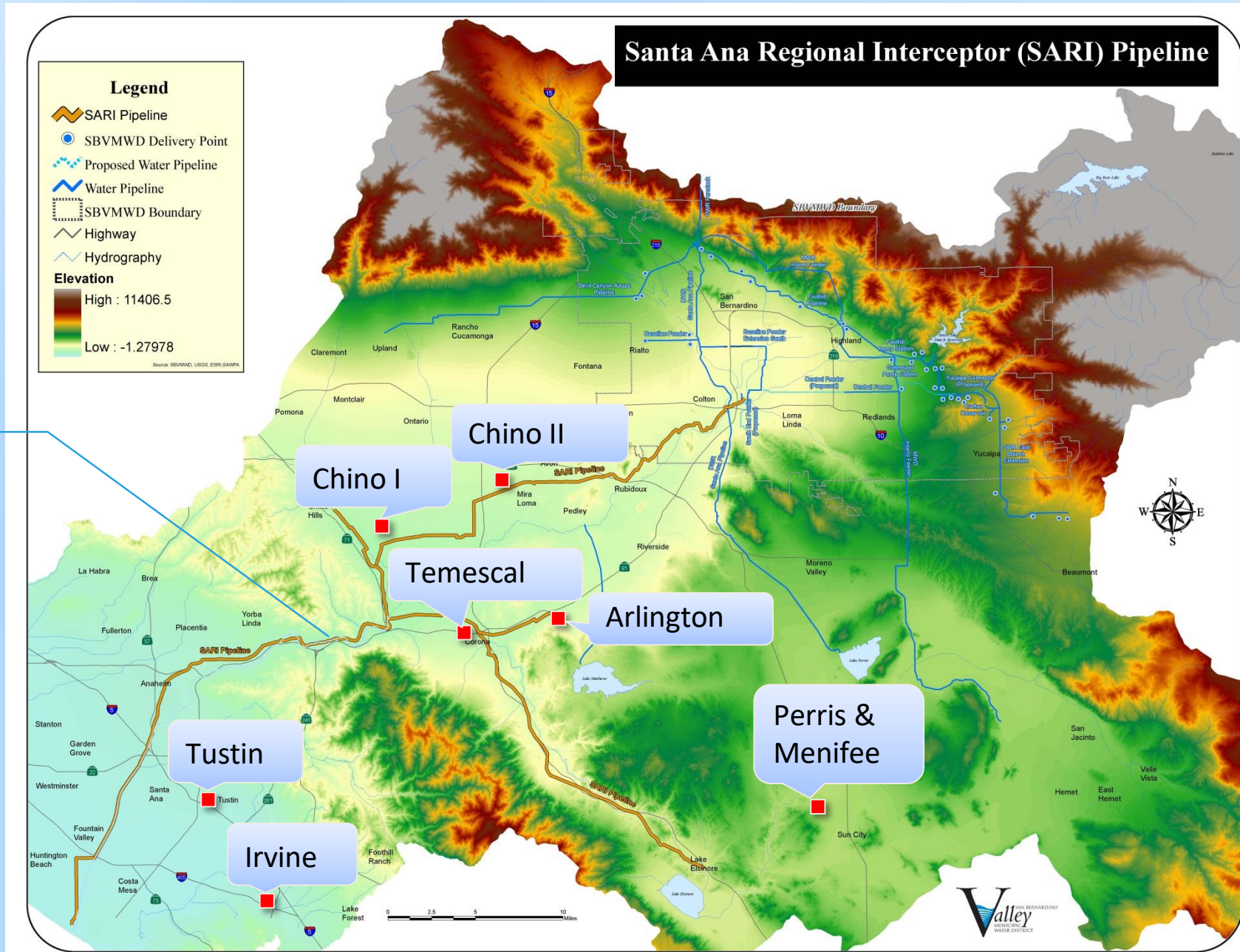


Case Study: Chino II Concentrate Reduction Facility

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Engineers...Working Wonders With Water®

The Brine Challenge In Southern California



Brine Line Export is Expensive and Capacity is Fixed

The Chino II Brine Reduction Facility Was the Product of Multiple Drivers

Project Drivers

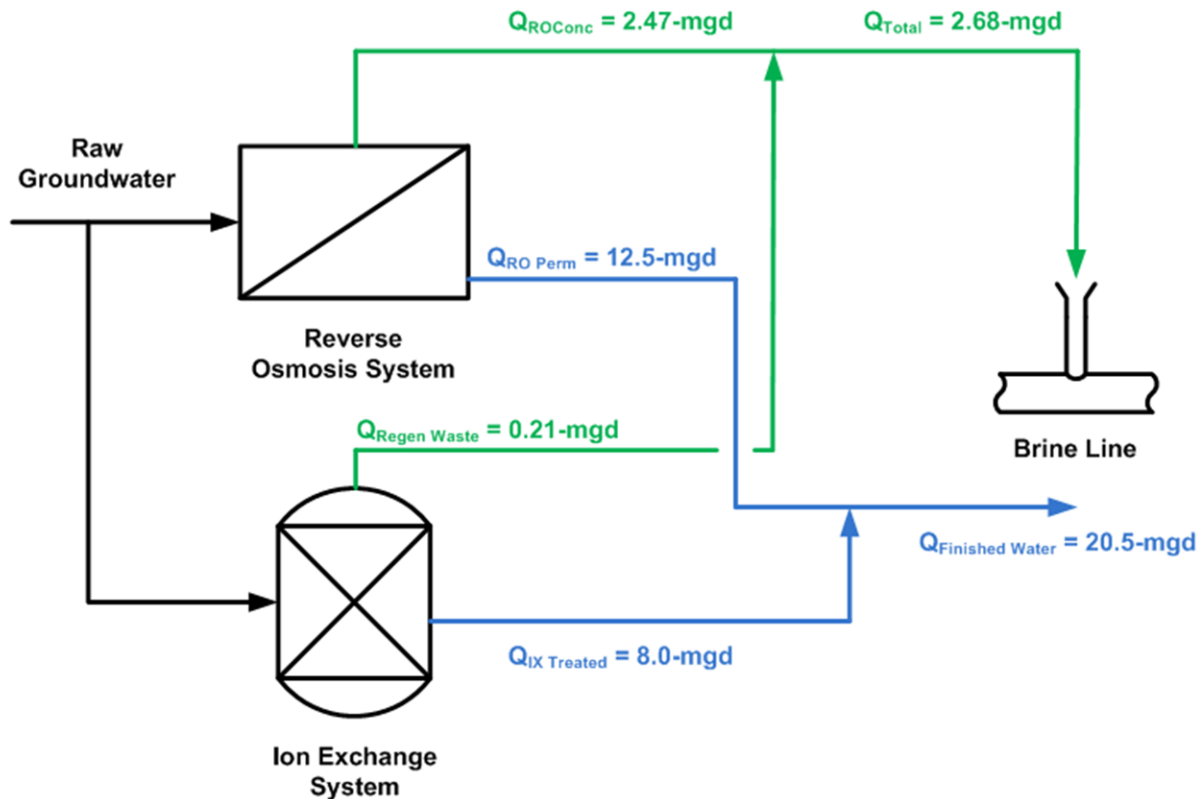
Reduce Discharge To Brine Line

- Allow for Expansion of Chino II Desalter
- Utilize Capital Project Specific Grant Funding

Resource Recovery and Sustainability

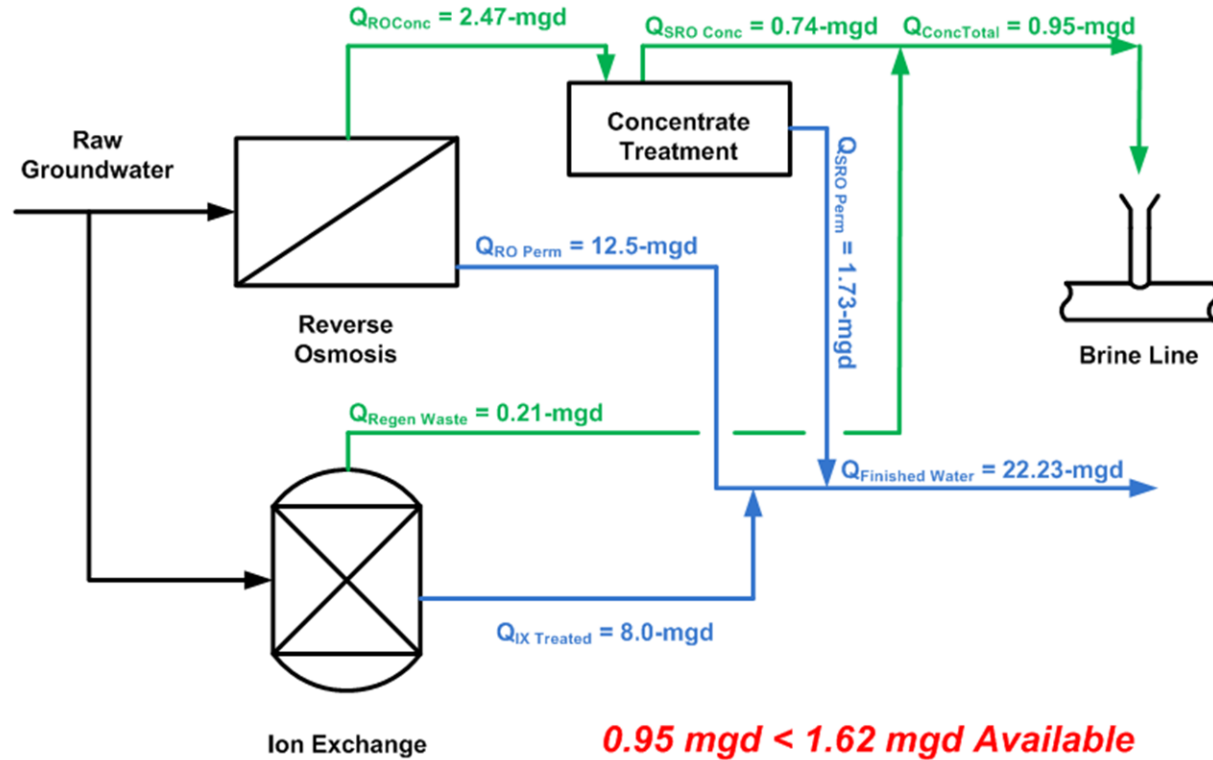
- Recover Additional Potable Water from Wellfield
- Produce Residuals That Have Beneficial Reuse (Economic and Environmental)
- Reduce Scaling Potential In Brine Line

The Concentrate Reduction Facility (CRF) Provided an Option to Purchasing Additional Brine Line Capacity

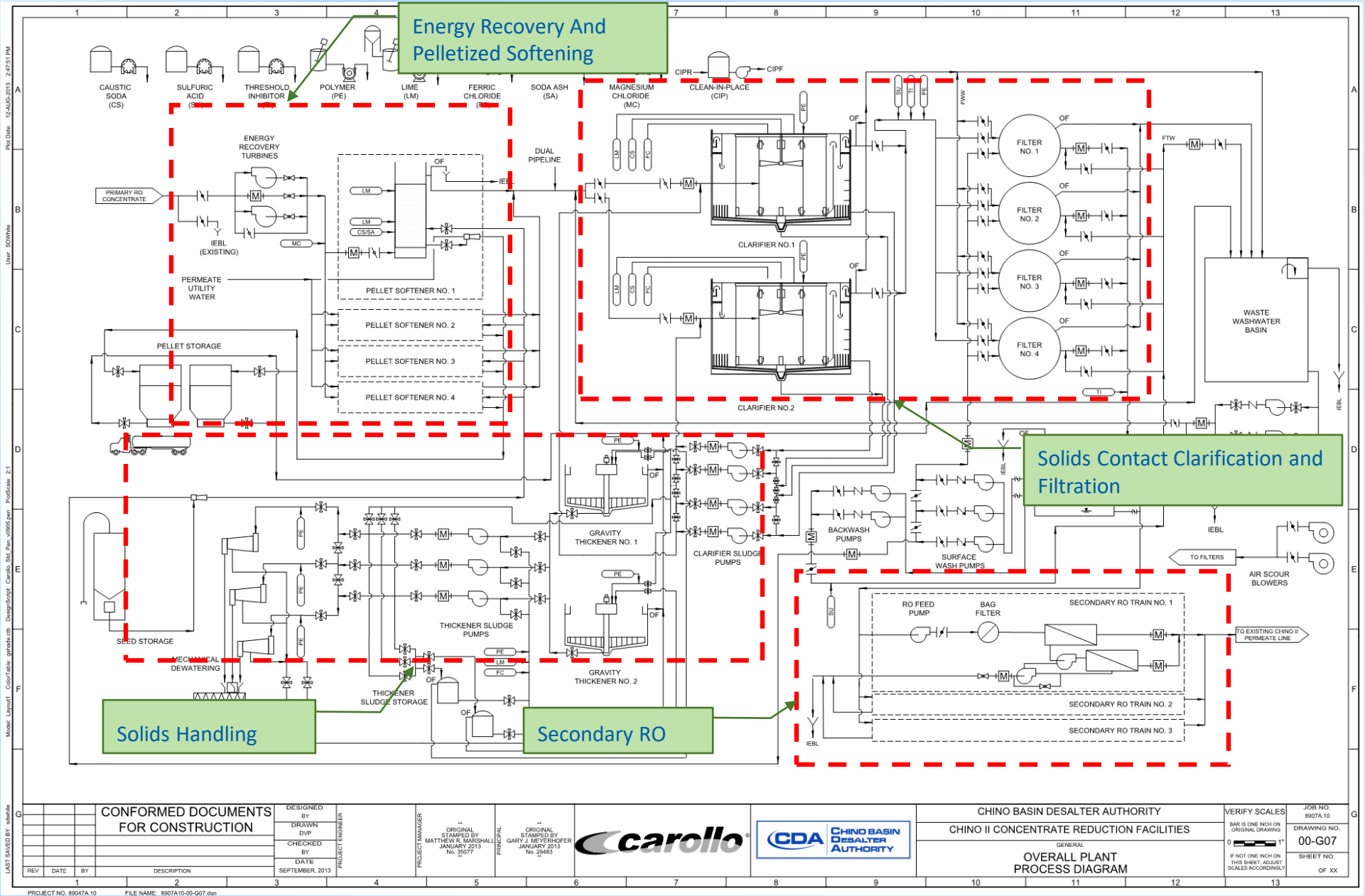


Expanded facility brine volume of 2.68-mgd exceeded current brine line capacity of 1.62-mgd.

The CRF Allows Chino II To Meet Disposal Goals And Recover Potable Water



A large portion of solid residuals have beneficial use value.



Proj Date: 12-AUG-2013 2:47:51 PM
 User: S5WHite
 Model: Layout1 Color: gbkade.ctb Design: S5WHite.dwg Plot: v0992.pn PlotScale: 2:1
 LAST SAVED BY: s5white
 PROJECT NO. 89047A.10 FILE NAME: 89047A10-00-G07.dwg

CONFORMED DOCUMENTS FOR CONSTRUCTION		
DESIGNED BY	DRAWN BY	CHECKED BY
DVP		
DATE	DATE	DATE
SEPTEMBER, 2013		

PROJECT ENGINEER	PROJECT MANAGER	PRINCIPAL
ORIGINAL STAMPED BY	ORIGINAL STAMPED BY	ORIGINAL STAMPED BY
MATTHEW S. MARSHALL	GARY J. MEYERHOFFER	
NO. 25077	NO. 24603	

CHINO BASIN DESALTER AUTHORITY
 CHINO II CONCENTRATE REDUCTION FACILITIES
 GENERAL
OVERALL PLANT PROCESS DIAGRAM

VERIFY SCALES	JOB NO.
BAR IS ONE INCH ON ORIGINAL DRAWING	8904A.10
0 1" (Scale bar)	DRAWING NO.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	00-G07
	SHEET NO. OF XX

Chemical softening removes scaling precursors in the primary RO concentrate

Secondary RO recovery of 66% (and higher) achieved through:

- Calcium reduction
- Magnesium reduction
- Alkalinity reduction
- Silica reduction

CHINO CRF TREATMENT GOALS

Silica

Calcium

180 mg/L

1,700 mg/L



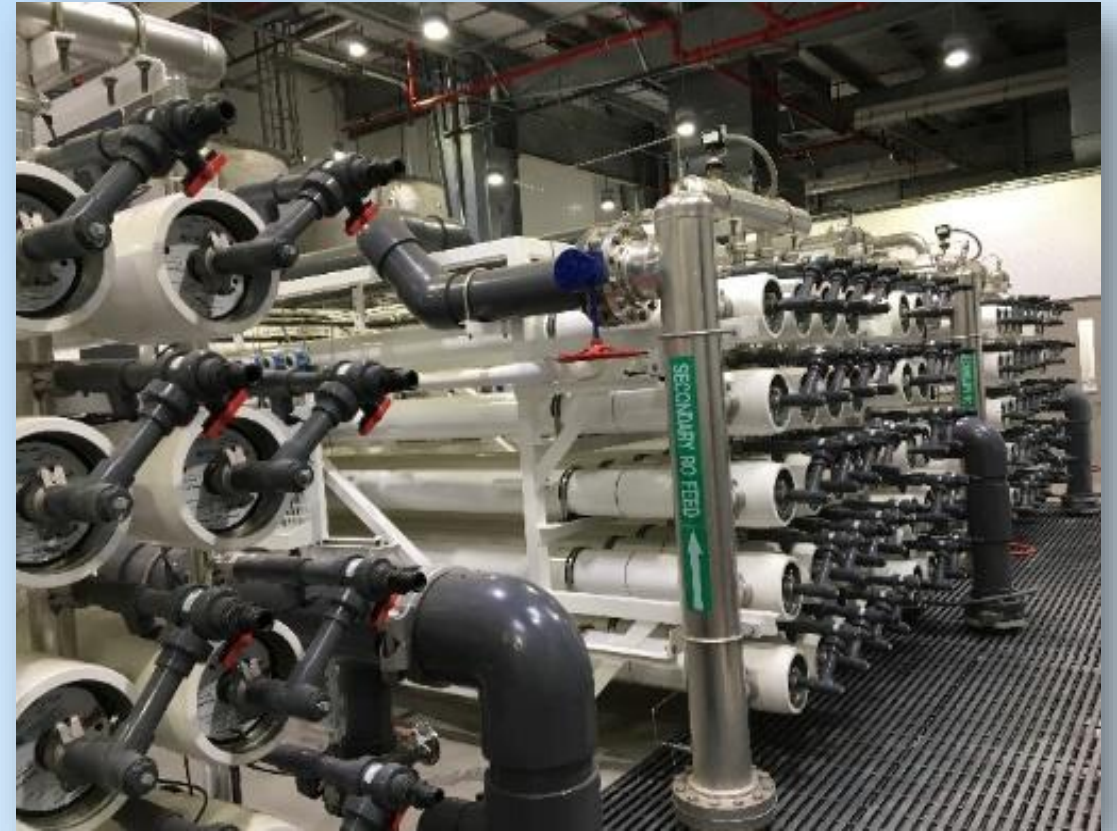
Achieving <50 mg/L

<80 mg/L

<40 mg/L

Facility Facts and Features

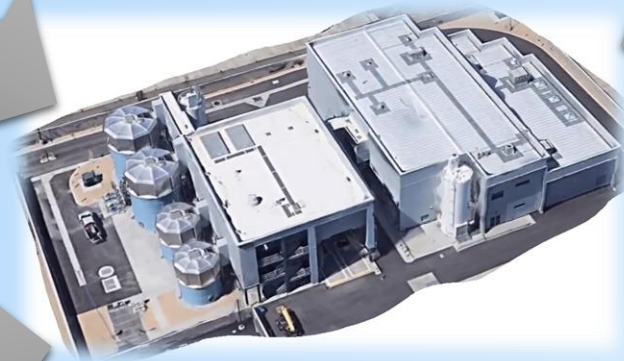
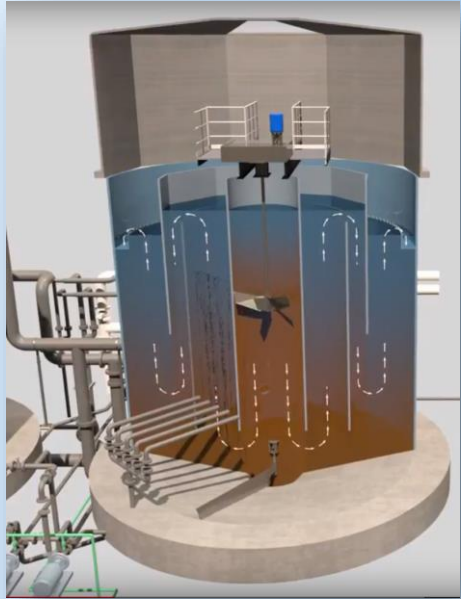
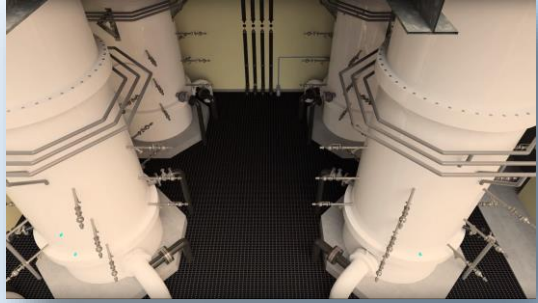
- Capacity:
 - Influent: Up to 2.47 mgd of primary RO concentrate
 - RO Permeate: >1.73 mgd
 - Brine and IX Waste: < 0.94-mgd
- Secondary RO Recovery: 66-85 Percent
- Overall Facility Recovery: >94 Percent
- Solid Residual Disposal:
 - Pellets: Sold to local specialty minerals distributor
 - Dewatered solids: Landfill with option for composting
- Product Water Use: Potable



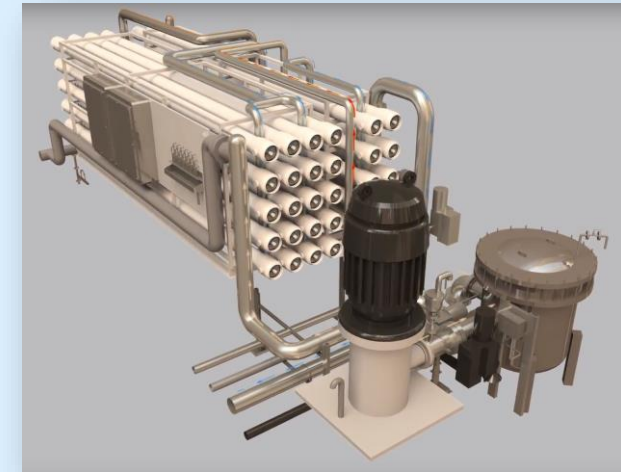
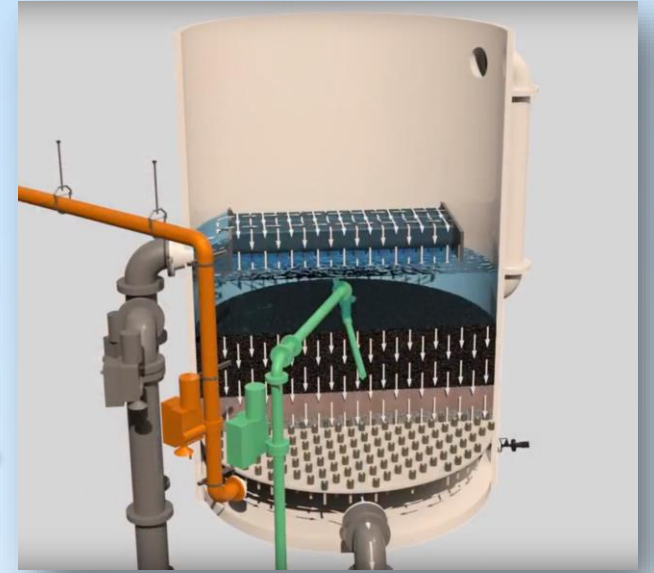
Facility in Operation Since May 2017

Lessons Learned – General

First time combination of established processes = Unknowns



Chino II CRF



Lessons Learned – General

Active Operator Engagement Required



“Softening on Steroids”



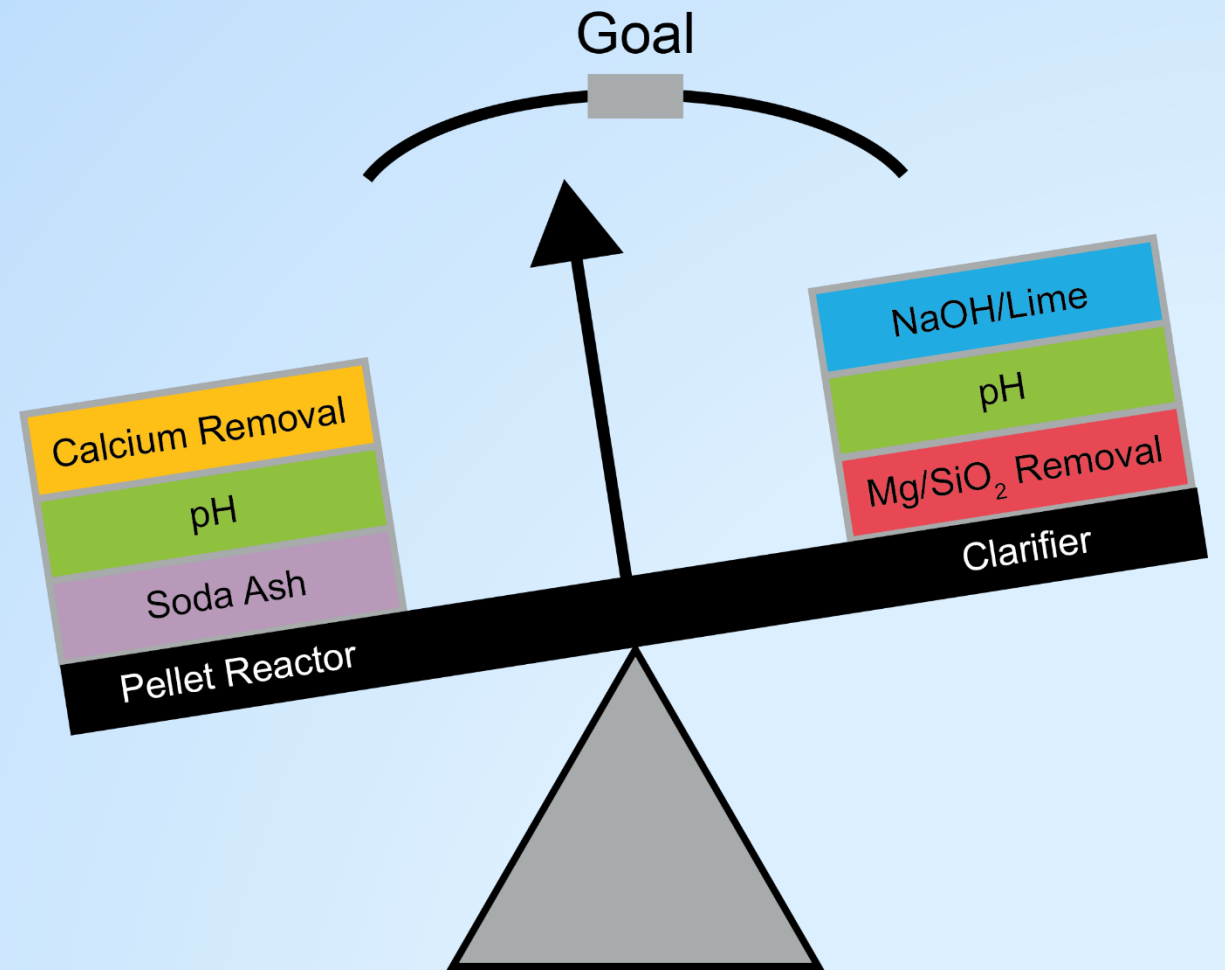
Upsets Happen Fast!



High Rate Processes
Due to Site Constraints

Lessons Learned – Process

Balancing two different softening processes requires operational finesse.

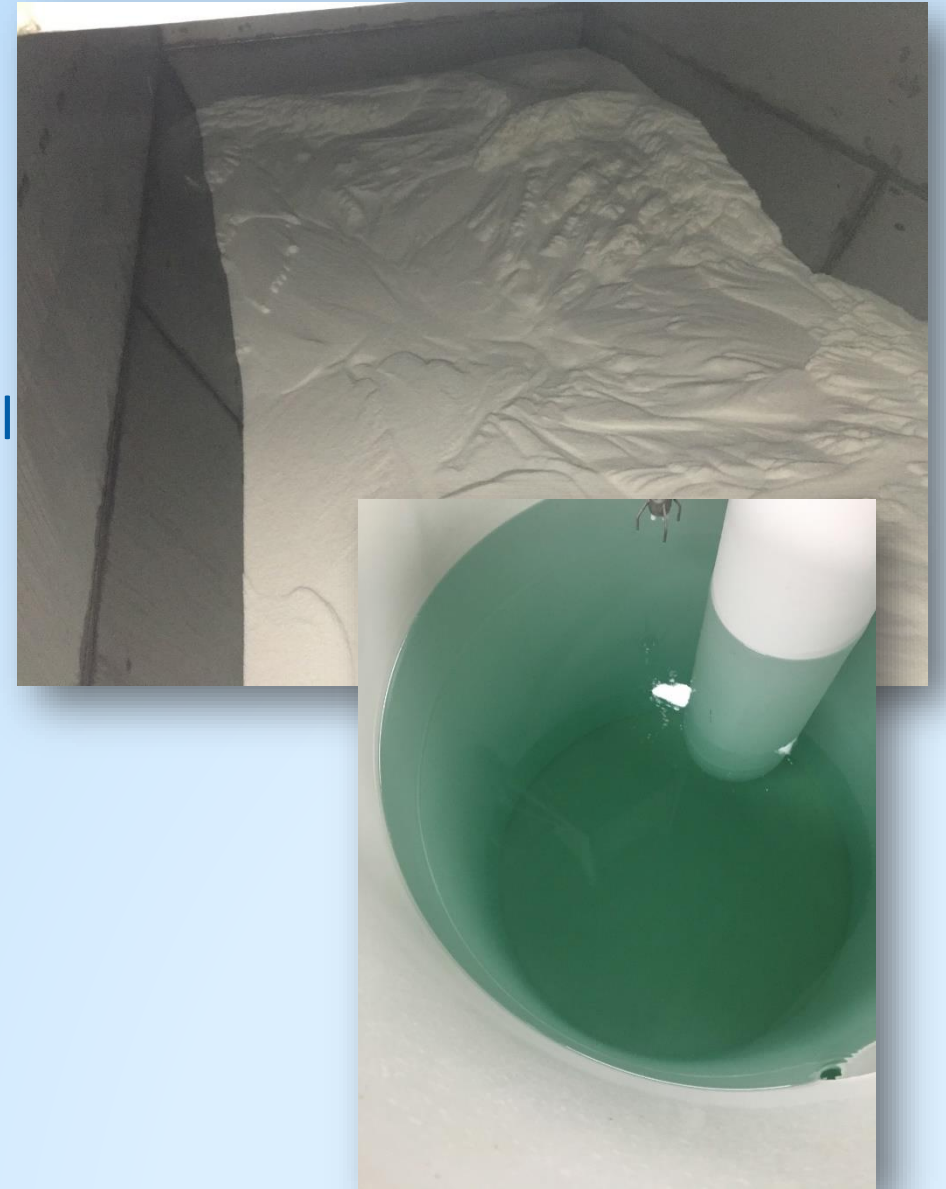


Lessons Learned – Process

Extreme Hardness = Uncharted Territory for Pellet Reactors

- Removal rate per area of reactor is 10X higher typical applications

New paradigm for seed feed and pellet blowdown developed



Lessons Learned – Process

Sludge Management

- Full scale solids much thicker than solids produced during piloting (30+% versus 6-10%)
- Solids Accumulation in Waste Washwater Basin
- Site constraints and no sewer connection make off spec water events hard to handle

Solutions

- Keep it moving
- Solids management plan developed for shutdowns
- Plan to manage carryover from centrifuge concentrate



Lessons Learned – Equipment

Recessed impellor pumps shear solids on recirculation system



More reliable bed level detector



Better check valves needed on injection lances



Despite Challenges, the CRF is a Success

- Last 4 months has seen the best performance since commissioning
- A plan is in place to address some of the lessons learned issues
- Water production costs have been within range for project feasibility

For more information, contact:
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