

Valencia Water Company Water Treatment Plant

Crystalactor® Zero Liquid Discharge Water Softening



Valencia Water Company

- Population served 113,000
- Water supply is 28.4 MGD
- Total Hardness ~ 350 mg/L ^{EDF4}
- Regional Water Quality Board requiring improvements to effluent water quality
- Issue is High chlorides in POTW effluent
- Home softening found to be the cause of high chlorides

Slide 2

EDF4

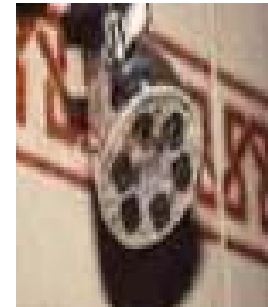
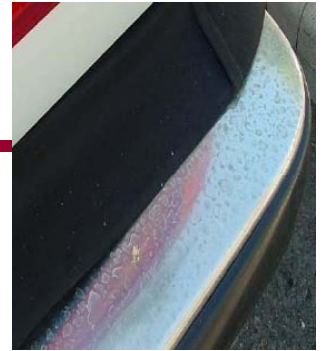
add total water per day and hardness

Eric Fessler, 3/23/2012

Why Soften?

The basics

- Hardness is measured as calcium carbonate
- Many regions in California have hard water
- Over 50% of water quality complaints tracked in a 10 year period relate directly to hard water



Residential

- Minimize spots
- Use less soap and detergent
- Softer skin
- Extend the life of pipes and appliances

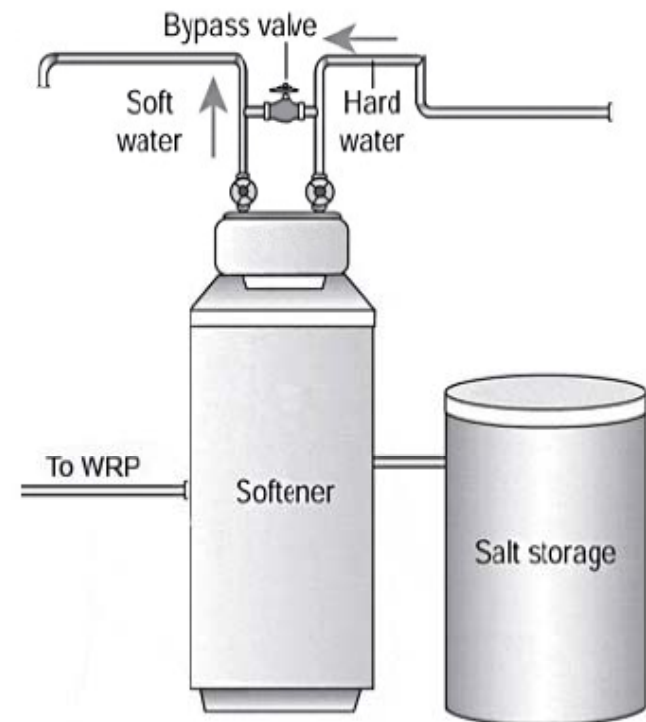
Industrial

- Reduce utility costs
- Reduce chemistry usage – anti-scalents
- Conserve water



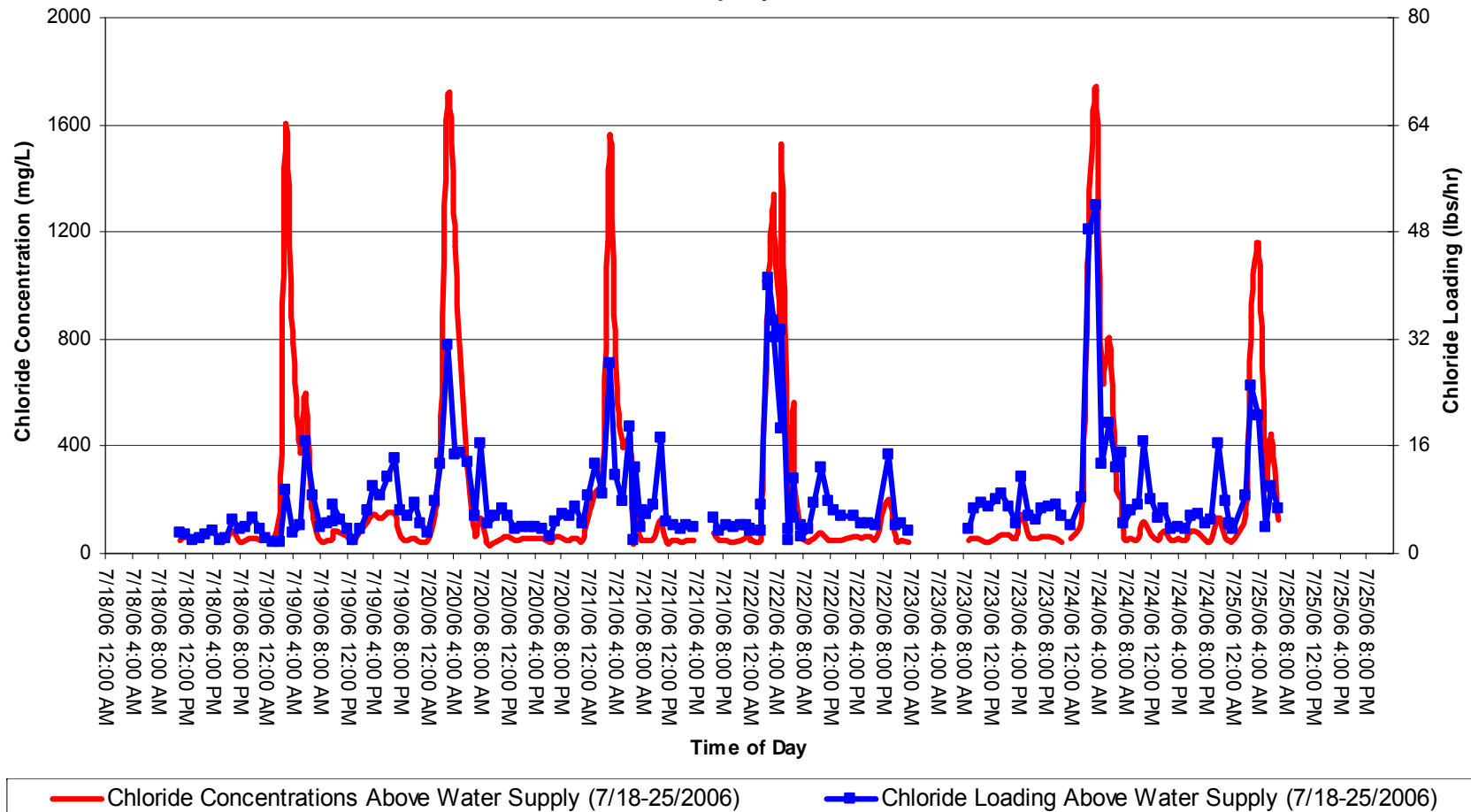
The Problem With Point-of-Use Softening

- Add chlorides to the waste stream
- Chlorides are not removed from water at reclamation plants
- High chlorides can damage agricultural crops by causing leaf burn or drying of leaf tissues
- Add to consumer's overall cost of delivered water
- Wastes water

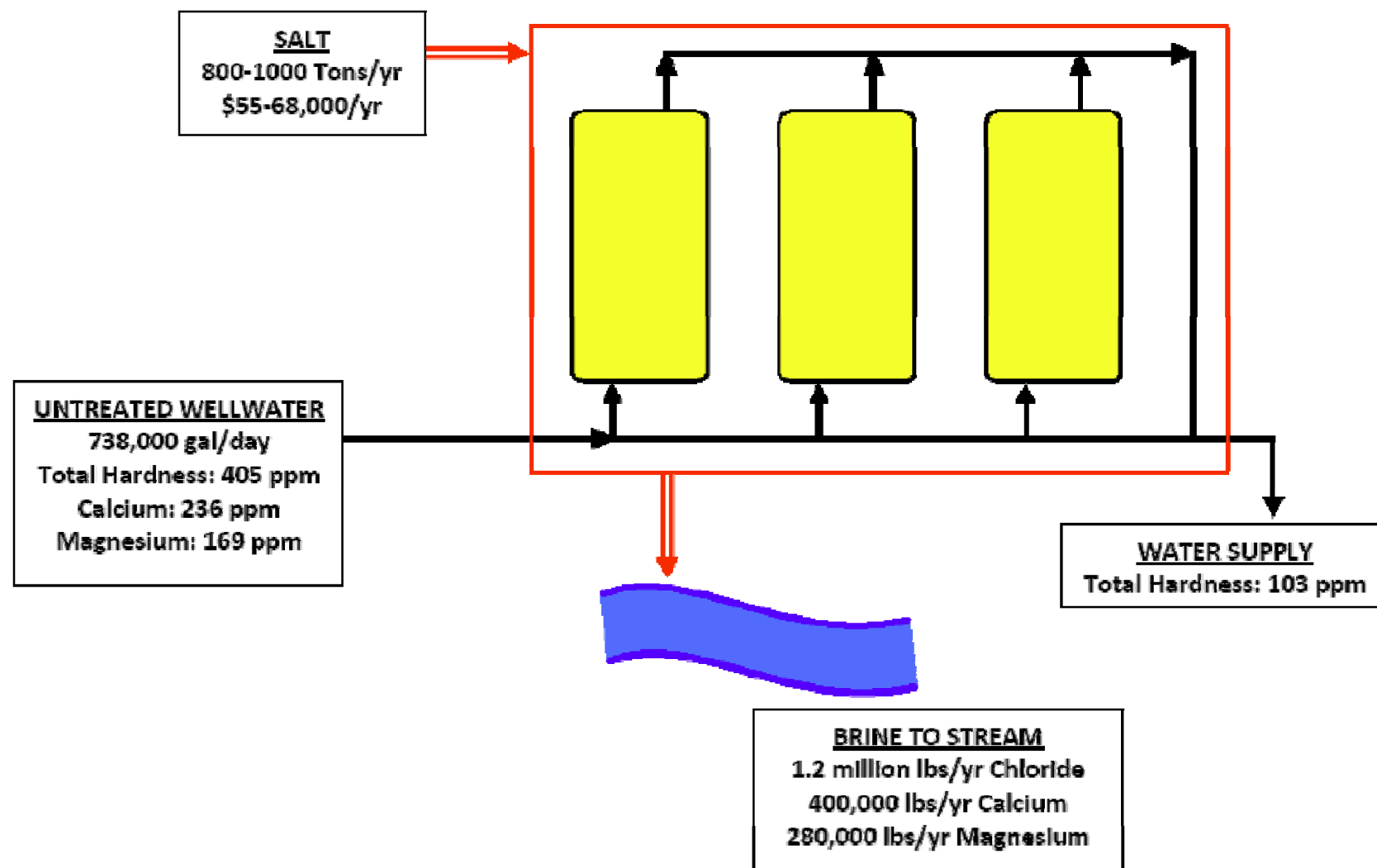


Actual Chloride Levels in Discharge - Valencia

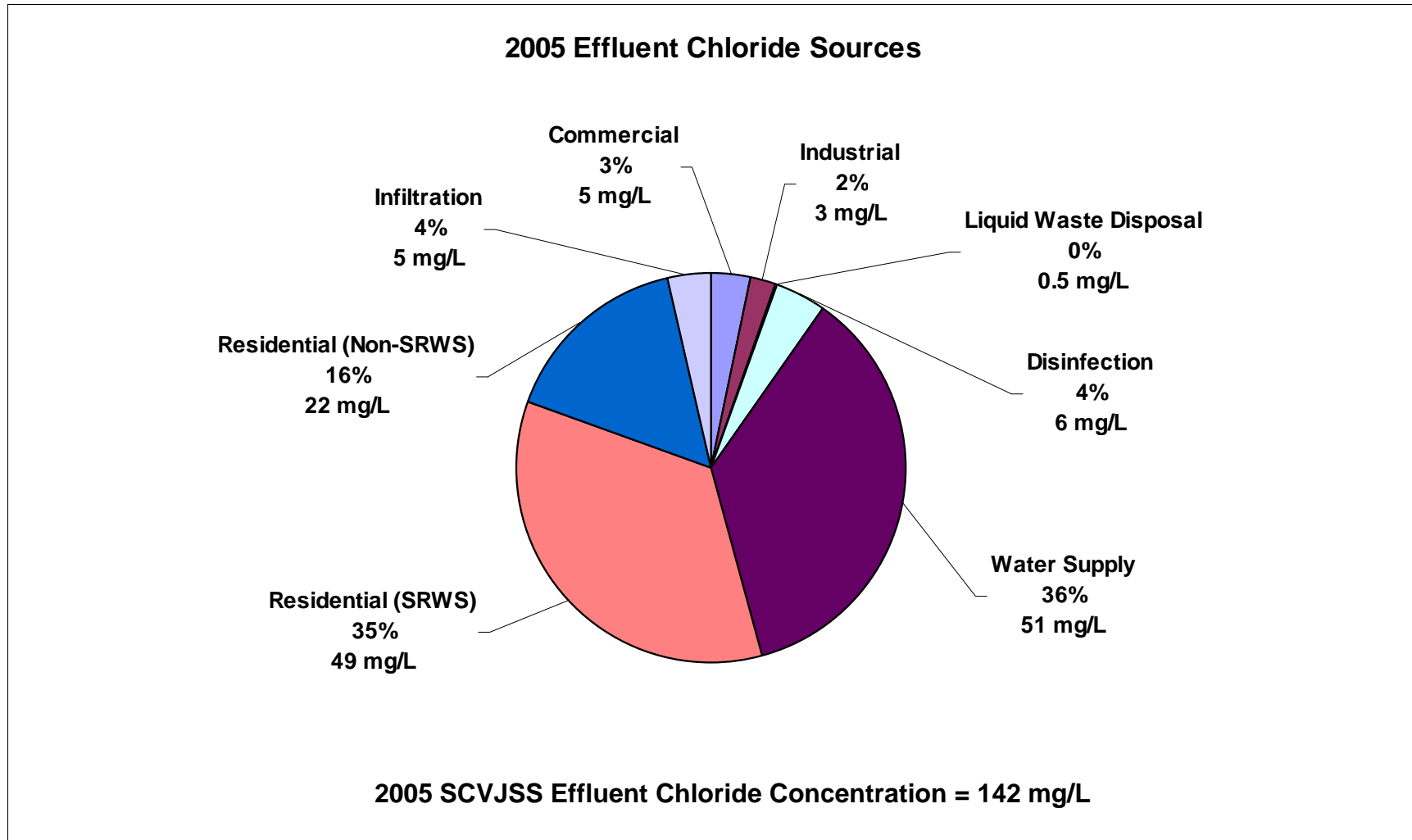
Chloride Concentration and Loading Profiles (Above Water Supply)
Valencia Water Company Demonstration Site



Softening in Rural Wisconsin Community



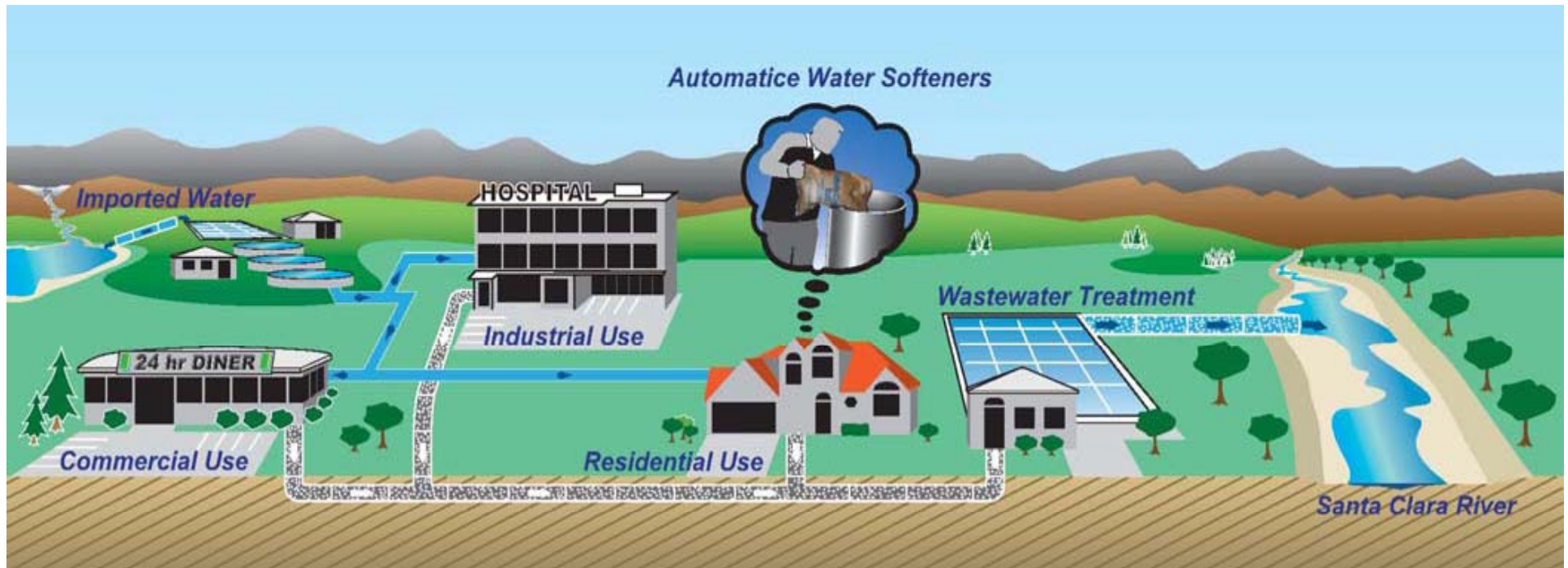
Chlorides From Ion Exchange Softening



Source: Data provided by Los Angeles Sanitation Districts of Los Angeles County

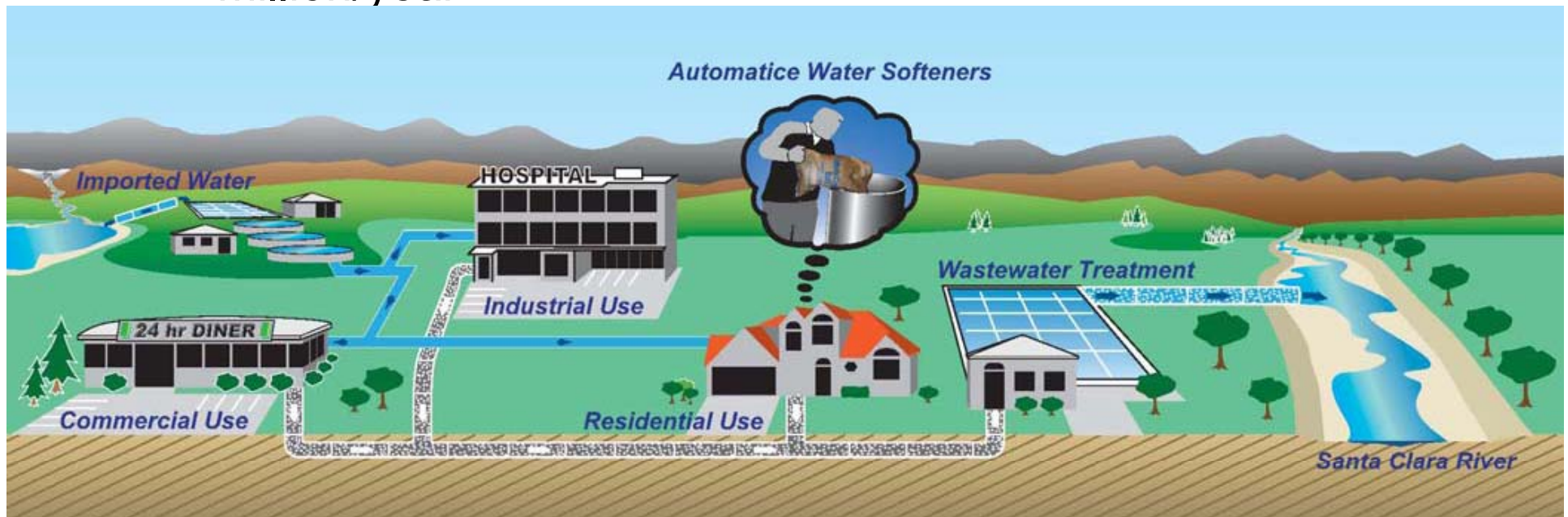
Treatment Options

- Treat industrial, commercial and residential wastewaters at the POTW
- Soften the ground water before it goes to the community
- Engineering study was conducted by Kennedy/Jenks Consultants to determine best option



Treatment Options

- Meeting chloride discharge limits could be accomplished through treatment at the POTW
 - Would require a \$500 - \$600 million, large scale, advanced treatment facility
 - Would require brine disposal
 - Brine line estimated to cost VWC population \$21.2 million/year



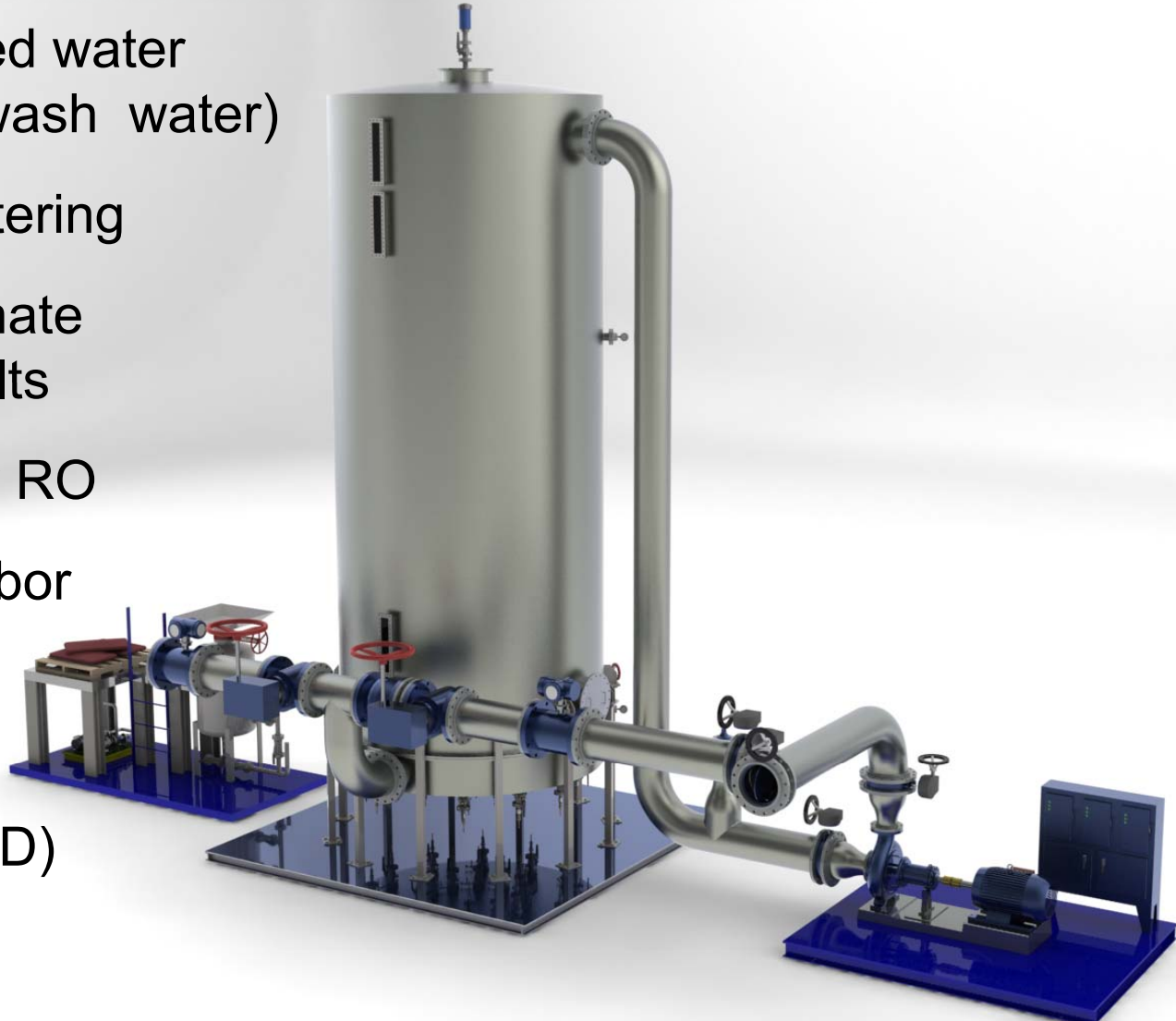
Treatment Options

- Soften the water for the community
- Eliminate or significantly reduce point of use softeners
 - Study indicated that softener use was anticipated to decline from 54 to 24 percent
- Technologies studied included:
 - Crystalactor
 - Ion Exchange
 - Membrane Processes
 - RO
 - Nanofiltration
 - Electrodialysis & Electrodialysis Reversal



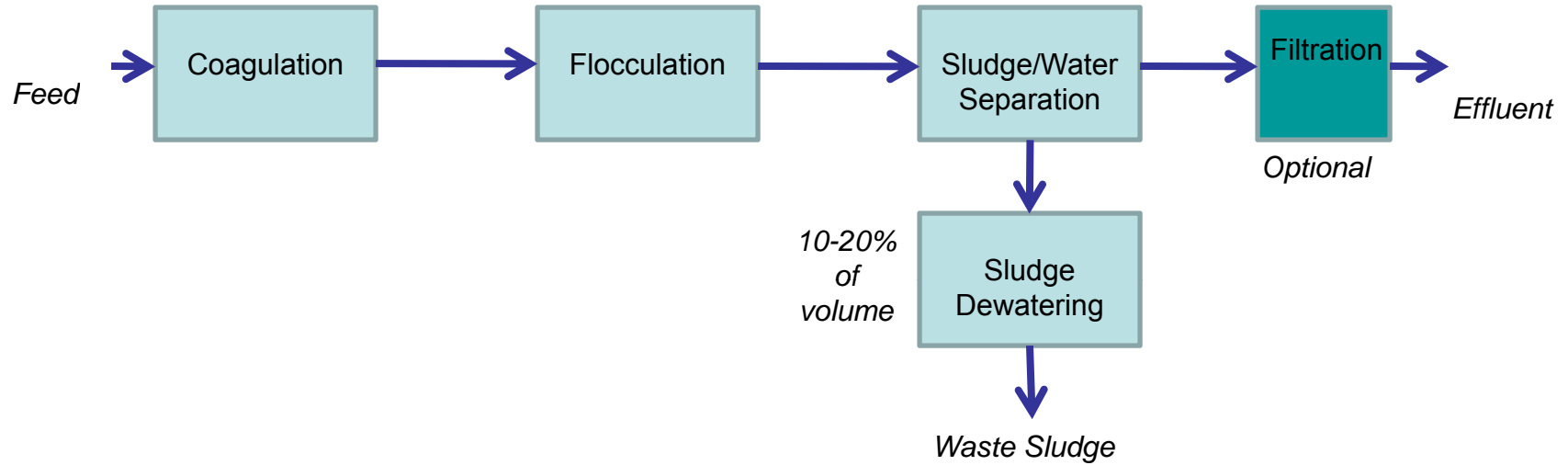
Process Advantages

- Eliminates wasted water (no reject / back wash water)
- No sludge dewatering
- Reduce or eliminate chlorides and salts
- Higher efficiency RO
- Requires min. labor
- Fully automated
- Small foot print (ex. 8' dia. = 2MGD)

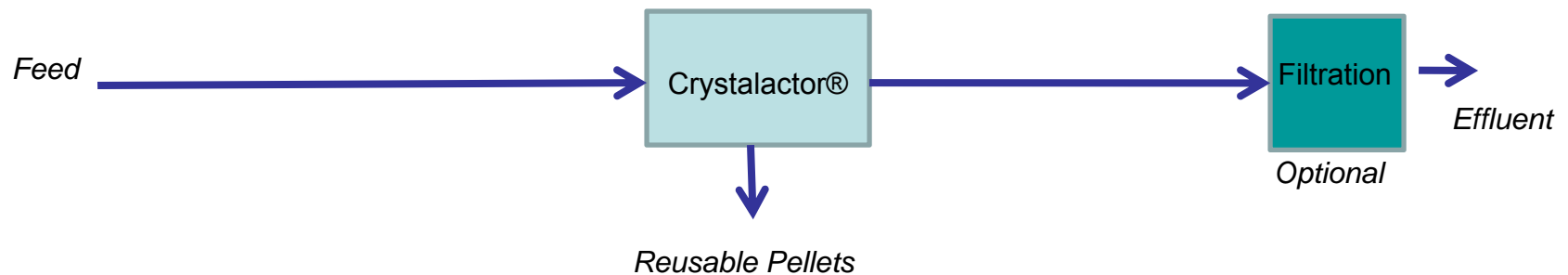


Four Steps In One

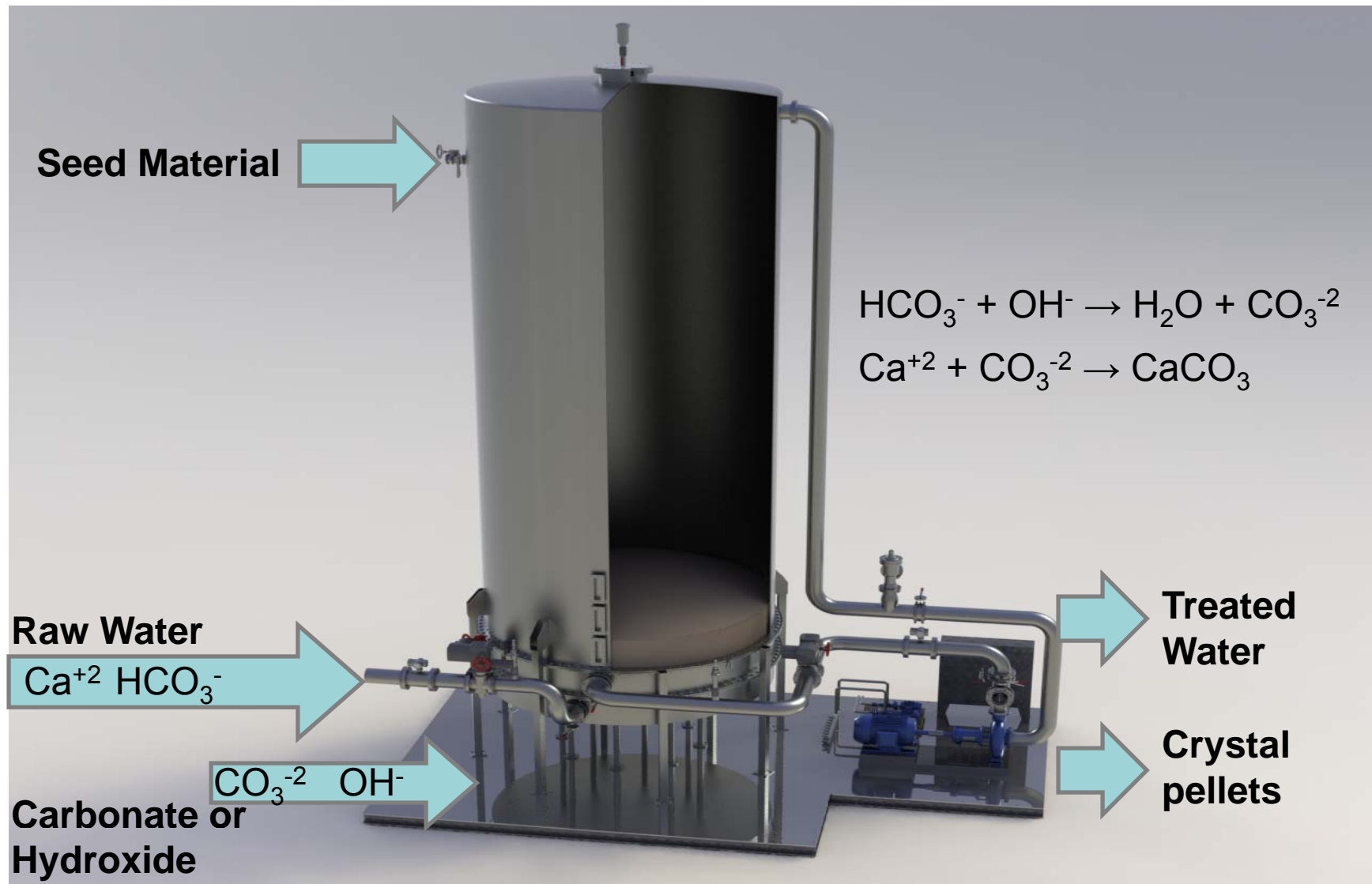
Conventional



Crystalactor®



How it Works



Process Basics – Pellet Handling



- Pellets removed by simple opening of valve
- Pellets are 90-95% dry product
- Pellets are 80-90% CaCO_3
- Pellets contain 5-10% seed material

Examples of Experience

Location	Number of Reactors	Capacity MGD
Woerden	6	6.8
Ridderkeerk	1	0.4
Alphen a/d Rijn	3	3.8
Altena	2	2.5
Hazerwoude	3	3.8
Weesperkarspel	1	4.2
Spannenburg	10	15.8
Noord-Bergum	3	14.3
Nijmegen	2	3.2
Leiduin	10	53.9
Zutphen	2	3.0
Seppe	4	10.1
Taiwan		119
Scheveningen	10	50.7
Valencia, CA	1	1.5
Atwater, MN	1	0.75

Valencia Water Company

- Water scarcity
- Hard water
- Wastewater high in conductivity (chlorides)
- Population 28,300
- Total Hardness 350 mg/L
- Goals:
 - Supply softened water to public
 - Eliminate resin softening (associated chlorides)
 - Enhance water supply by 15-20%

Installation

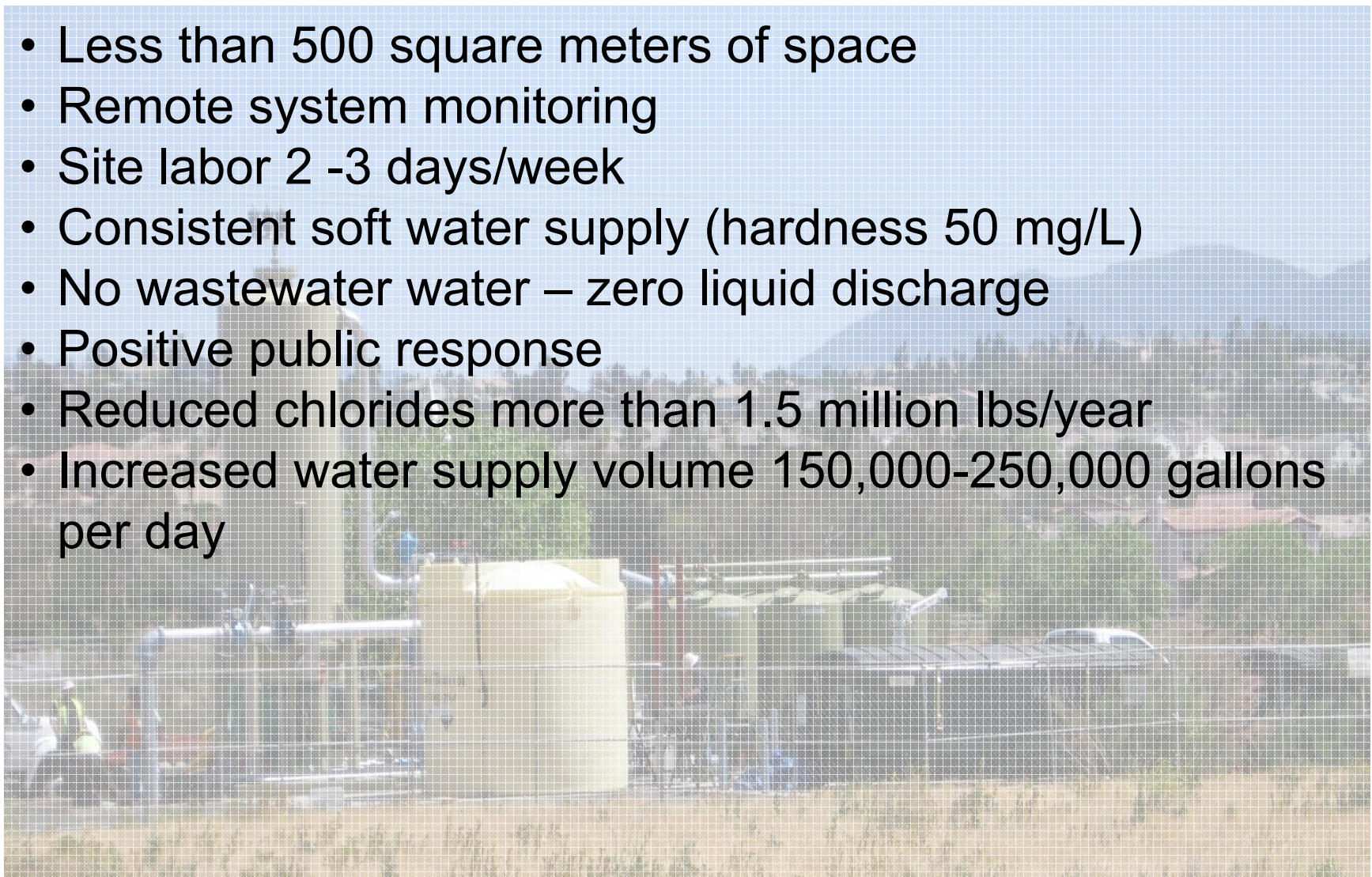


- Skid mounted or custom design
- Removes risk & time of installation
- Begin full operation quickly

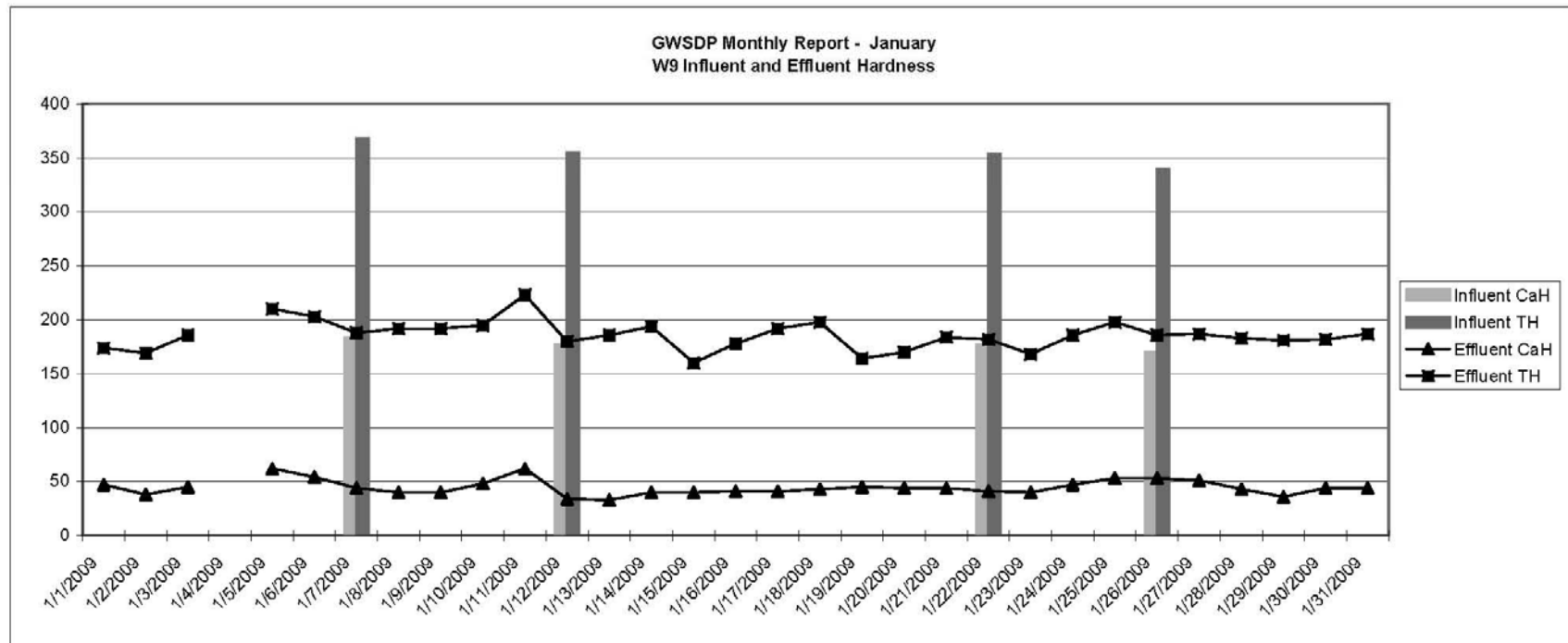


Single Well Treatment (1.5 MGD)

- Less than 500 square meters of space
- Remote system monitoring
- Site labor 2 -3 days/week
- Consistent soft water supply (hardness 50 mg/L)
- No wastewater water – zero liquid discharge
- Positive public response
- Reduced chlorides more than 1.5 million lbs/year
- Increased water supply volume 150,000-250,000 gallons per day



Results

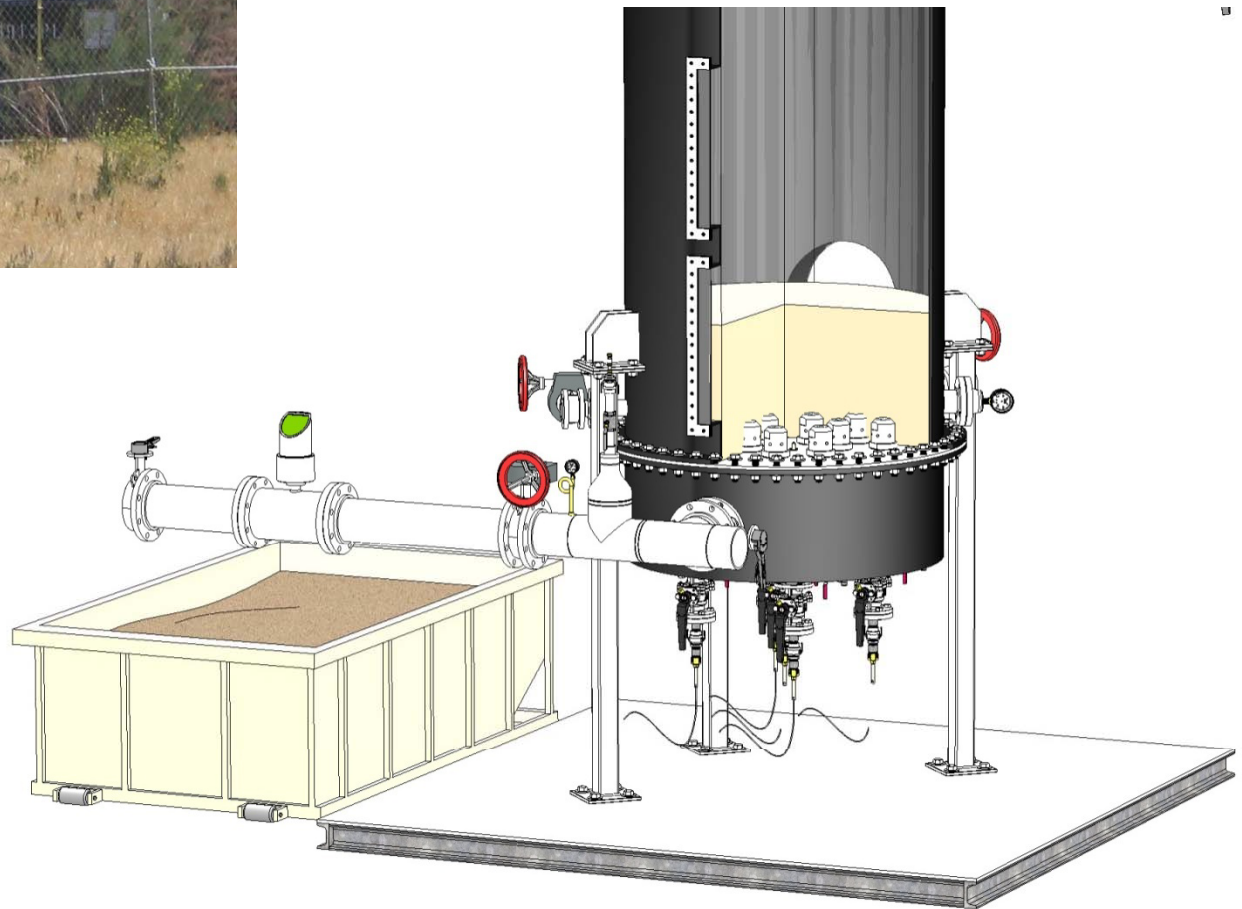


- Insert chemical usage here

Pellet Handling



California community installing a desalter project – produced pellets will sell for \$20 - \$40 per ton.



Pellet By-Product Utilization

Local companies are interested in calcium carbonate pellets from water plant!

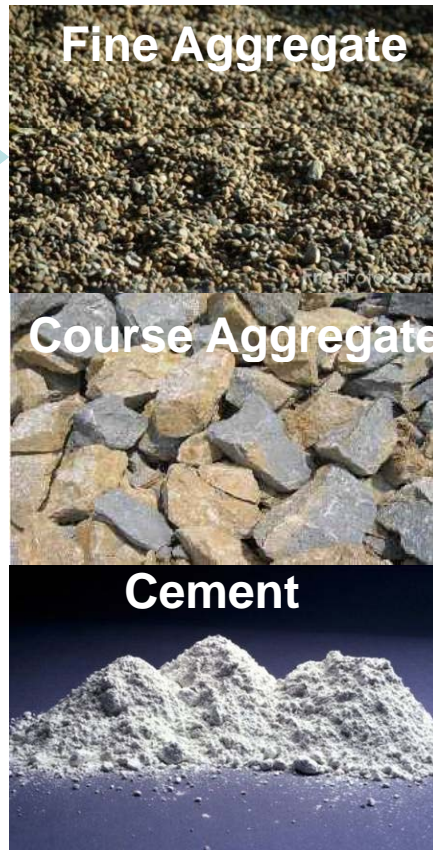


2.5 MGD

1.5-1.9 TPD (1-1.5 cy/day)

5.0 MGD

3.0-3.8 TPD (2-3 cy/day)



Pellets enhance
concrete value
increasing flow-
ability!

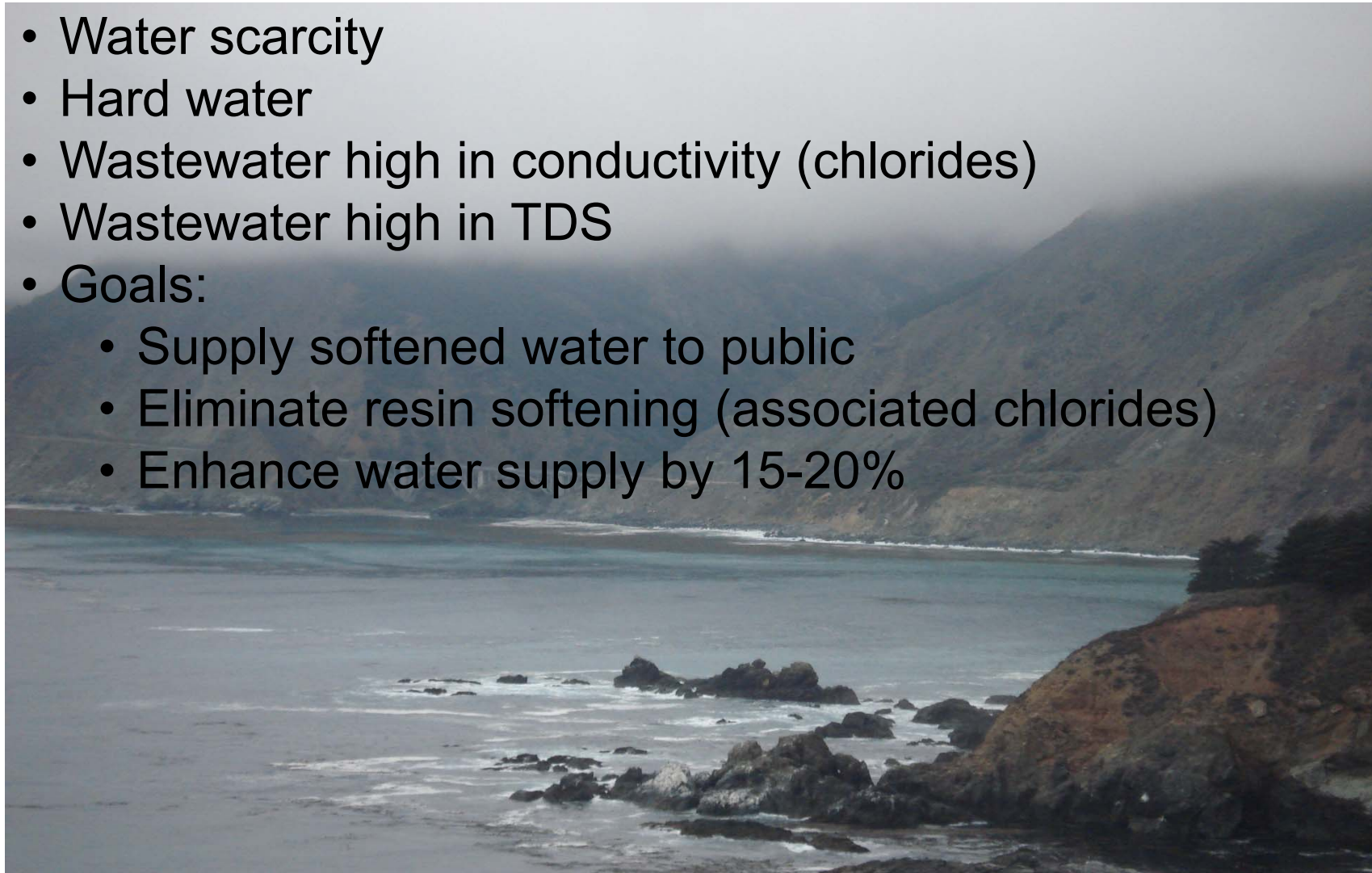
Other uses include roofing material, soil amendment

Additional Applications



Softening Using Lime

- Water scarcity
- Hard water
- Wastewater high in conductivity (chlorides)
- Wastewater high in TDS
- Goals:
 - Supply softened water to public
 - Eliminate resin softening (associated chlorides)
 - Enhance water supply by 15-20%



Rendering

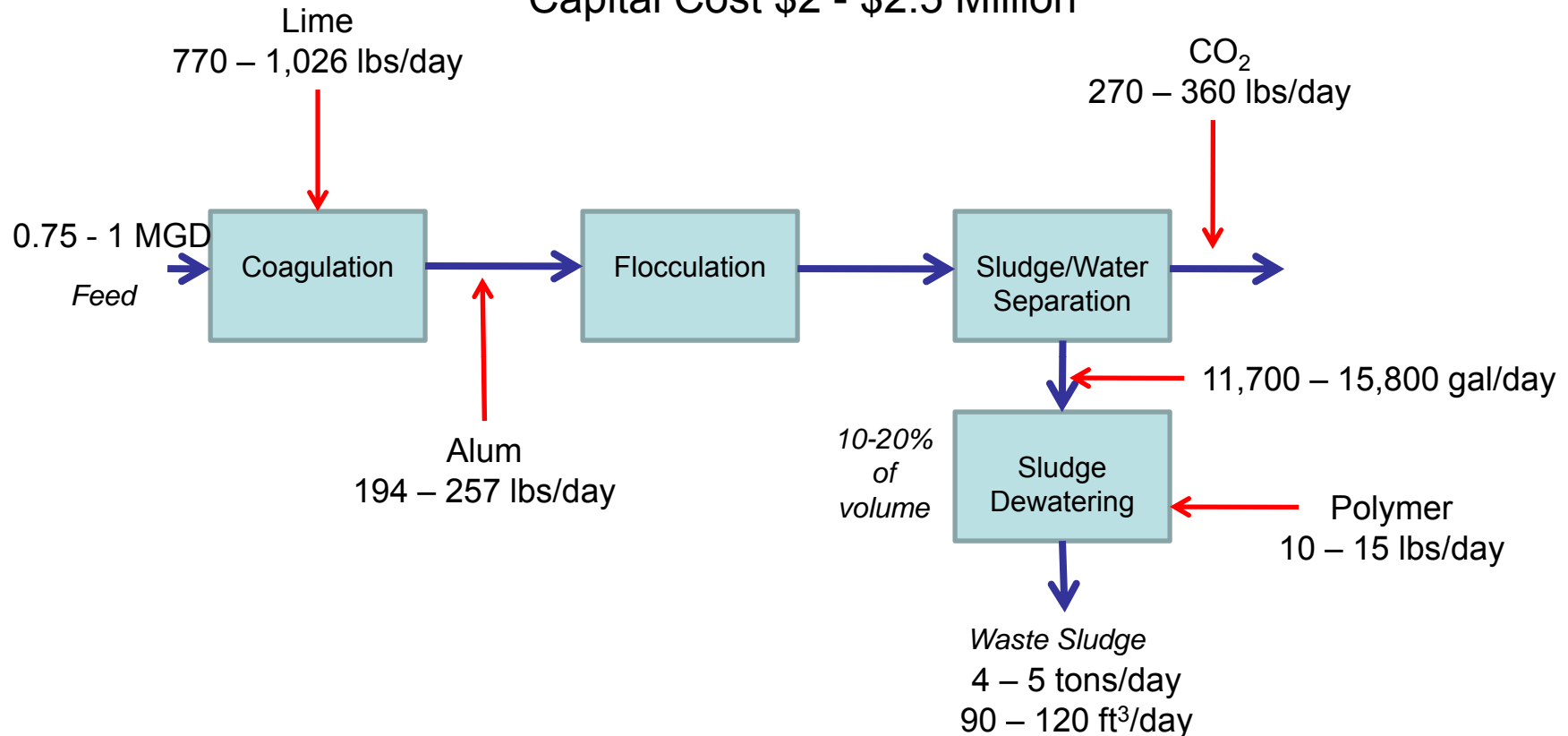
Chemical and labor costs \$0.20
per 1,000 gallons or \$200 per
day



Pellets produced: 2,500 –
3,000 lbs/day
(1 cubic yard)

Traditional Lime Softening Comparison

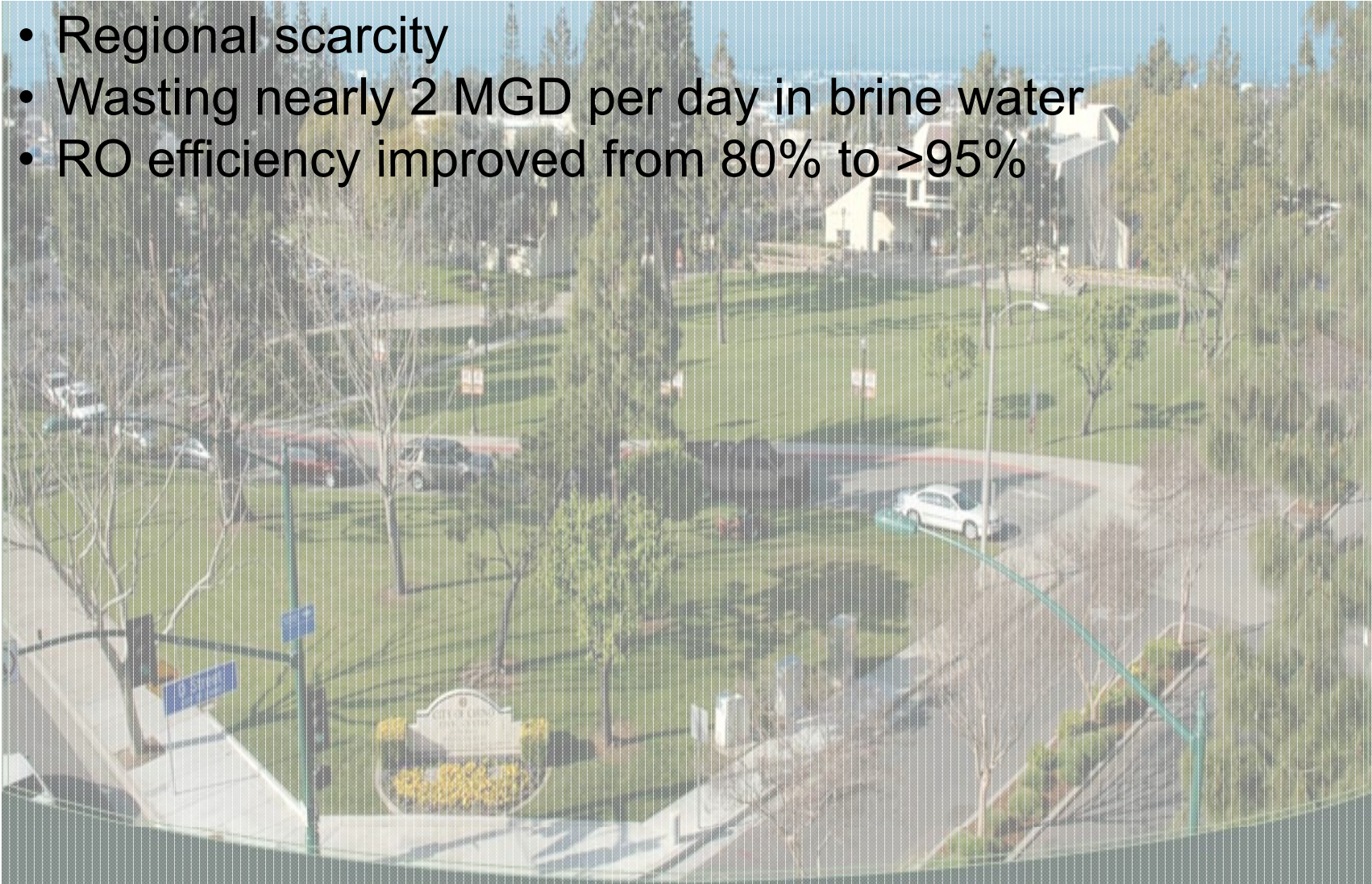
Capital Cost \$2 - \$2.5 Million*



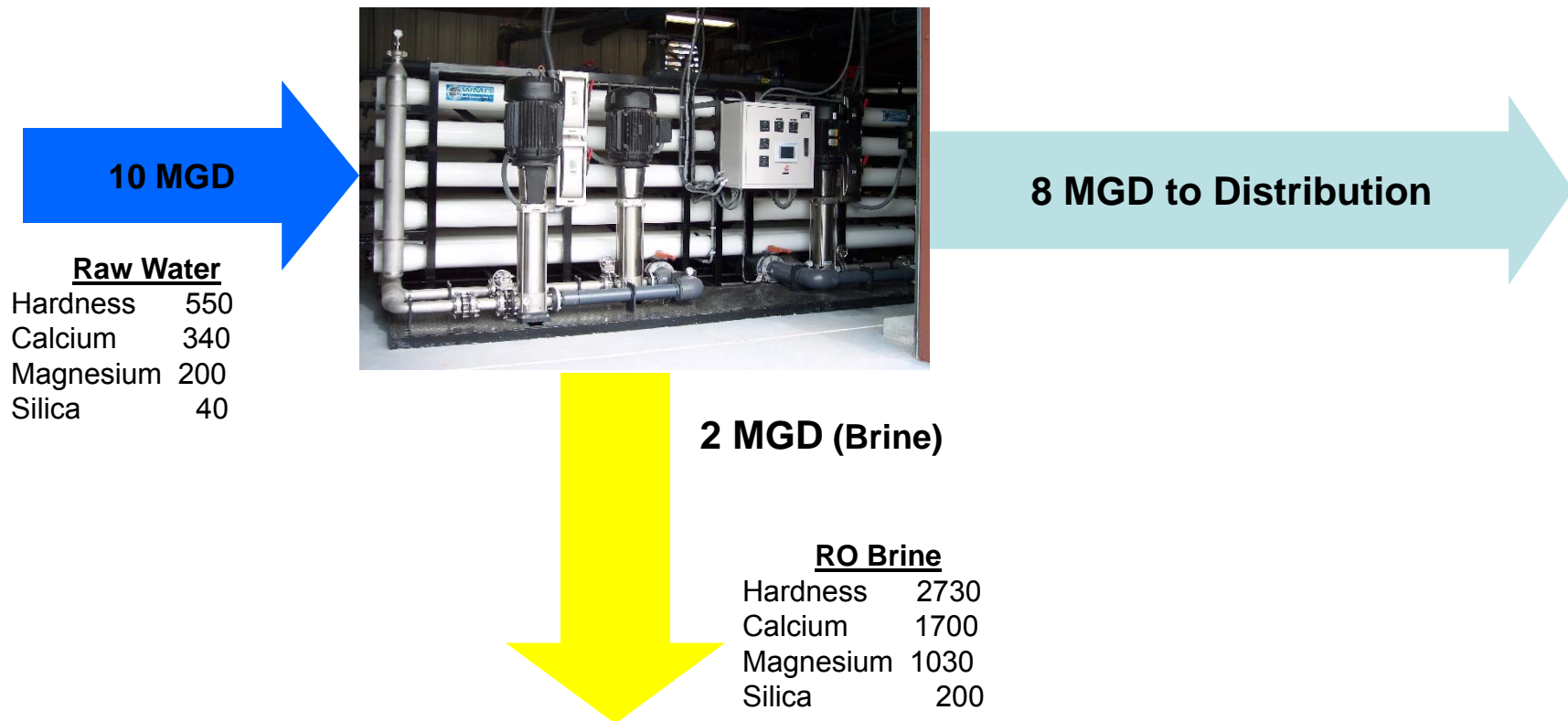
Chemical / Disposal Cost	\$255 - \$340 /day (\$0.34/1,000 gal)
Labor	\$217 - \$290/day (\$0.29/1,000 gal)
	<u>\$473 - \$630/day (\$0.63/1,000 gal)</u>

RO Brine Treatment – Approaching ZLD

- Regional scarcity
- Wasting nearly 2 MGD per day in brine water
- RO efficiency improved from 80% to >95%



State-of-the-Art Reverse Osmosis Desalination



Process efficiency is 80% - 2MGD are wasted as brine!

Brine Treatment Performance



RO Brine Inflow

Hardness	2730
Calcium	1700
Magnesium	1030
Silica	200

Reactor Effluent

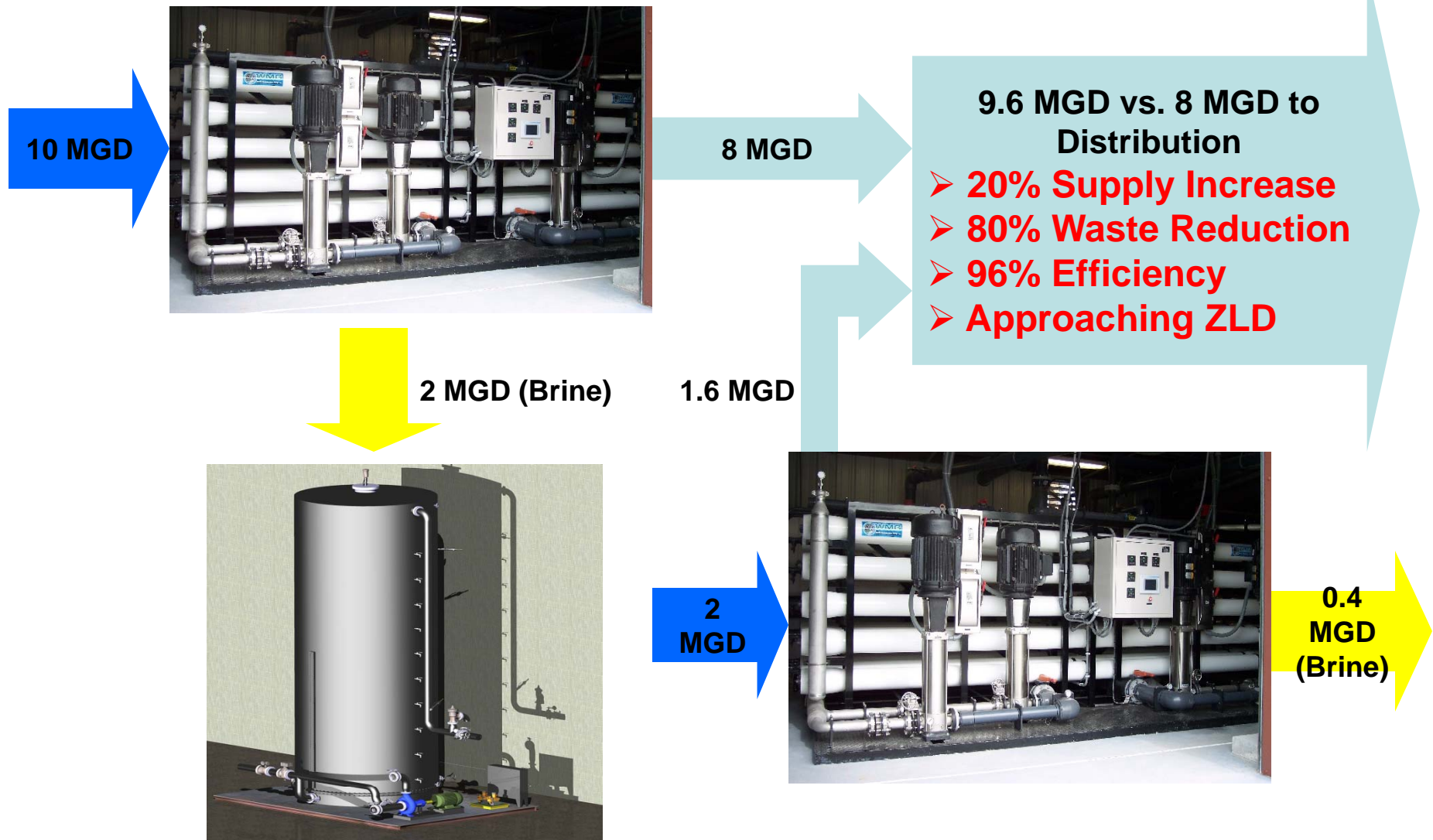
Hardness	885
Calcium	350
Magnesium	535
Silica	29



> Raw Water Quality!



Design & Results



Let us show you!

- You provide water quality data
 - We provide modeling report
- Onsite pilot testing
 - Demonstrate hardness removal
- Measure chemical usage (operating costs)
- Validate design parameters and equipment capital cost



Zero Liquid Discharge Water Treatment



- Softening
 - Eliminate chlorides
 - Eliminate wasted water
- Increase RO efficiency
 - Recover more water
 - Lower cost
- RO brine recovery
 - Recover wasted water



Patent pending



Deliver more water from same supply