

# Small System Design

Presented by: Stephanie Layfield





# Introduction:

## Stephanie (Hall) Layfield

- Owner and founder of Ionico Technical Services
- Third generation in the water treatment industry behind grandfather (Bill Hall Sr.) and father (Bill Hall Jr.)
- Graduate of Texas State University with a Bachelor's Degree in Aquatic Biology and a minor in Chemistry





# Class Structure

- Common water problems
  - Chemistry and effect
  - Treatment technologies
    - Hardness
    - Iron
    - Hydrogen Sulfide
    - Chlorine
    - Bacteria
- Water analysis interpretation
  - Evaluation
- Small system design
  - Selection of Technologies
  - Correct Orientation

# Hardness

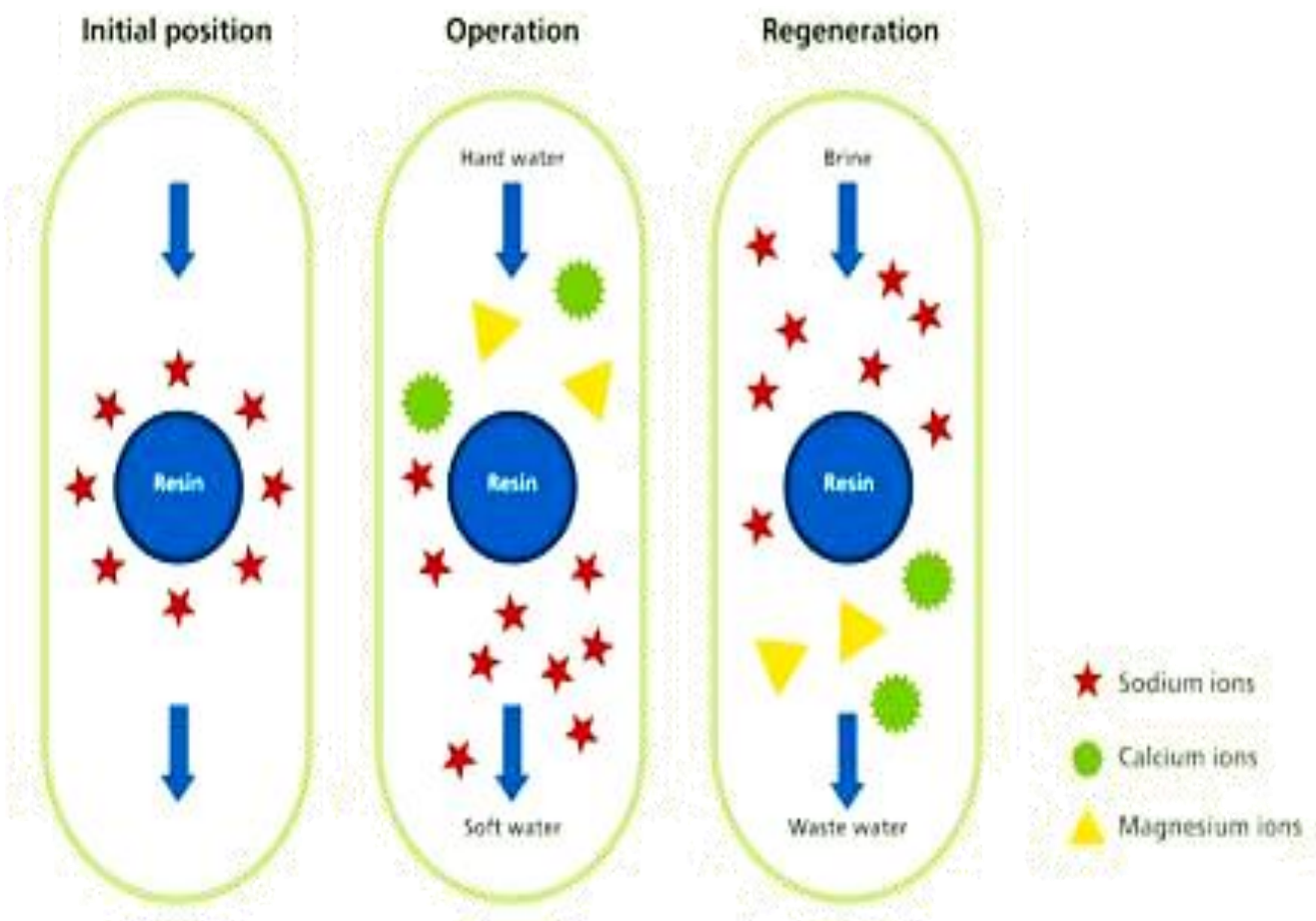
- Where does it come from?
  - Natural mineral in public and private water supplies
- What does it cause?
  - Scale and hard water stains
- How is it measured?
  - Grains per Gallon (gpg) or Milligrams per Litter (mg/l)
  - $1 \text{ gpg} = 17.12 \text{ mg/l}$





# Hardness

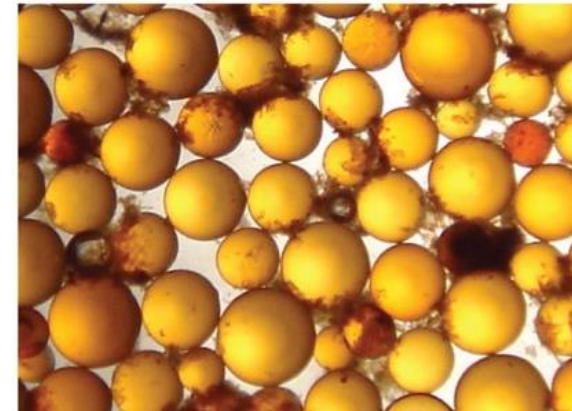
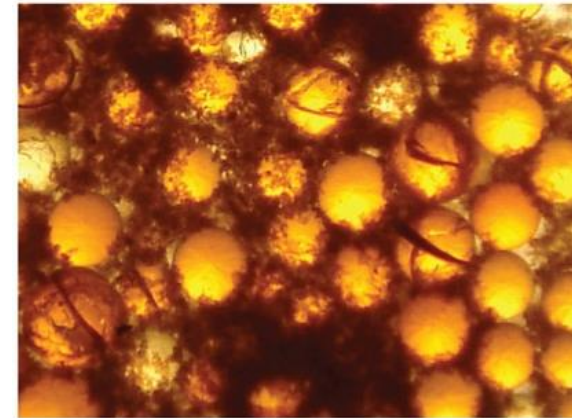
- Treatment Technology
  - Softener
- Position
  - After Iron
  - After Carbon





# Hardness

- Limitations
  - Iron
- Increased Sodium concentrations
  - Potassium
  - RO for drinking water





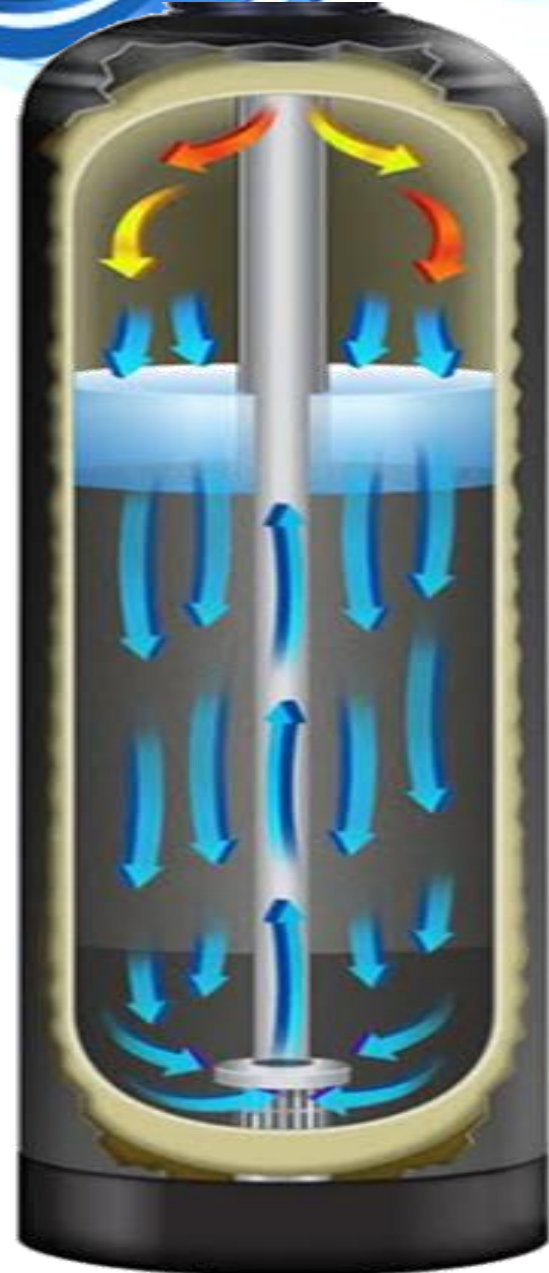
# Iron

- Where does it come from?
  - Mostly private wells
- What does it cause?
  - Red color and stains
- Are there different types?
  - 3 forms
    - Ferrous
    - Ferric
    - Bacterial



# Iron

- Treatment Technologies
  - Oxidation/Filtration
  - Other Options
- Position
  - Before Softener
  - Before Carbon

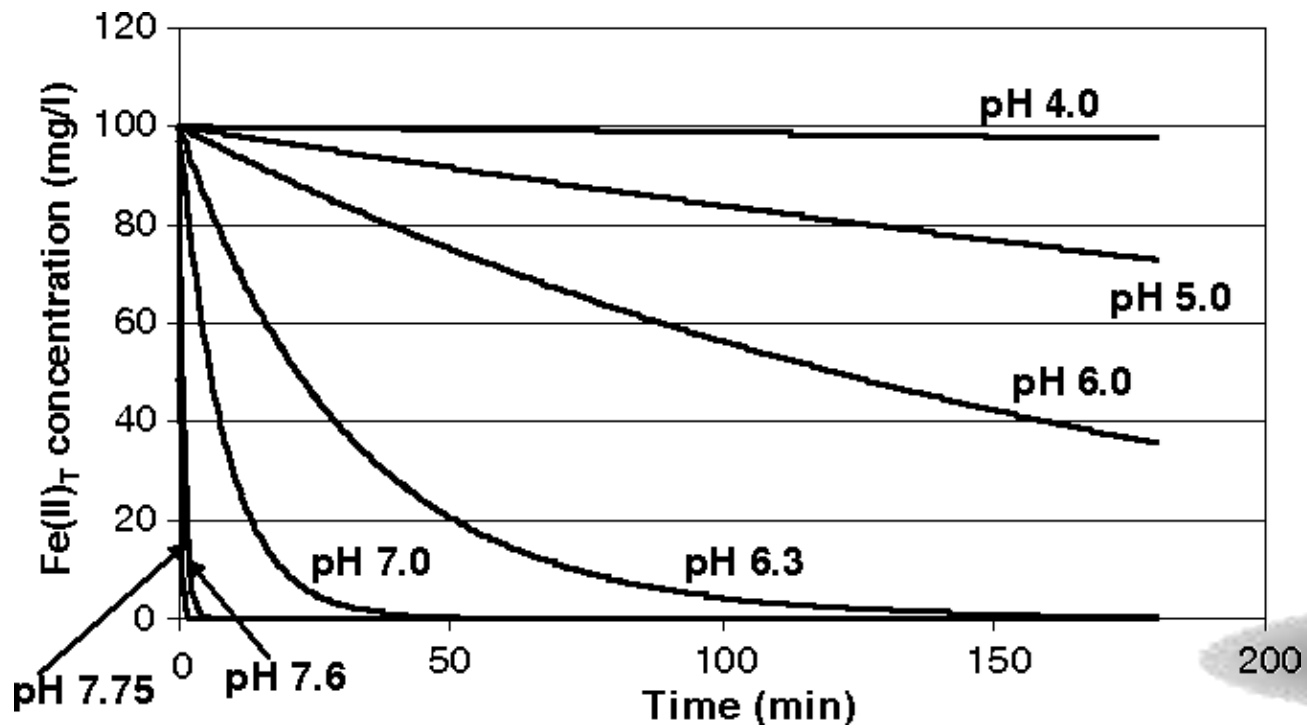






# Iron

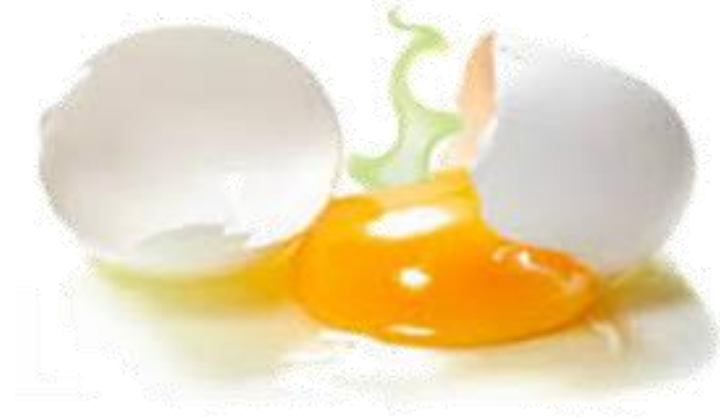
- Limitations
  - pH >7.0
  - Calcite before





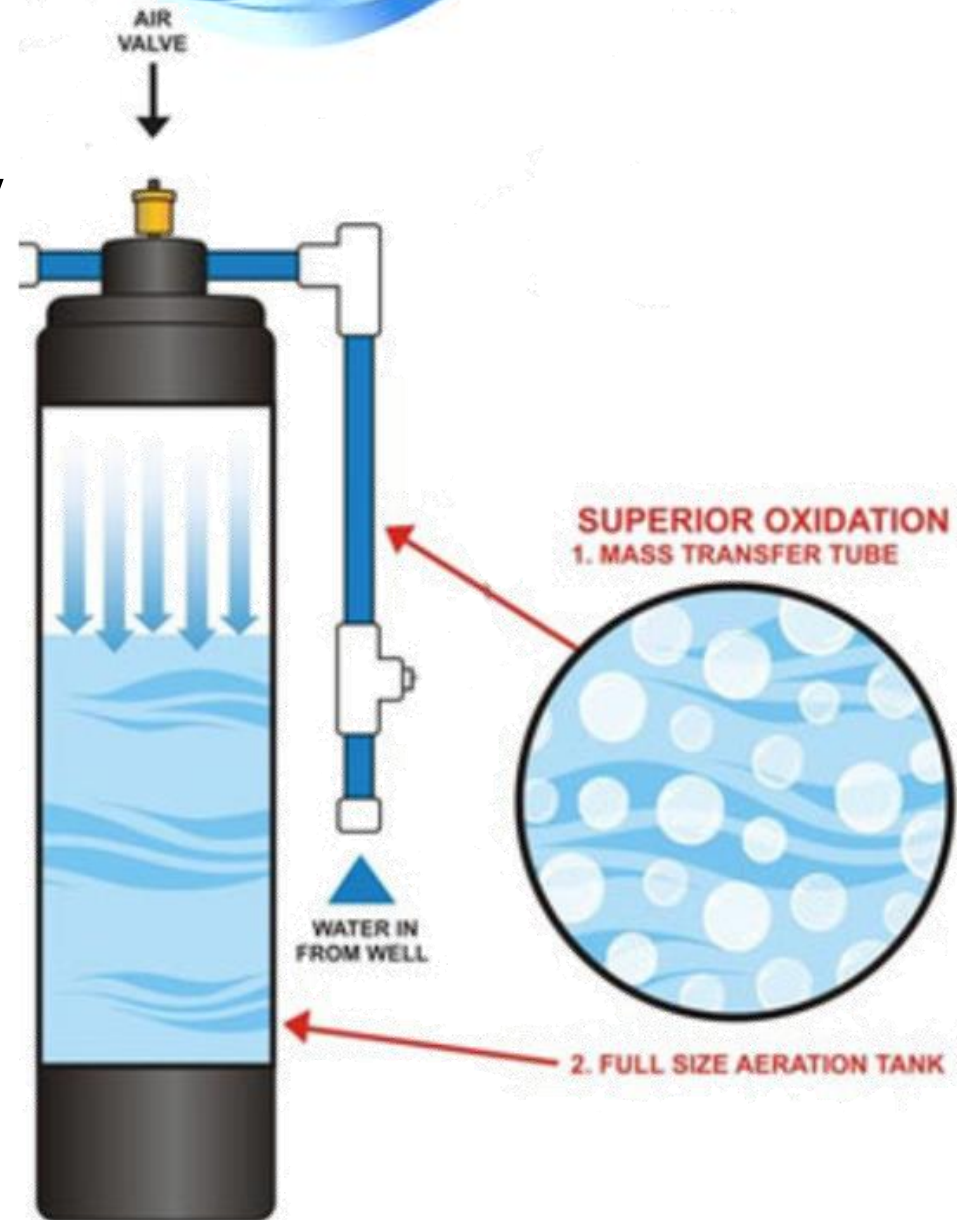
# Hydrogen Sulfide

- Where does it come from?
  - Private well water
- What does it cause?
  - Rotten Egg Odor
- How to test for it?
  - Odor, hot water



# Hydrogen Sulfide

- Treatment Technology
  - Aeration
    - Oxidation/Filtration
- Position
  - Before Softener



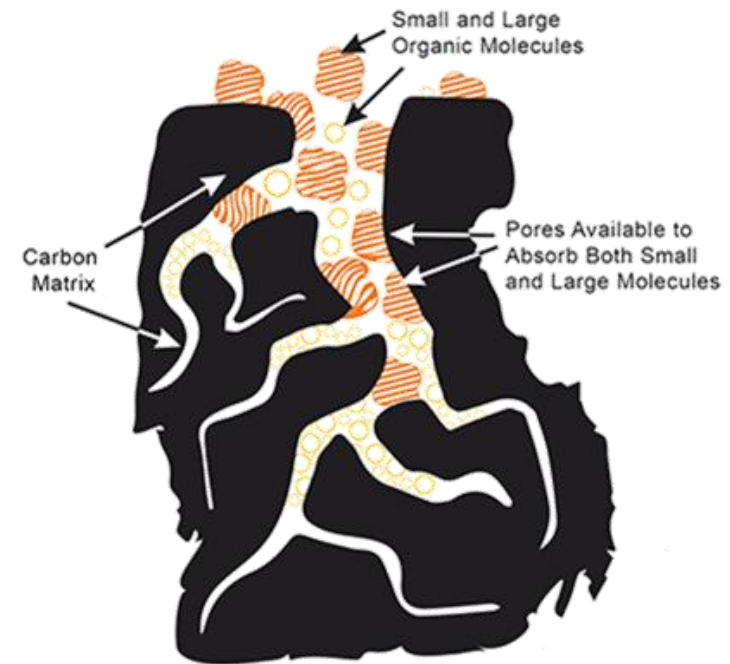
# Chlorine

- Where does it come from?
  - Public water supplies
- What does it cause?
  - Objectionable taste and Odor
- How to test for them?
  - Water Quality Report
    - 0.2-4.0 mg/l



# Chlorine

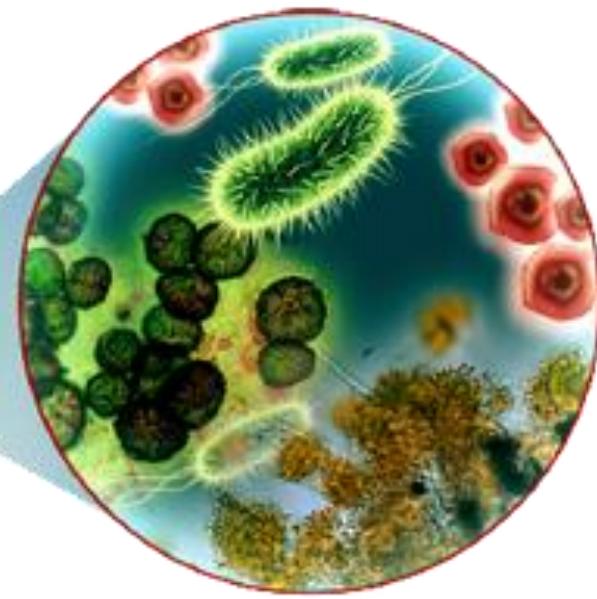
- Treatment Technology
  - Activated Carbon
    - Adsorption
- Position
  - After storage tank
  - After Iron removal
    - Wells, ONLY if chlorinated
  - Before Softener
- Limitations
  - No Microbial control following





# Bacteria

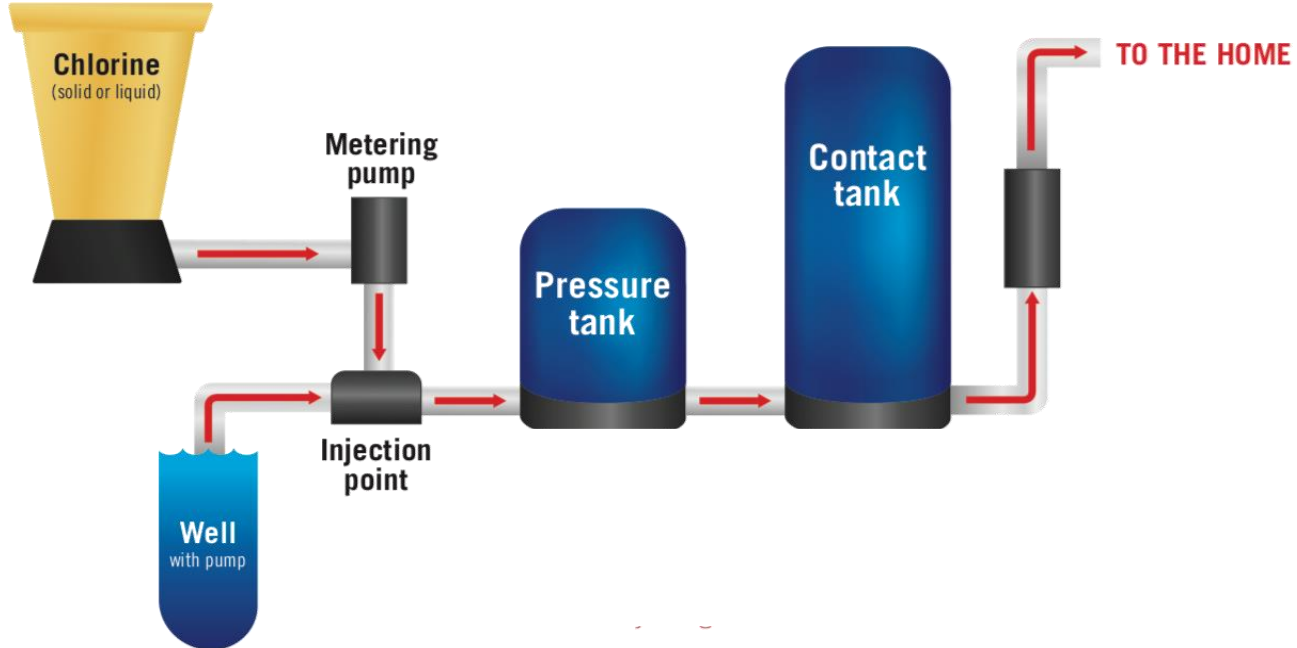
- Where do they come from?
  - Private well water
- What do they cause?
  - Outbreaks of severe illness
- How to test for them?
  - Bacteriological Analysis





# Bacteria

- Treatment Technology
  - Chlorine injection
- Position
  - Before storage tank
  - Contact time



- **Customer Complaints:**  
Often sick,  
white glasses,  
red stains,  
cloudy ice

ABC ENVIRONMENTAL LABORATORY SERVICES		Date: 3/15/18
Client: <i>Martin, Kalya</i>		Client Sample ID: <i>98-24-620</i>
Location: <i>Bastrop County</i>		Collection Date: <i>2/14/2019</i>
Lab ID: <i>05893</i>		Matrix: <i>Groundwater</i>
Analyses	Result	Units
Dissolved Metals		
Calcium	82.1	mg/L
Magnesium	37.1	mg/L
Sodium	8.70	mg/L
Boron	52	µg/L
Iron	3	mg/L
Arsenic	ND	µg/L
Copper	2.25	µg/L
Lead	ND	µg/L
Manganese	ND	µg/L
Dissolved Anions		
Chloride	12.9	mg/L
Fluoride	0.35	mg/L
Sulfate	15.5	mg/L
Nitrogen, Nitrates & Nitrite	0.41	mg/L
Alkalinity, Total (as CaCO <sub>3</sub> )	345	mg/L
Other		
Free Chlorine	0.0	Mg/L
H <sub>2</sub> S	0.10	mg/L
TOC	0.0	mg/L
TDS	673	ppm
pH	7.9	
Turbidity	0.0	NTU
Bacteria		
Coliform	Present	
E. Coli	Absent	

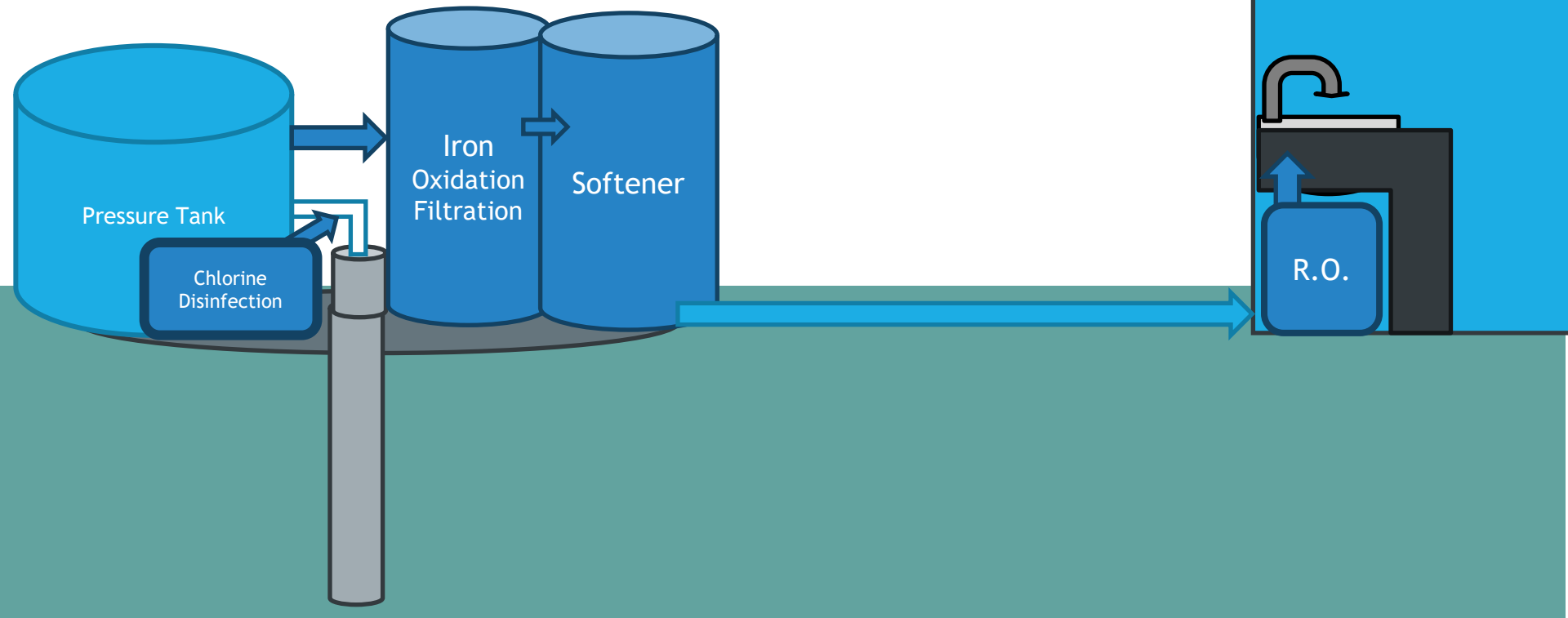






# What equipment would you recommend?

- Chlorine Feed    yes  no             if yes, for what contaminant(s) *Bacteria*
- Filter(s):            yes  no             if yes, for what contaminant(s) \_\_\_\_\_
- Carbon (GAC)    yes  no             if yes, for what contaminant(s) \_\_\_\_\_
- Ox/Filtration    yes  no             if yes, for what contaminant(s) *Iron*
- Softener            yes  no             if yes, for what contaminant(s) *Hardness*
- RO (\*)            yes  no             if yes, for what contaminant(s) *TDS*
- Other: \_\_\_\_\_





# Any Questions?

- **Stephanie Layfield**
  - 817-223-8873
  - [IonicoTechnicalServices@gmail.com](mailto:IonicoTechnicalServices@gmail.com)

