the cost of the design; estimated at \$815,000 in 2018 so we are ready to bid and get the PSIG Grant funding in 2019. This would be a WWTF cost of \$733,500.

The City of Marshall Wastewater Treatment Facility's total estimated commitment is \$1,143,000 and Marshall Municipal Utilities commitment of \$900,000 which they would need to spend on plant improvements if they did not further soften.



The City of Marshall should support MMU in this project to further soften the community water supply in order to provide a better quality water to the consumers and to meet compliance requirements for the Wastewater Treatment Facility.



# SOFTENING SYSTEM MODIFICATION STUDY UPDATE

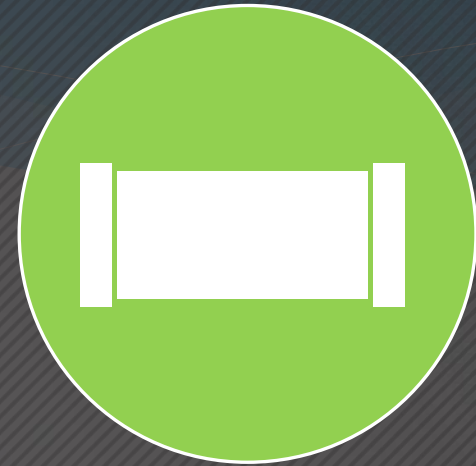
**MMU FILTRATION PLANT**

May 2017

# OBJECTIVES



Support the City in  
**Achieving Compliance**  
w/ more stringent  
Chloride discharge  
regulations from  
WWTF



Improve MMUFP  
**Process**  
**Performance** &  
Address  
**Aging Equipment**

# EXISTING WATER TREATMENT FACILITY



## MMU owns and operates a 8.0 MGD Lime Softening Treatment Facility

- Hardness of the Raw Water ~ **850 mg/L**
- Hardness of the Treated Water ~ **600 mg/L**

Water Hardness Scale		
Grains/Gal	mg/L or PPM	Classification
Less than 1	Less than 17.1	Soft
1-3.5	17.1-60	Slightly Hard
3.5-7	60-120	Moderately Hard
7-10	120-180	Hard
Over 10	Over 180	Very Hard
1 gpg = 17.1 mg/L = 17.1 ppm		



# EXISTING WATER TREATMENT FACILITY



## IMPORTANT NOTE:

Chlorides in the system do NOT come from the MMUFP.

- ***MPCA is proposing chloride concentration limits of:***
  - *261 mg/L for the Average Month*
  - *302 mg/L for the Maximum Day*
- ***Average WWTF discharge into the Redwood River:***
  - *Range from 470 mg/L to 689 mg/L*
  - *Average of 561.2 mg/L*
- ***Average finished water chloride concentration from the MMUFP:***
  - *Range of 22 to 51 mg/l*
  - *Average Blended scenario ~ 26.28 mg/L*

# SOFTENING SYSTEM MODIFICATION STUDY



**PURPOSE:** Assess the impact of additional softening at the MMUFP on:

- Reduced home water softener use
- Reduced Chloride in industrial discharges

**APPROACH:** Evaluated Feasibility of Softening to 100 mg/L

- Water Quality Impact
- Required MMUFP Improvements
  - Technical and Financial

# SOFTENING SYSTEM MODIFICATION STUDY



## WATER QUALITY IMPACT CONCLUSIONS

	CALCULATED CHLORIDE CONCENTRATION N (mg/L)	PROPOSED DISCHARGE LIMIT (mg/L)
<b>CURRENT DISCHARGE</b>	<b>561</b>	
Softening Improvements at MMUFP <b><u>ONLY</u></b>	<b>288</b>	
Reductions of Major Industries to 260mg/L <b><u>ONLY</u></b>	<b>443</b>	<b>261</b>
Softening Improvements at MMUFP <b><u>AND</u></b> Reduction of Major Industries to 260mg/L	<b>180</b>	



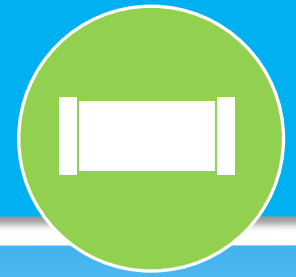


## WATER QUALITY IMPACT CONCLUSIONS

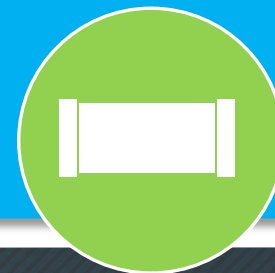
Achieving Required Chloride Concentration will Require both “Residential” and “Industrial” Participation

- **Public Education**
  - Compliance Programs, Rebates, Ordinances
- **Industrial Pretreatment Programs**
  - Limiting Industrial WW discharge chloride concentrations to 260 mg/L

# RECOMMENDED MMUFP IMPROVEMENTS



- 1. Increased Capacity to Feed Lime**
- 2. New System to Feed Soda Ash**
- 3. Expanded Building to House Equipment**
- 4. Increased Recarbonation Capacity (pH adjustment)**
- 5. Improved System to Manage Residual Waste Product**

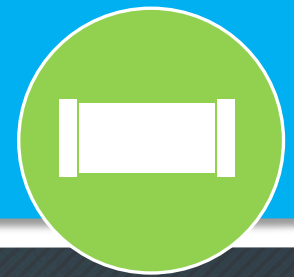


## SUMMARY OF PROBABLE TOTAL PROJECT COSTS

Summary of Probable Costs	
Softening – Lime and Soda Ash <i>(Building Expansion)</i>	\$6,203,000
Recarbonation System	\$1,041,000
Gravity Thickener	\$1,799,000
<b>Total</b>	<b>\$9,043,000</b>

Note: Cost estimates are for an anticipated 2019 construction timeline.

# SUMMARY COSTS



## SUMMARY OF ESTIMATED O&M COSTS

Description	*Soften to 100 mg/l = 6 grains/gal*			
	Quantities		Estimated Cost	
<b>TOTALS</b>				
<b>Chemical Cost per CCF</b>			<b>\$1.11</b>	<b>per CCF</b>
O&M Cost				
Staff/Labor Cost	0.54	FTE	\$33,110	per year
Sludge Management Cost			\$280,000	per year
Power Cost			\$17,500	per year
Total O&M Cost			\$330,610	per year
Annual Production	920	MG		
<b>O&amp;M Cost per CCF</b>			<b>\$0.27</b>	<b>per CCF</b>
<b>Total Softening O&amp;M Cost per CCF</b>			<b>\$1.38</b>	<b>per CCF</b>
<b>Incremental Increase from Existing</b>			<b>\$1.08</b>	<b>per CCF</b>



## **Improvements at the MMUFP can assist in Achieving Chloride Discharge Compliance**

- Softening to ~100 mg/L
- Reduce residential water softening practices
- Industrial Pretreatment Program(s)

## **Improvements at the MMUFP**

- Achieve both increased softening and replacement of aging process equipment
- New process equipment with improved efficiency
- Capital Cost ~ \$9M
- Increase in Operating Costs ~\$1.08/CCF
- Estimated 2-years from initiation to operation