Energy Efficiency, Water Conservation, Chemical Optimization Kerry Ingredients

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MnTAP

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Company Background: Kerry

- **Food, ingredients, and flavours**
  - Sales in over 140 countries
  - Global HQ: Ireland
  - Americas HQ: Beloit, Wisconsin

- **Rochester Manufacturing Site**
  - Opened in 1970, acquired in 2004
  - Functional Ingredients & Actives
  - UpGrade™
  - Accel™

Motivations for Change

KERRY 2015-2020 ENVIRONMENT PROGRAMME			
	Carbon Emissions	Water Use	Waste
Targets BASELINE YEAR 2013	-13%	-7%	-12%
2016 Performance BASELINE YEAR 2013	-2.5%	-2.7%	-10%

Reasons for MnTAP Assistance

- **Assess energy and chemical usage**
- **Reduce environmental impact**
  - Electric & natural gas
  - City and well water use
  - Cleaners/chemicals
- **Evaluate savings for proposed ideas**

Supporting Agencies

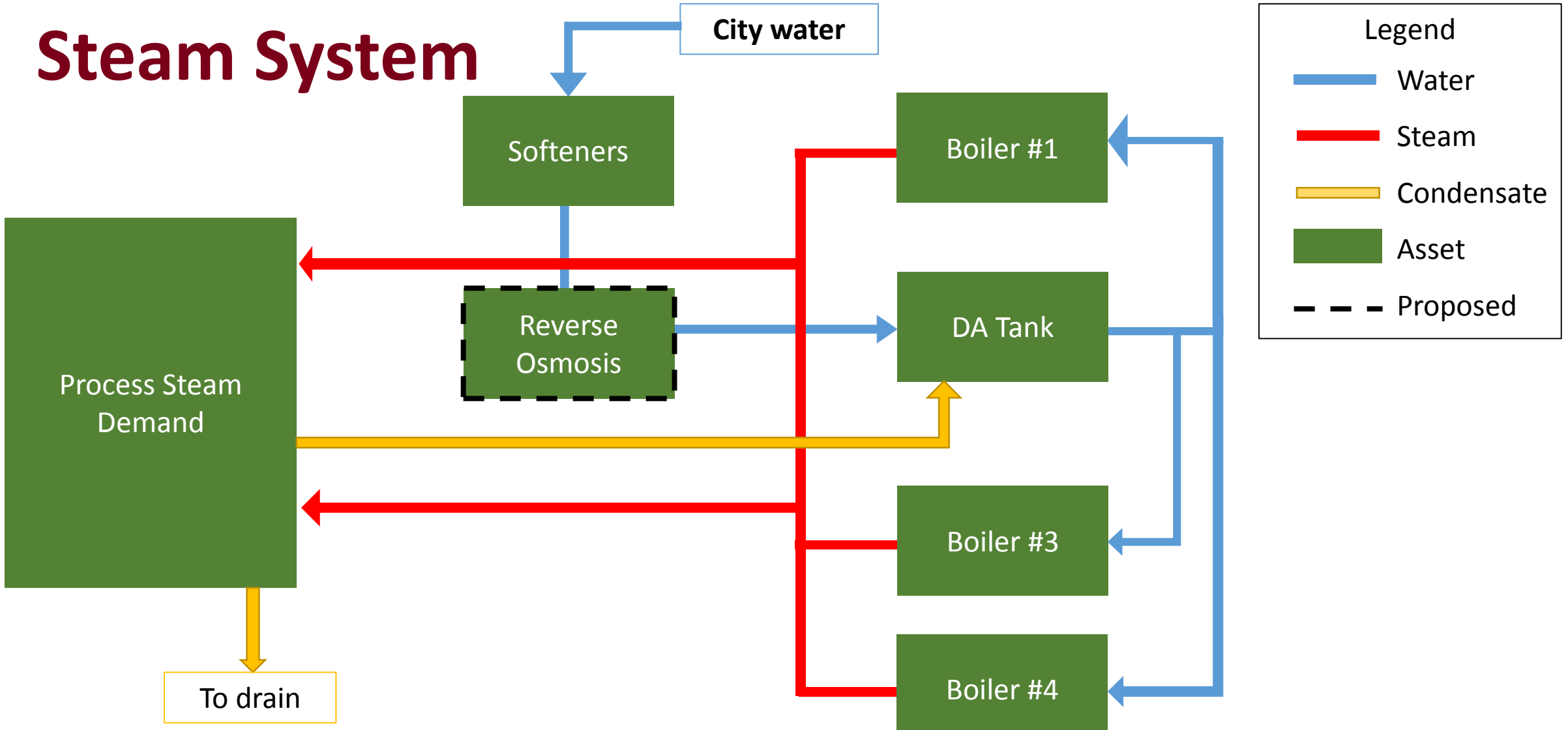
- **Minnesota Pollution Control Agency**
- **U.S. Environmental Protection Agency Region 5**
  - Pollution prevention in food processing industry

MINNESOTA POLLUTION CONTROL AGENCY

Approach

- **Understand plant utilities**
  - Steam usage, water treatment and usage
  - City and well water
- **Contact chemical vendors for chemical inventory and usage**
- **Prioritized investigation**
  - Opportunities for improvement
  - Importance to manufacturing process

Steam System



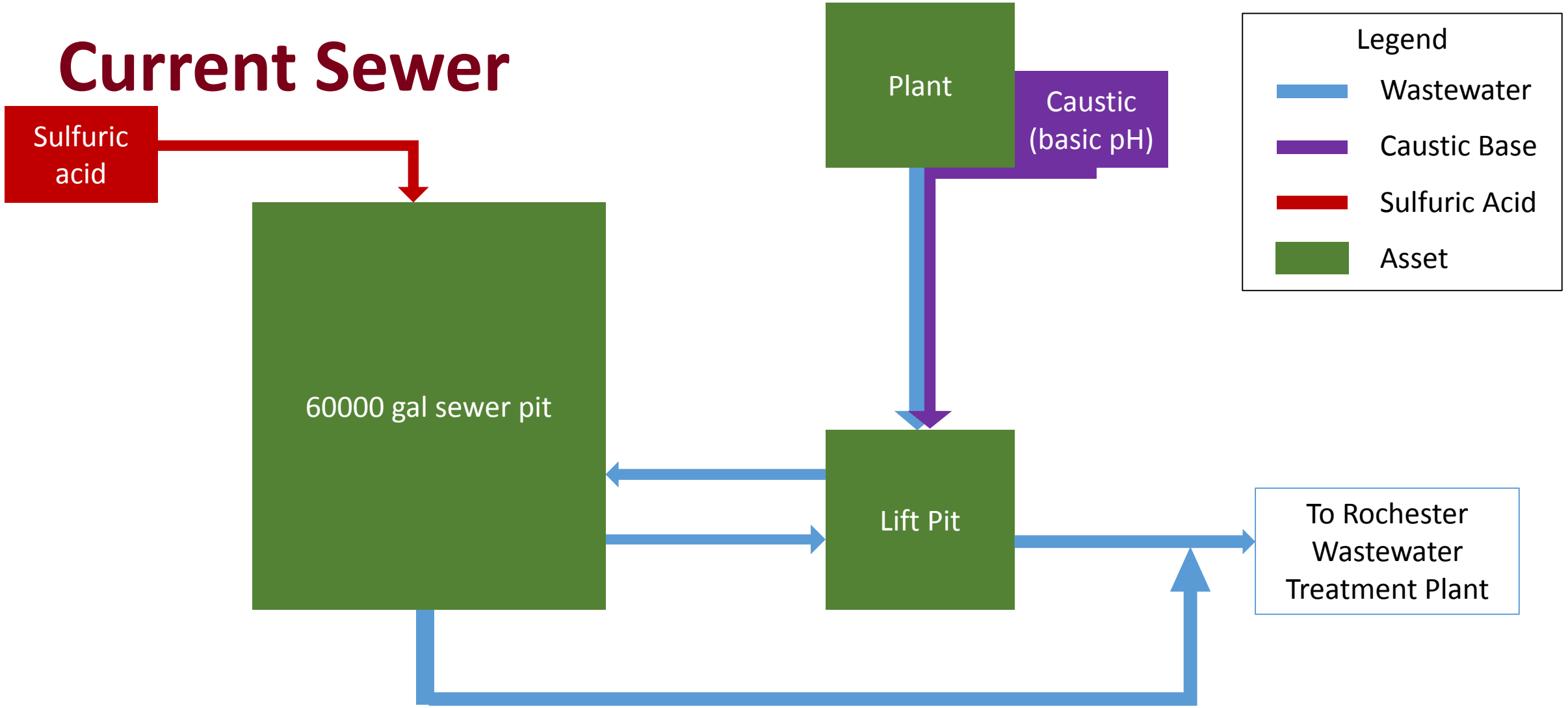
Recommendation: Reverse Osmosis (RO)

Recommendation	Waste Reduction, per year	Savings, per year	Payback Period	Status
Install RO Skid	2.1 million gal water, 68,100 therms	$38,600	2.5 years	Recommended/ Implementing

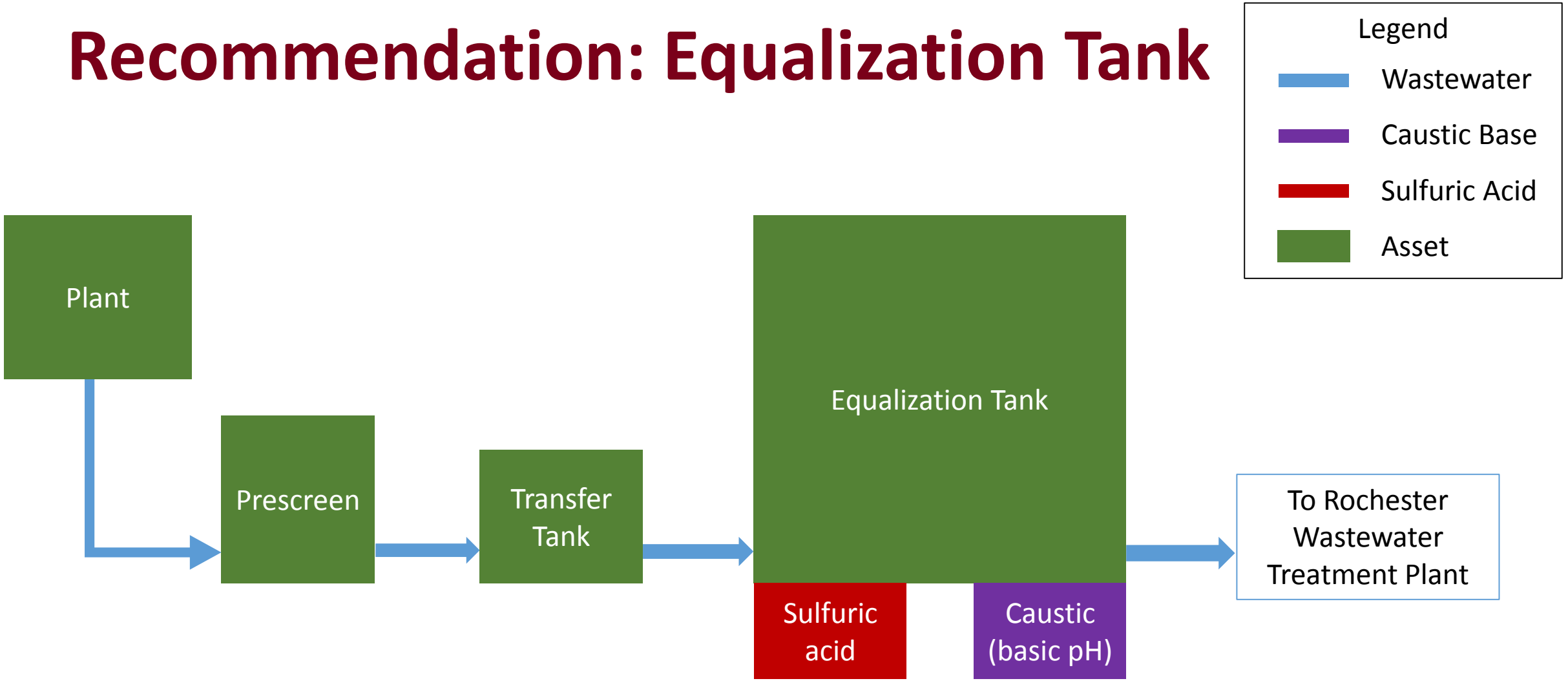
- **Improve water chemistry**
  - Reduce boiler blowdown
  - Reduce treatment chemical use
  - Cleaner heat transfer surfaces
  - Increase equipment longevity
- **Environment**
  - 361 metric tons of CO_2

Water Softening for Boiler Water

Current Sewer

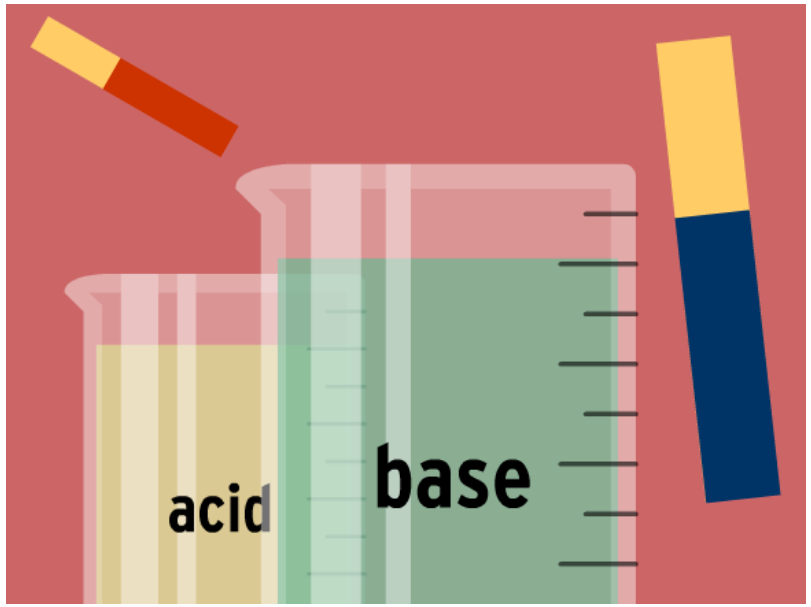


Recommendation: Equalization Tank



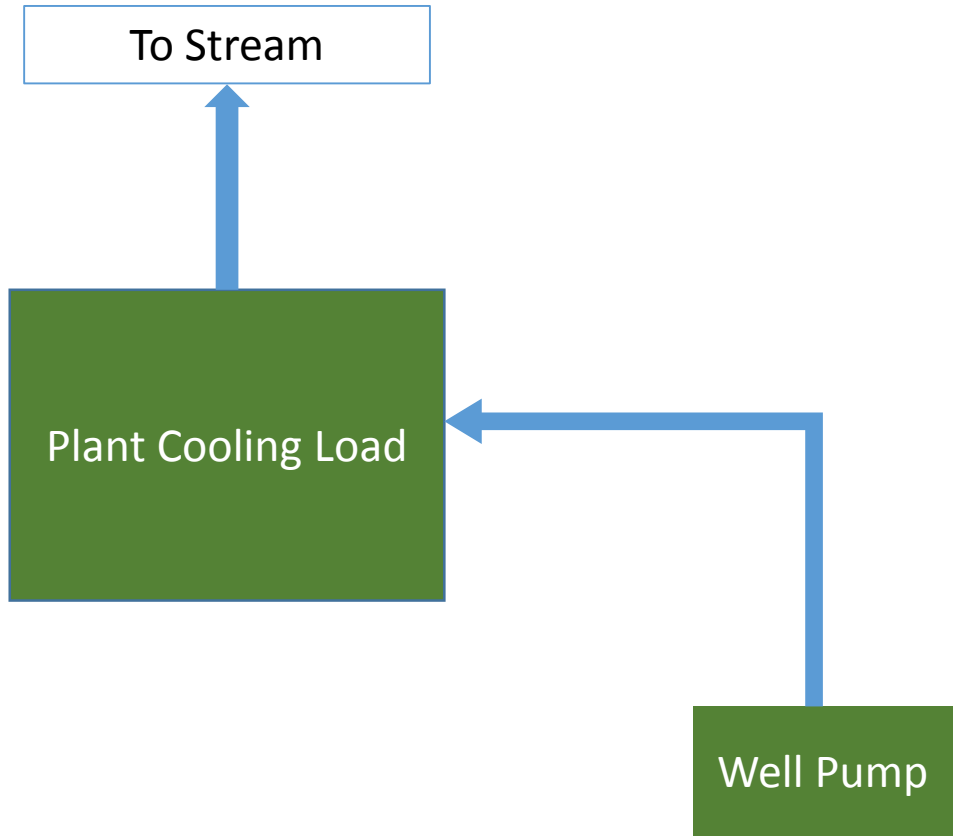
Recommendation: Equalization Tank

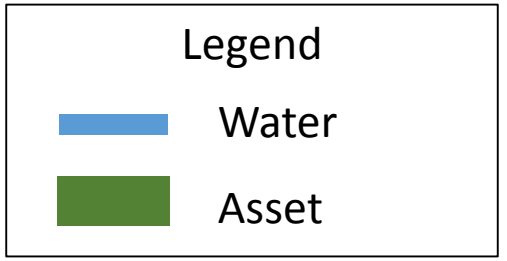
Recommendation	Waste Reduction, per year	Savings, per year	Payback Period	Status
Equalization Tank	16,600 lb caustic, 9,400 lb sulfuric acid	$8,000	>10 years	Recommended/ Implementing



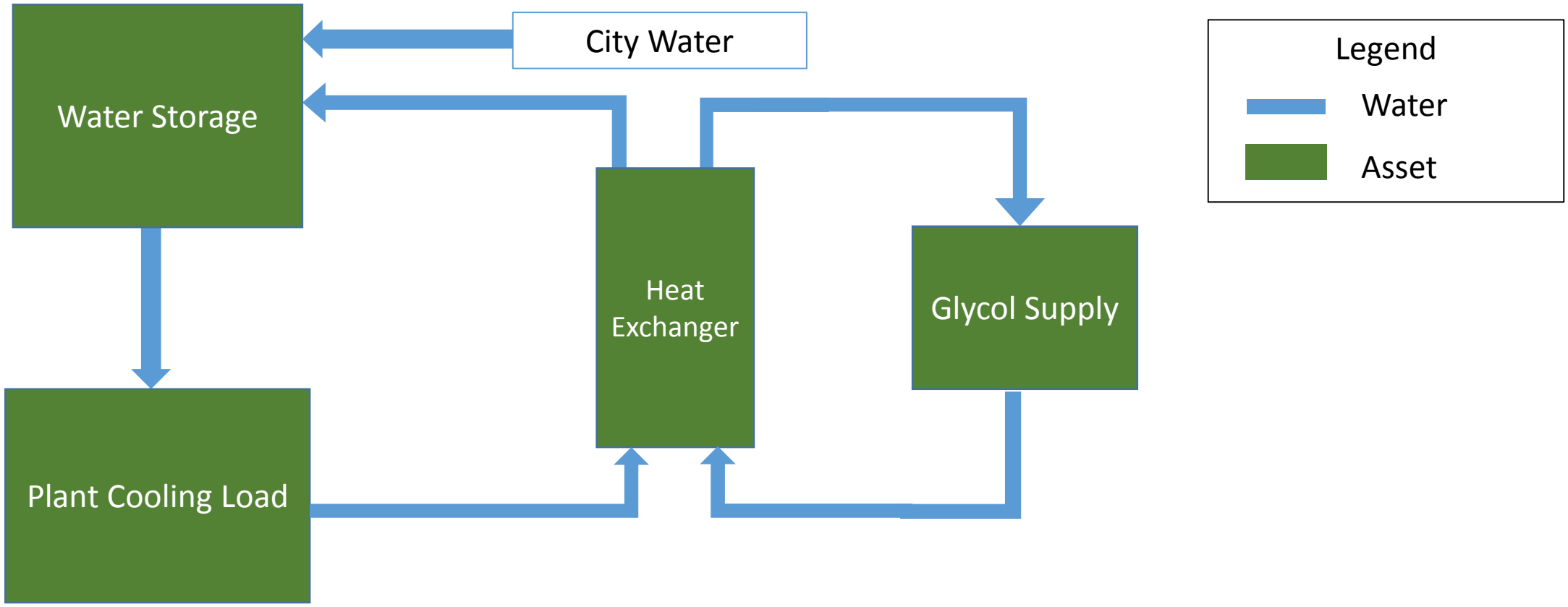
- **Chemical optimization**
  - Agitation and dosing within tank
  - Improve acid/base effectiveness
  - 50% caustic reduction & sulfuric acid reduction
- **Prescreen equipment**
  - Large debris

Current Single-Pass Cooling





Recommendation: Closed Loop Cooling



Recommendation: Closed Loop Cooling

Recommendation	Waste Reduction, per year	Savings, per year	Payback Period	Status
Closed Loop Cooling	200 million gal water	$27,000	Needs further review	Recommended

- **Significantly reduce well water consumption**
- **Reduce electricity consumption**
- **No need to constantly run well pump**

Glycol Chiller

Recommendation: Improve Steam Traps

Recommendation	Waste Reduction, per year	Savings, per year	Payback Period	Status
Improve Pasteurizer HX Steam Traps	270,000 gal water 4,110 therms	$2,500	3.5	Needs further review

- **Begin improvement with pasteurizer**
- **Reduce new make-up water**
  - Natural gas and water savings
- **Improve equipment operation and maintenance**
  - Steam line longevity

Orifice Steam Trap

Summary

Recommendation	Waste Reduction, per year	Savings, per year	Payback Period	Status
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Equalization Tank	16,600 lb caustic, 9,400 lb sulfuric acid	$8,000	>10 years	Recommended/ Implementing
Closed Loop Cooling	200 million gal water	$27,000	Needs further review	Recommended
Improve Pasteurizer HX Steam Traps	270,000 gal water 4110 therms	$2,500	3.5	Needs further review

Additional Ideas

- **LED lighting throughout plant**
  - 32W florescent to 18W LED
  - Save 89 kWh/yr-bulb, $8.48/yr-bulb
  - 138 pounds CO_2/yr-bulb
- **Dry cleaning process**
  - Reduce biological oxygen demand
- **Install additional condensate pumps and steam traps**

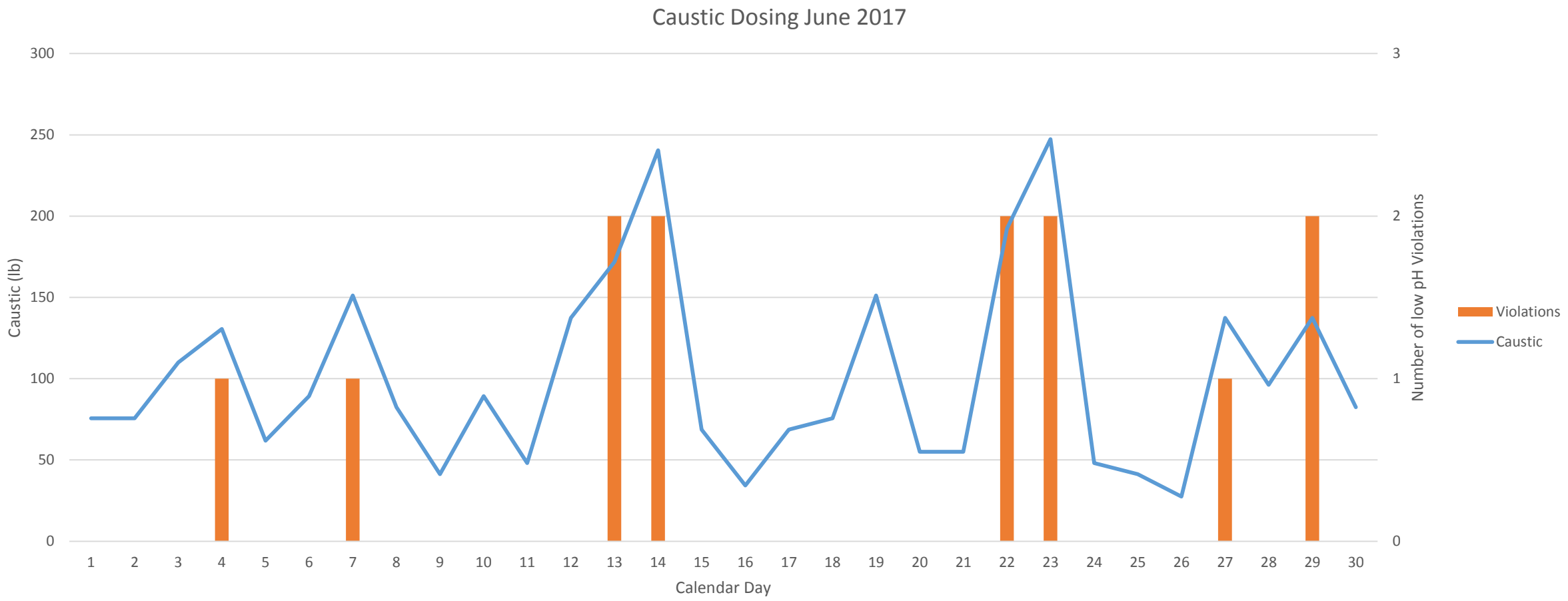
600 BHP Boiler

Personal Takeaways

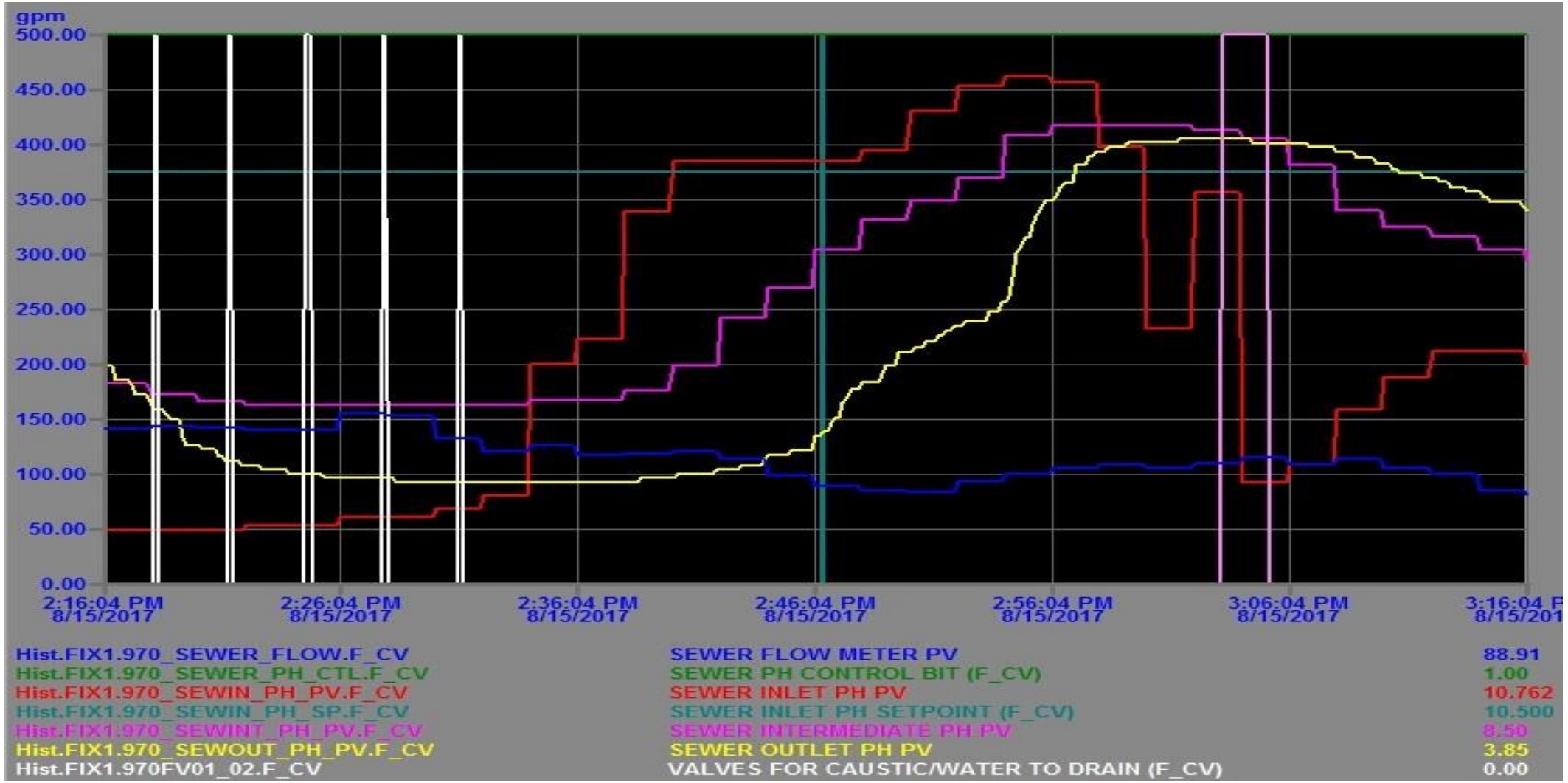
- First engineering internship
- Industry experience and engagement
- Problem solving
- Technical knowledge

Questions?

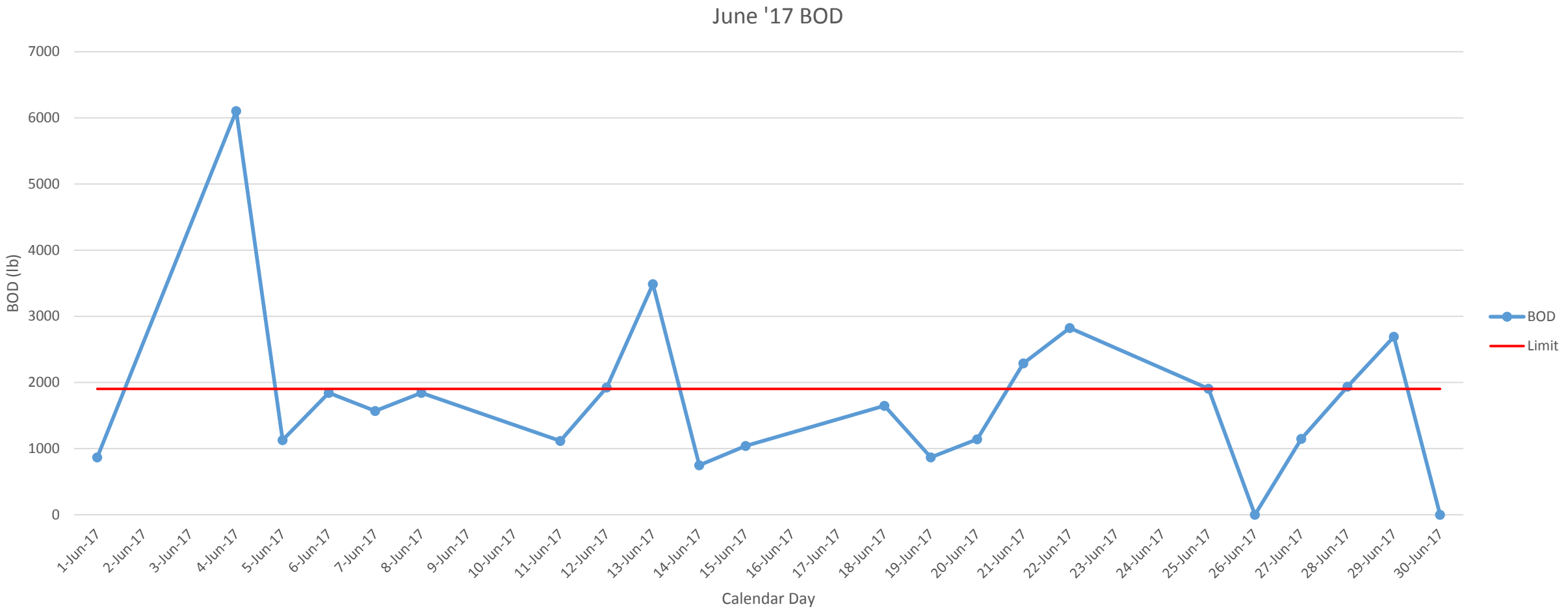
Caustic Dosing



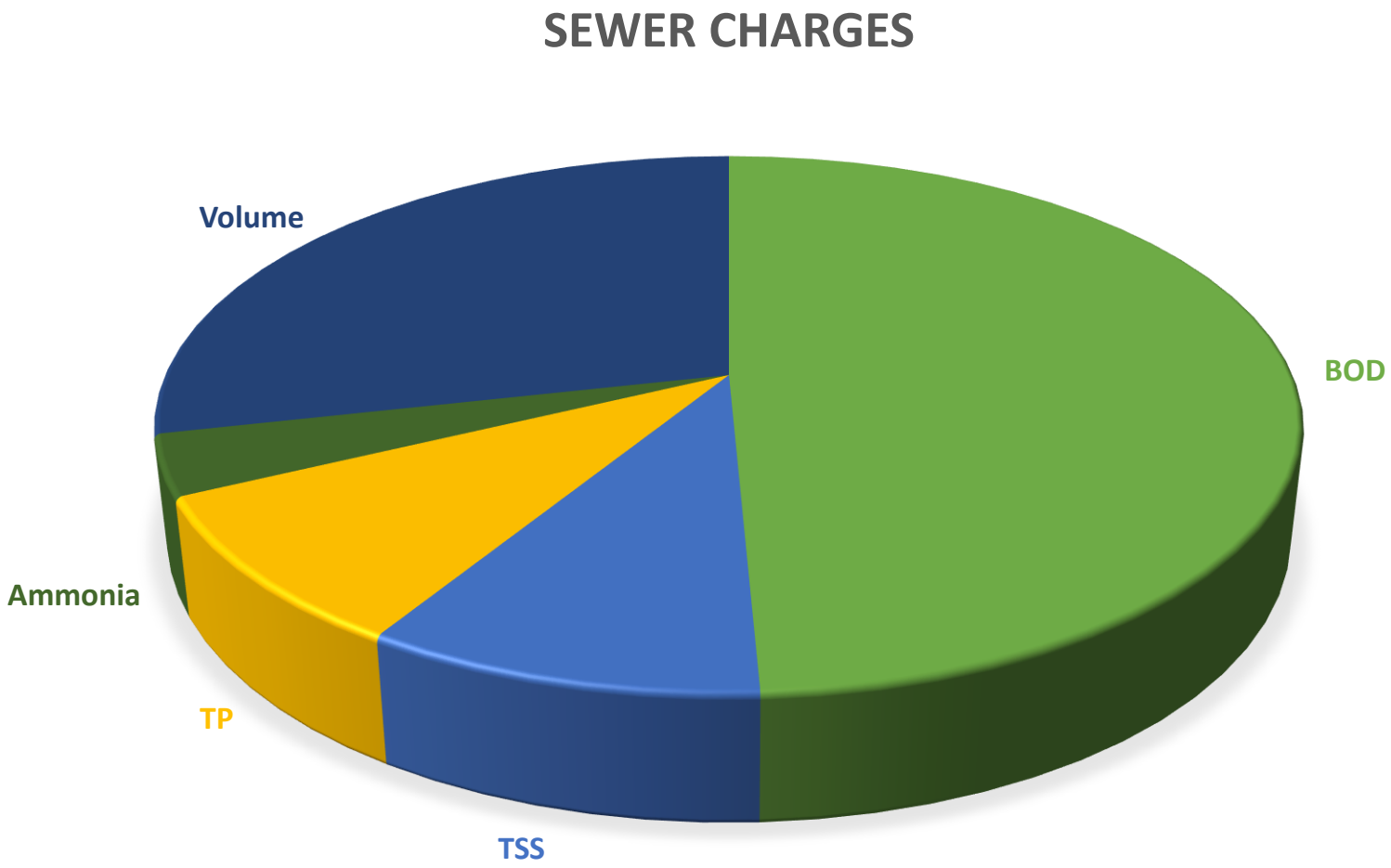
Current pH Neutralization



Additional Ideas: BOD Loading



Additional Ideas: Sewer Charges



Additional Ideas

- **BOD/TSS removal**
  - Dissolved air flotation (Primary)
    - TSS, insoluble BOD
    - 15 year payback period
  - Biological treatment (Secondary)
    - Soluble BOD

Treatment Type	BOD reduction (%)	TSS reduction (%)	BOD cost reduction ($)	TSS Cost Reduction ($)	Total Cost Savings ($)
Primary	25	95	63,000	46,000	109,000
Primary + Secondary	85	95	214,000	46,000	260,000