



Carlsbad Desalination Plant Wedgewire Screen Pilot Study August 31, 2022



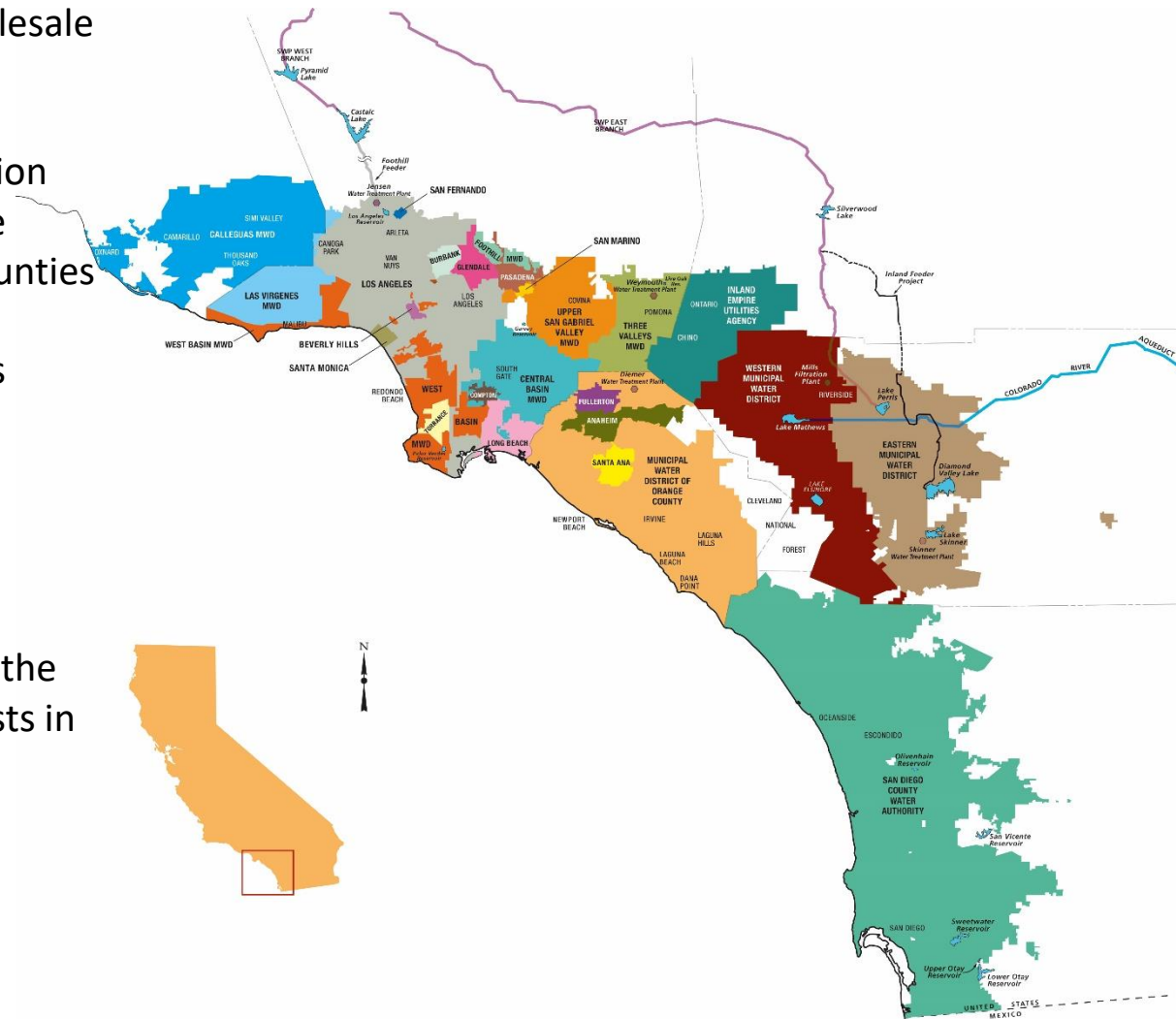
Agenda





The Metropolitan Water District of Southern California

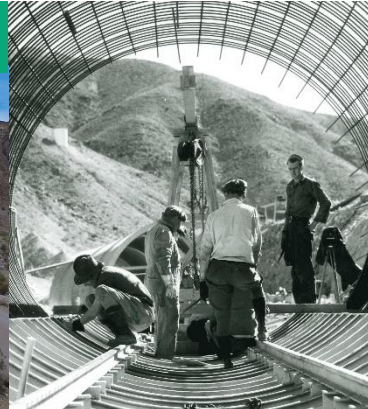
- Nation's largest wholesale water provider
- Service area: 19 million people/5,200 square miles/parts of six counties
- 26 member agencies
- Supports \$1 trillion regional economy
- Imports water from Northern Sierra and the Colorado River, invests in local projects





Metropolitan's Role for Southern CA

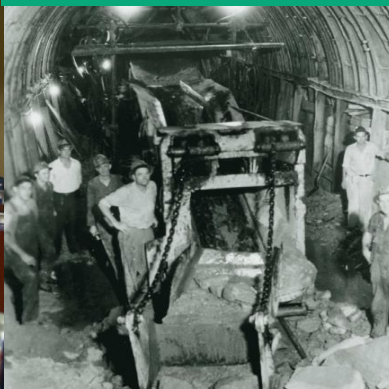
REGIONAL PROVIDER



INNOVATION



VISION



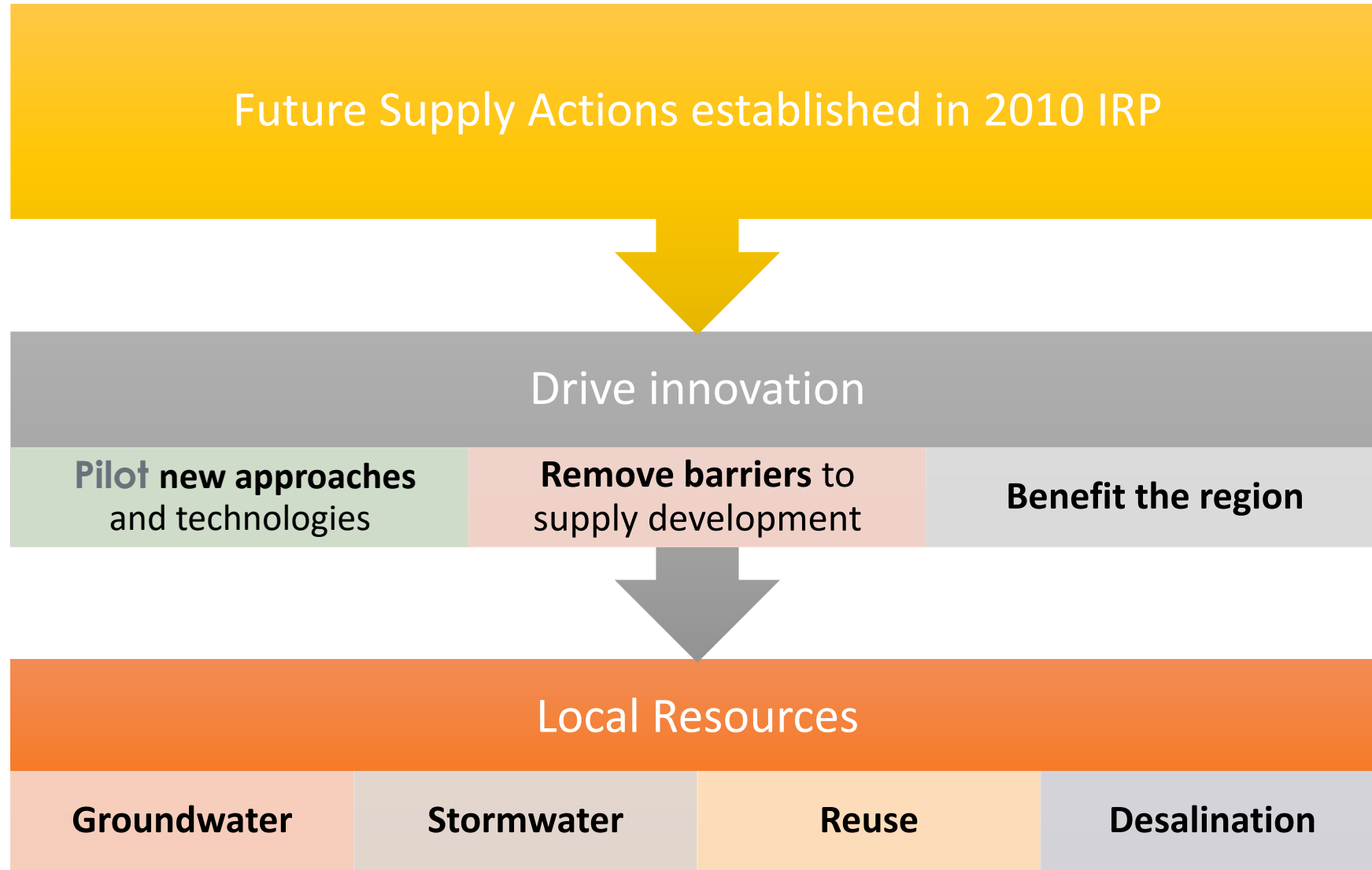
Flexible System



SAFE & RELIABLE



Future Supply Actions Funding Program





Current Program

Member Agency

- 14 studies
- \$3.1 million

Water Research Foundation

- 6 potable reuse studies
- 1 agricultural reuse study
- \$975k



Speakers

- **Nathan Faber**
San Diego County Water Authority



- **Tim Hogan**
TWB Environmental Research and Consulting, Inc.





Agenda

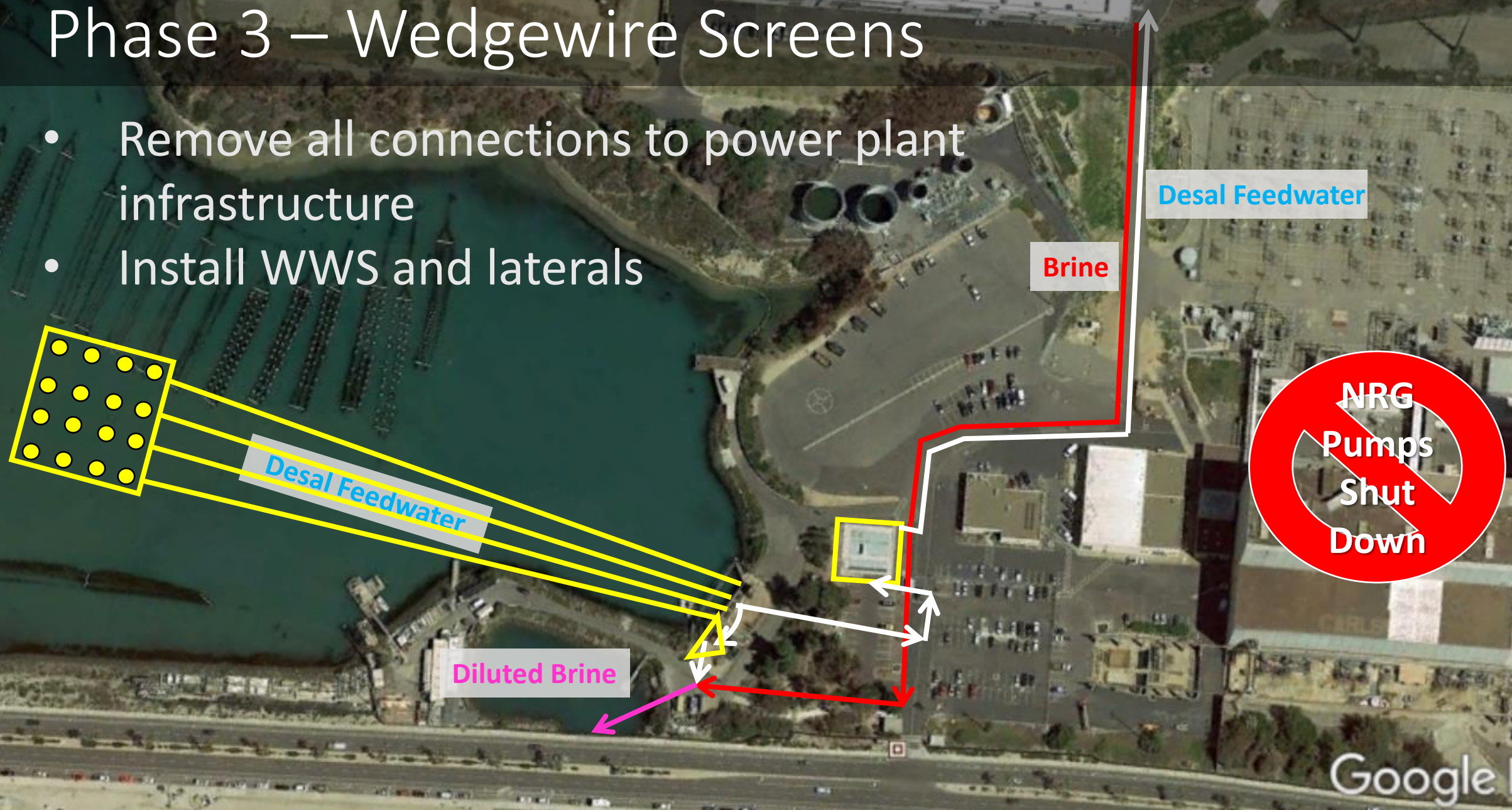
- Background and Objectives
- Project Design
- Pilot Operation
- Results
- Lessons Learned
- Related Studies

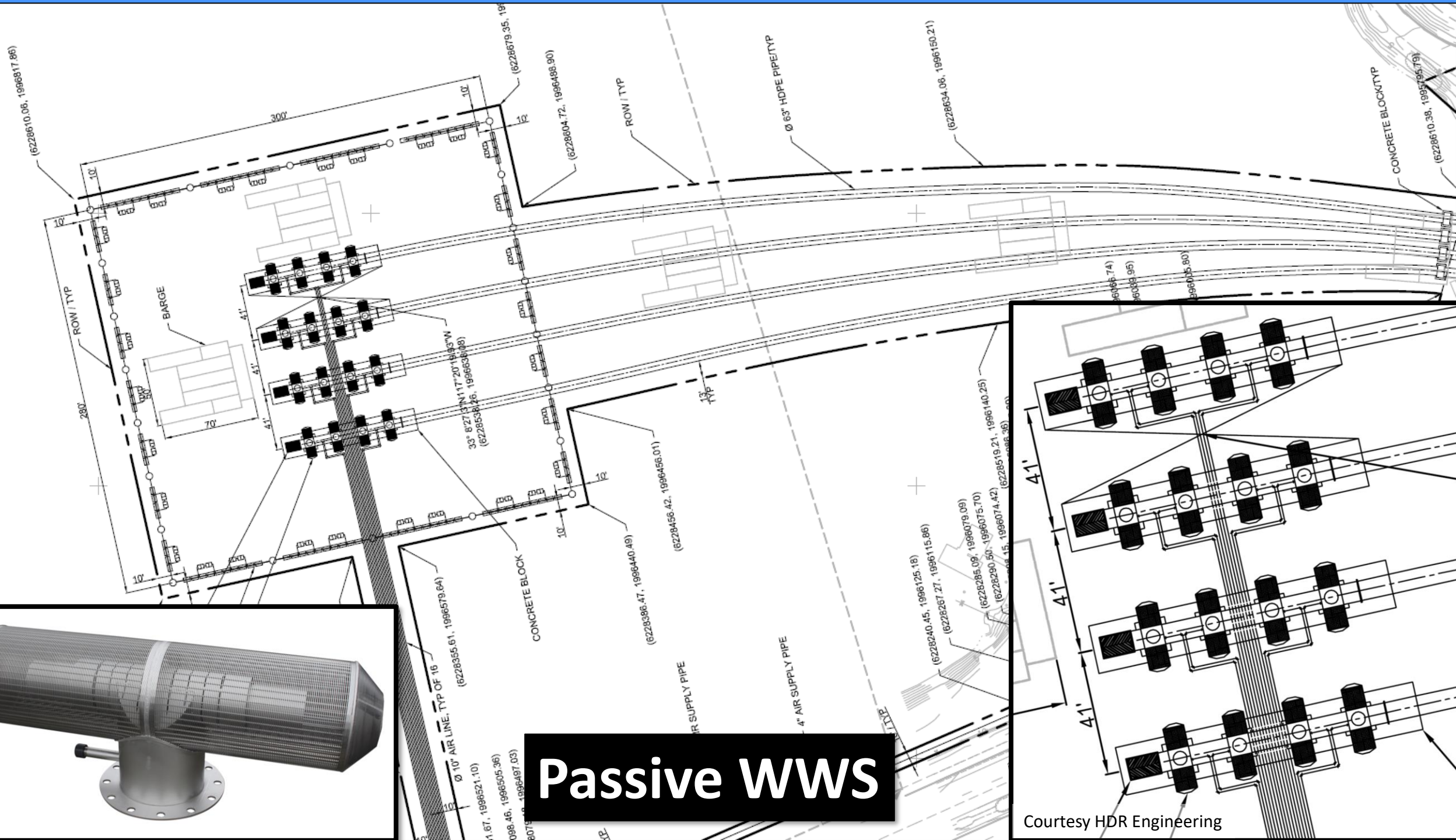


Background and Objectives

Phase 3 – Wedgewire Screens

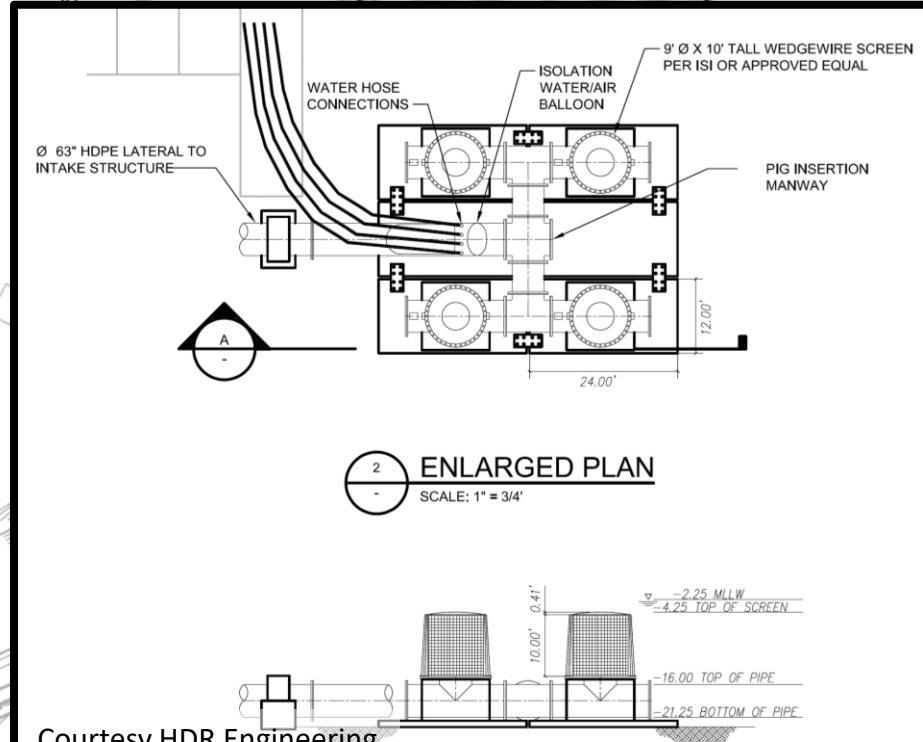
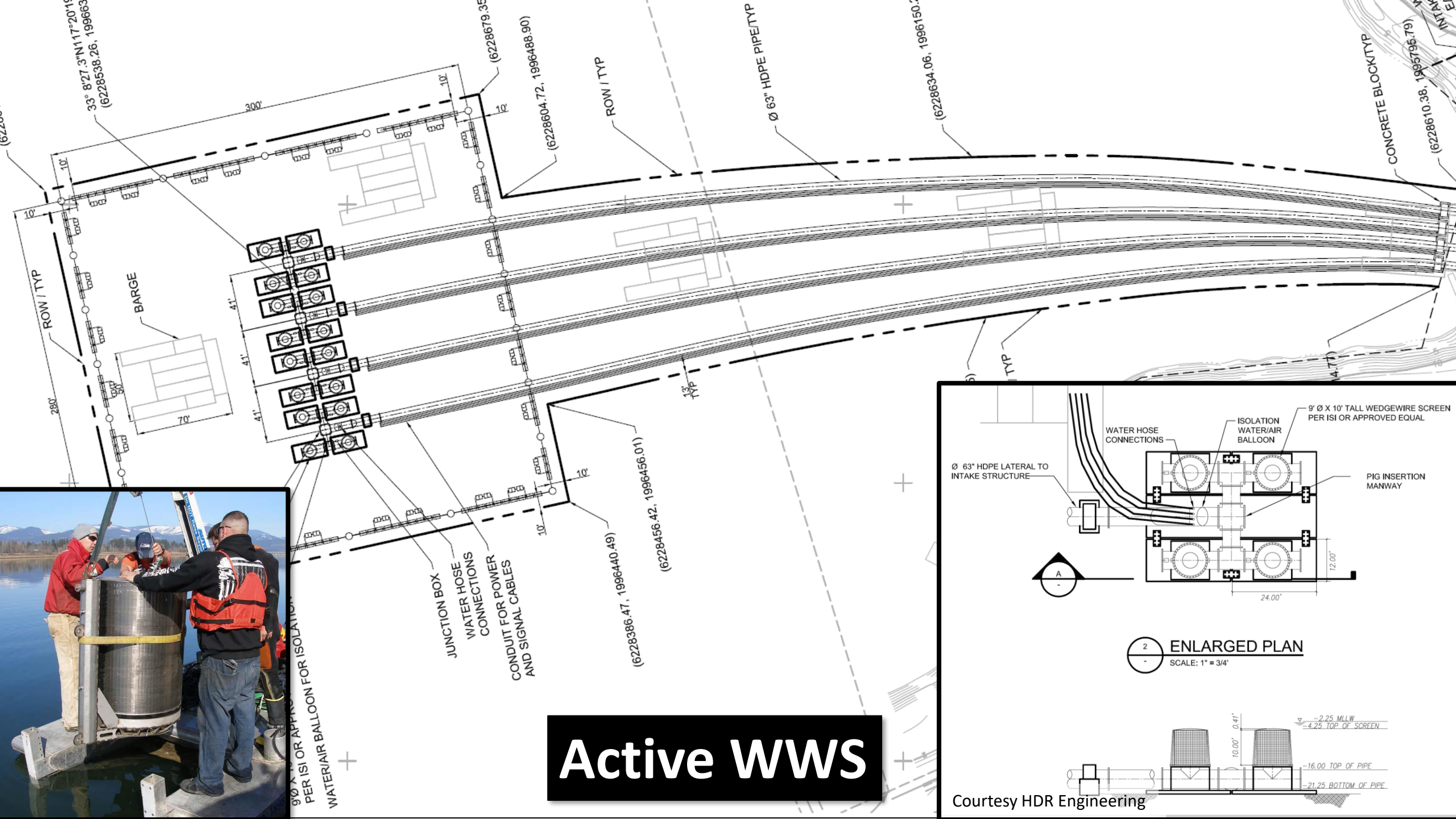
- Remove all connections to power plant infrastructure
- Install WWS and laterals





Passive WWS

Courtesy HDR Engineering



Active WWS

Courtesy HDR Engineering



Objectives

- Evaluate site-specific performance of WWS
 1. Biofouling
 2. Free-floating debris
 3. Assess O&M needs
- Compare performance of passive and active WWS
- Inform design and O&M requirements

How?

- Test screens under active pumping
- Test at proposed full-scale installation location
- One-year duration to assess long-term performance



Project Design

Overview

Carlsbad Desalination Plant

Acoustic doppler current profiler

Pilot skid

Umbilical

NRG Cabrillo Power

WWS pilot project onshore container with screen controls, air compressor, receiver, electrical panel, data logging system





Skid and Screens



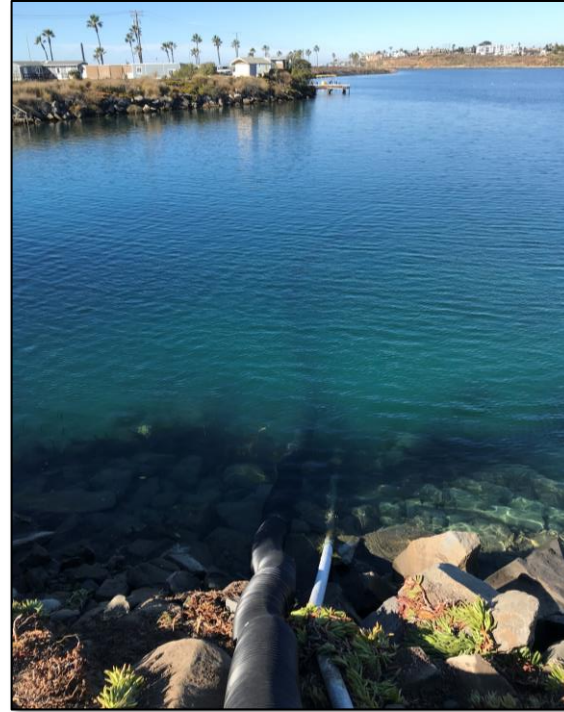


Umbilical





Portable Control Room



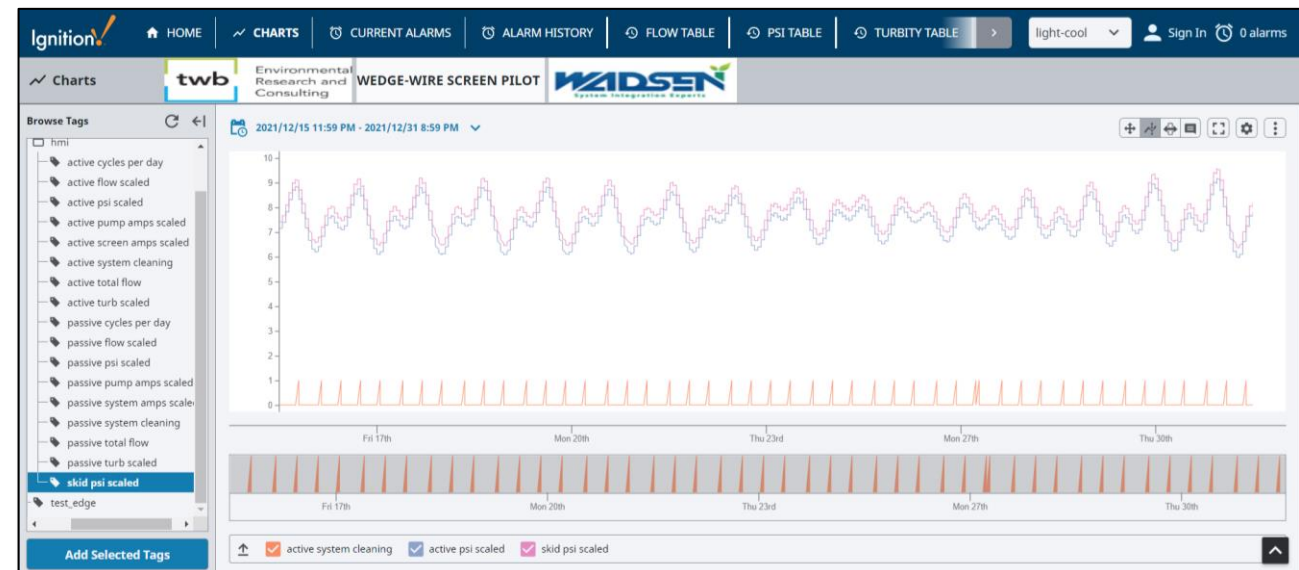


Pilot Operation



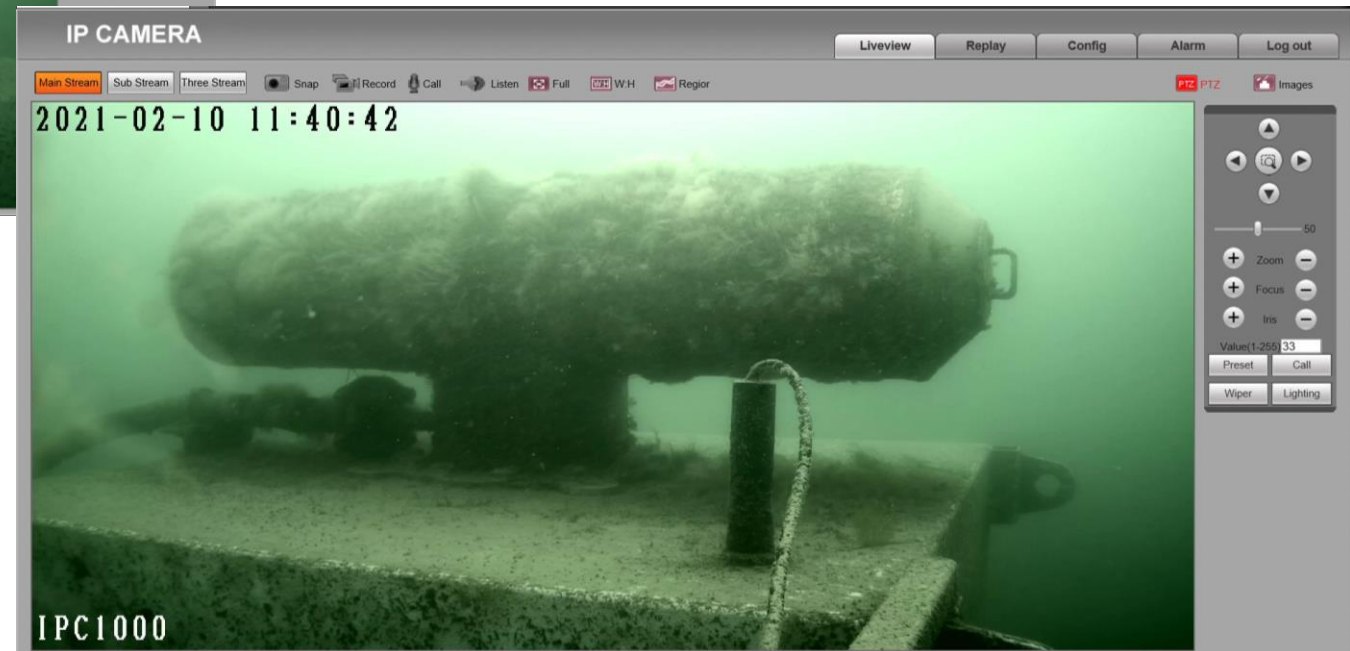
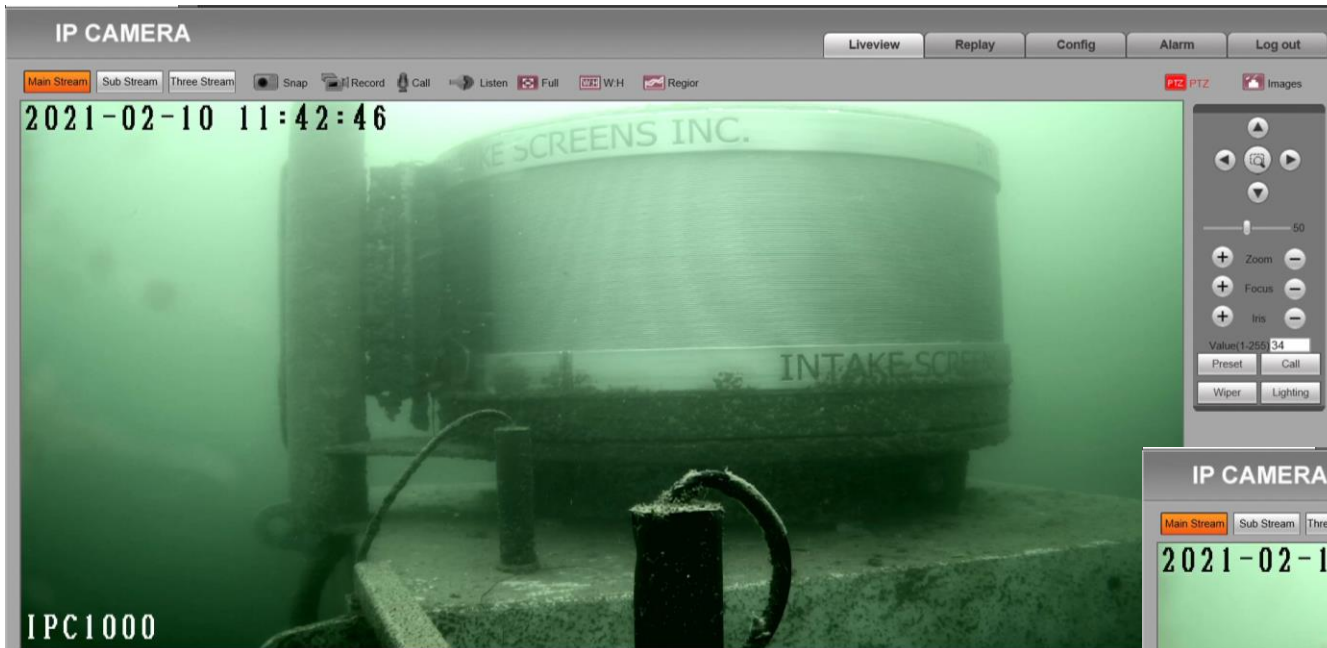
Pilot Operation

- Pumps run continuously except for inspections/maintenance
- Screen cleaning varied based on observations
- Monthly dive surveys for observation/maintenance
- Weekly inspection/maintenance of PCR
- Data collected in realtime:
 - Flow rate
 - Pressure differential
 - Pump amperage
 - Turbidity
- Data logged and downloaded:
 - Ambient currents (ADCP)
 - Water quality
 - temp, salinity, pH, turbidity





Pilot Operation





Pilot Operation

	Dec 7, 2020 - Jan 11, 2021	Jan 12, 2021 - Feb 17, 2021	Feb 18, 2021 - Mar 15, 2021
Passive	1 airburst/day	4 airbursts/day	Based on flow rate and differential pressure ²
Active	3 rotations/day ¹	3 rotations/day ¹	Based on flow rate and differential pressure ²

¹ Duration of each rotation was two minutes (one minute in one direction and one minute in the other direction)

² Cleaning was initiated by either (a) flow rate \leq 550 gpm for 15 seconds or (b) pressure differential pressure \geq 1 psi for 15 seconds

	Mar 17, 2021 - Jun 17, 2021	Jun 18, 2021 - Aug 12, 2021	Aug 13, 2021 - Today
Passive	4 airburst/day	NA ¹	8 airburst/day
Active	3 rotations/day	NA ¹	3 rotations/day

¹ All Pilot Project components were locked-out-tagged-out during this period; no screen cleaning occurred



Results



General

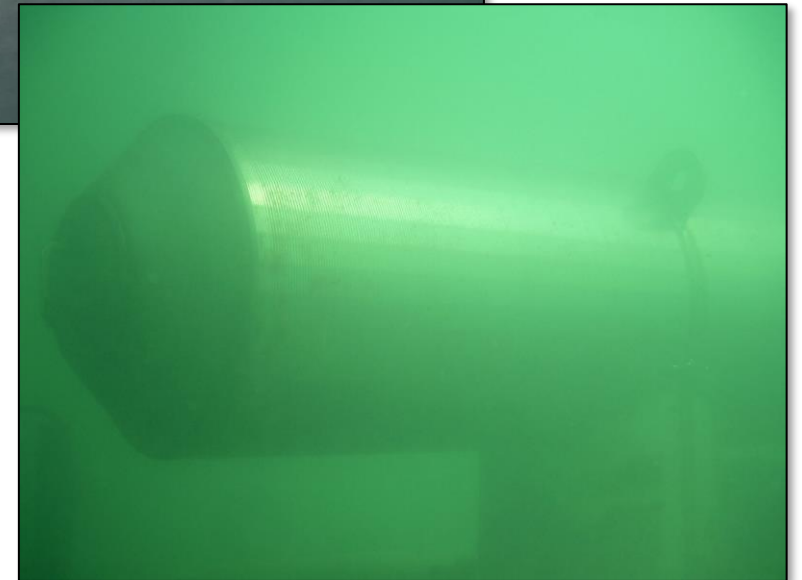
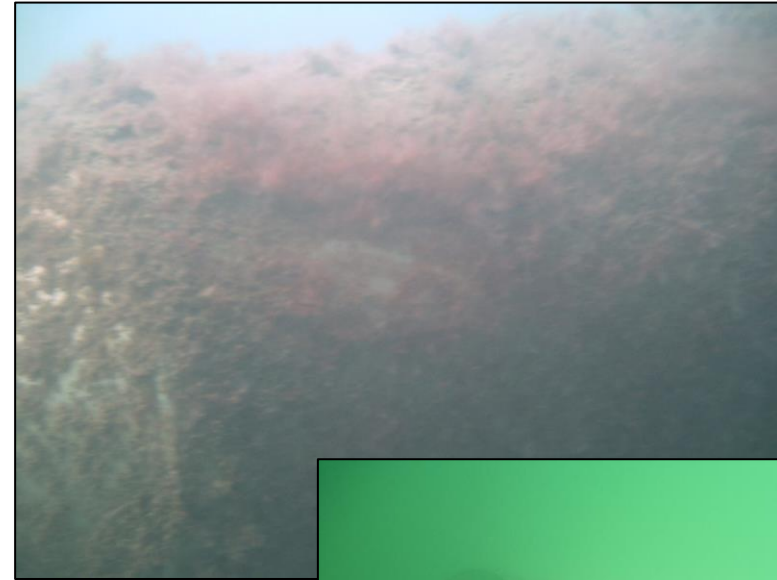
- Equipment maintenance in the Lagoon is a challenge:
 - cathodic protection, flow meters, pressure transducers, camera, umbilical anchoring, etc.





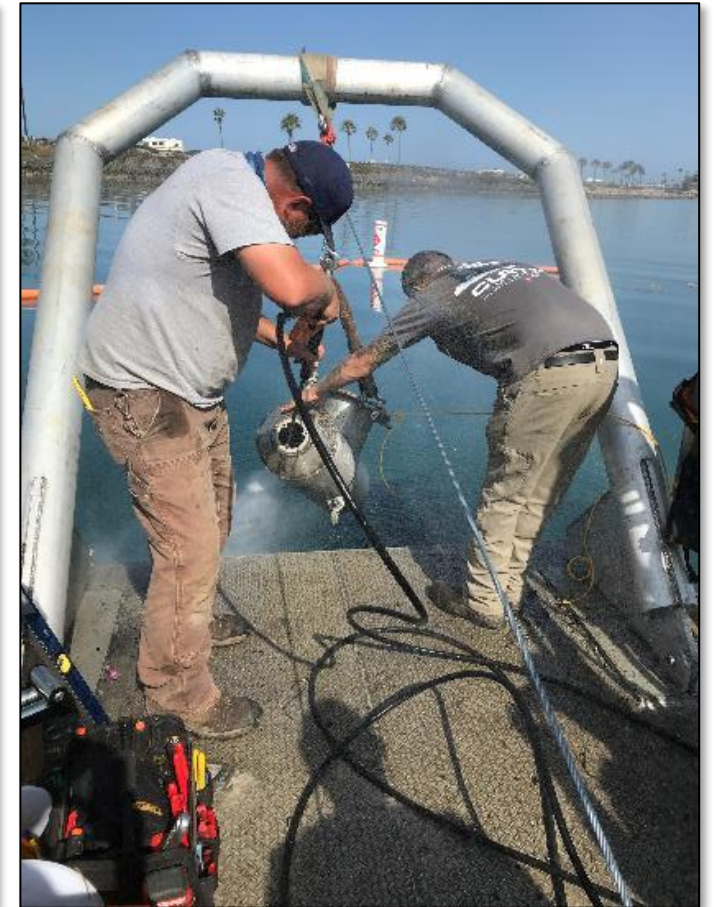
Passive WWS (Super Duplex Stainless)

- Exterior fouling accumulated within one month (**Note:** screen is not copper nickel)
 - Exterior fouling was soft growth and was easily removed manually by divers
 - Airburst was effective for free-floating debris, but did not clear attached biofouling
- Interior inspection began after 6 months of operation
 - Substantial interior fouling accumulated since interior not cleaned monthly – airburst was operating for most of the 6-mo period
 - Progressed from soft to hard growth (mussels)
 - After monthly interior cleaning began, interior fouling was soft growth and was easily removed by divers (manually/with pressure washer)



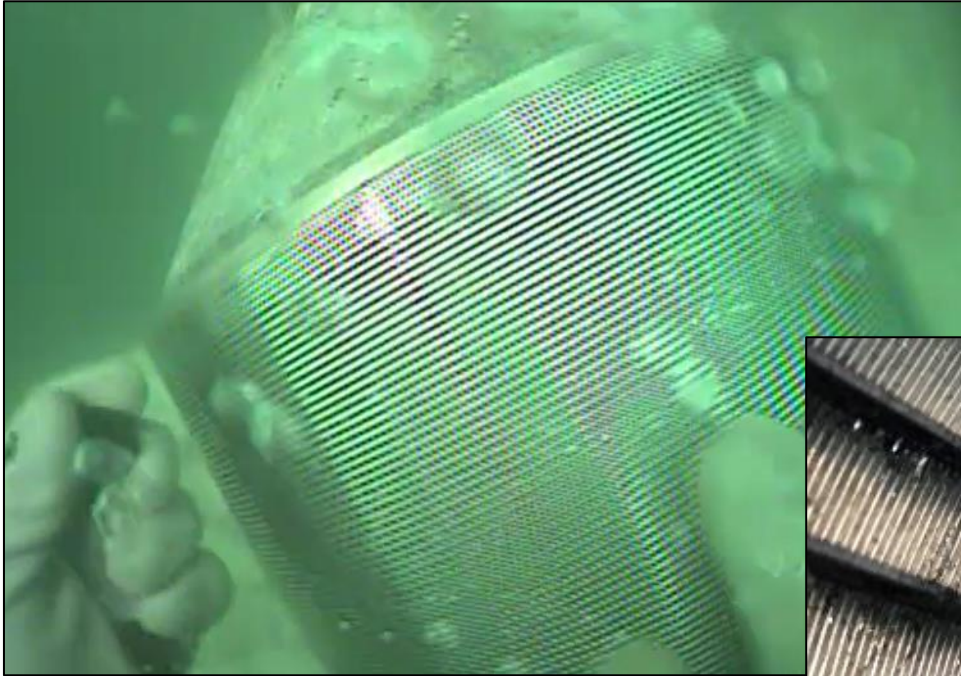


Passive WWS (Super Duplex Stainless)





Passive WWS (Super Duplex Stainless)



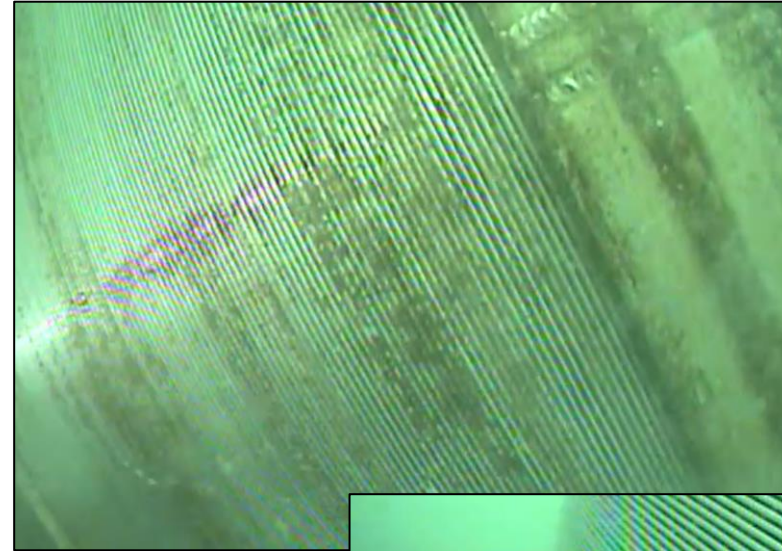
Passive WWS after thorough cleaning





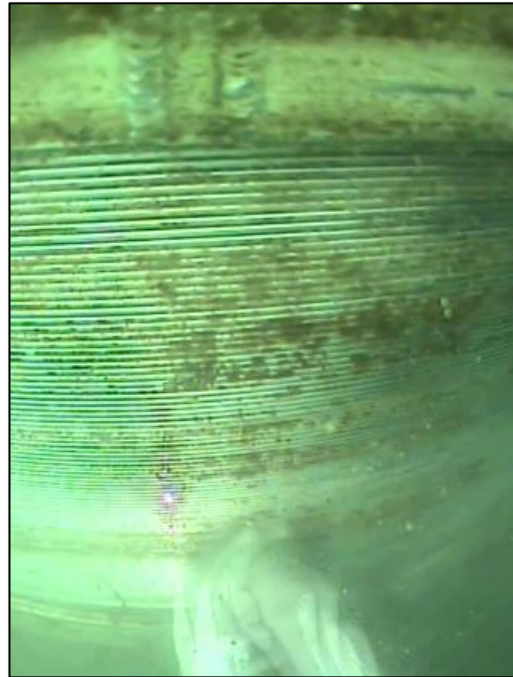
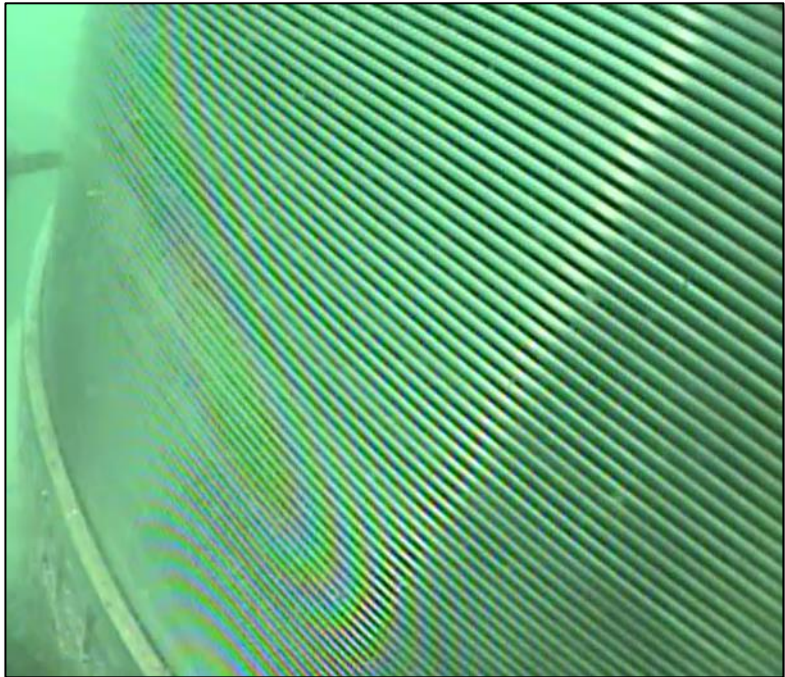
Active WWS (Super Duplex Stainless)

- Exterior fouling was controlled by brushes and rotation of screen
 - No noticeable accumulation over duration of study at cleaning frequency of 3 cleaning events/day
 - Brush contact must be assured - adjust as needed
- Interior fouling of the screen surface (which is brushed) was light at the 6-month inspection point





Active WWS (Super Duplex Stainless)





Lessons Learned

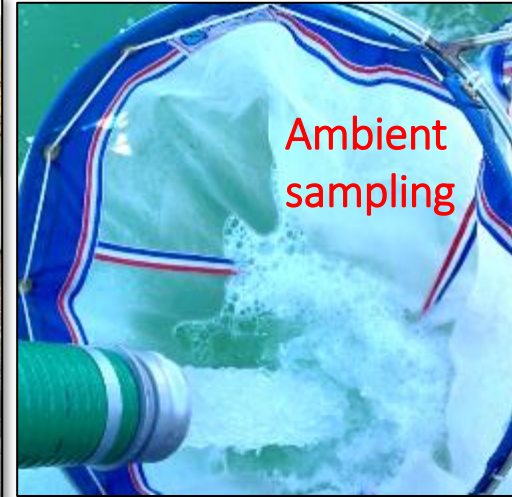
- Control of biofouling on super-duplex stainless steel is the principal O&M concern for WWS in Agua Hedionda Lagoon
- Brush-cleaned, active WWS (super duplex stainless steel) was better equipped to control biofouling in the Lagoon under operating conditions representative of full-scale
- The active WWS would likely require less maintenance at full scale
- Airbursting, passive WWS (super duplex stainless steel) required divers for manual cleaning; would be the case at full scale



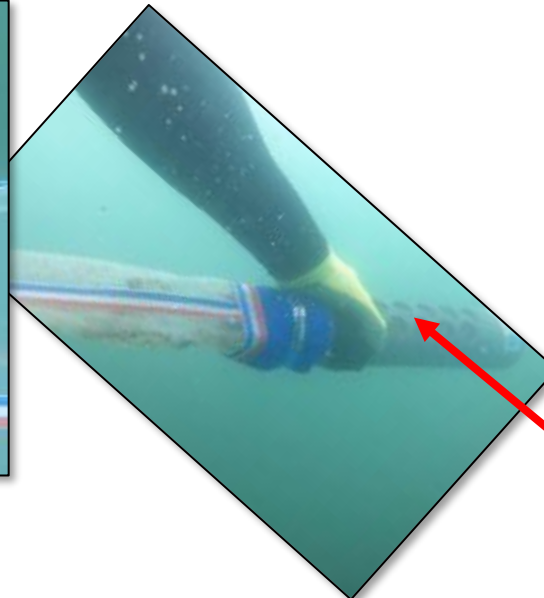
Related Studies

Plankton Sampling

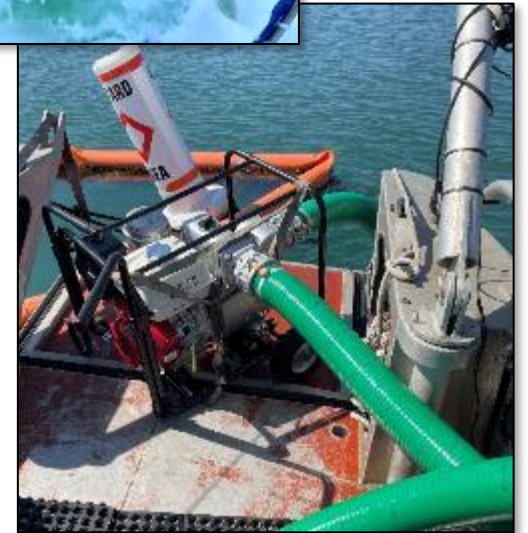
- Objective: address the 1% credit for using 1-mm screens
- 3 sampling locations:
 - Passive pump discharge
 - Active pump discharge
 - Unscreened control port
- 335- μ m net
- 50 m³ samples



Discharge port from pump



Cod end for collection





Plankton Sampling Results

- Very few larvae collected (19)
 - 13 via ambient port
 - 6 via WWS (3 active, 3 passive)
- Insufficient data for statistics

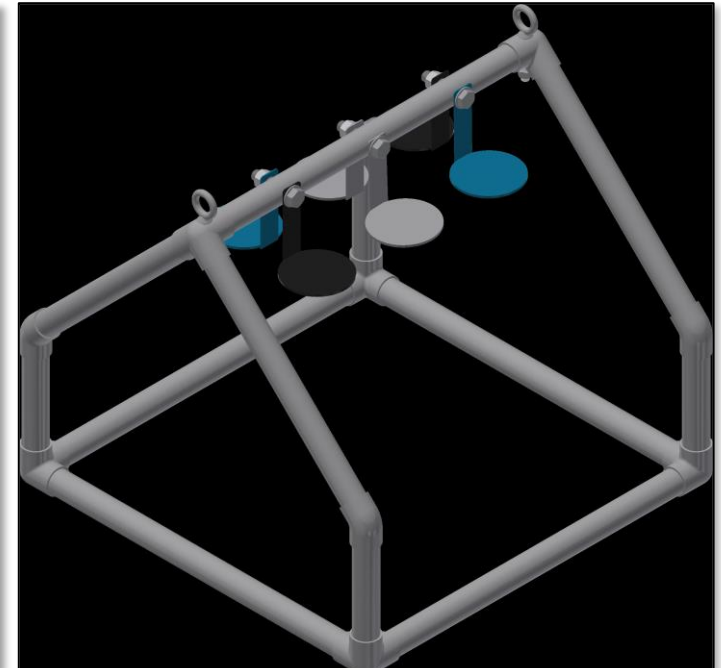
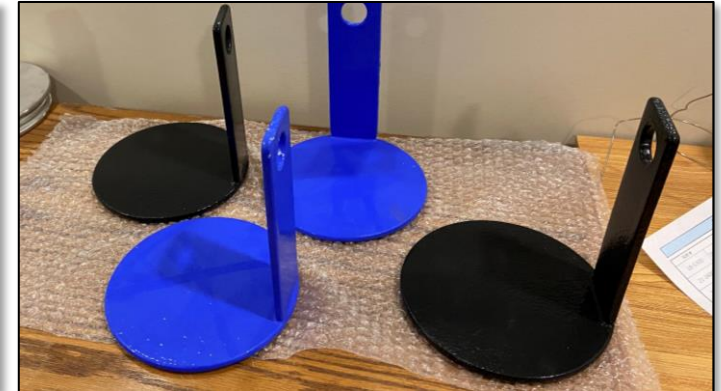
Date	Location	Taxon	Quantity	Mean Length (mm)
09/30/21	Ambient	CIQ Goby	4	2.9
10/21/21	Passive	CIQ Goby	1	2.0
10/21/21	Active	CIQ Goby	2	2.0
10/21/21	Ambient	Combtooth Blenny	5	2.4
10/21/21	Ambient	Northern Anchovy	1	4.4
11/05/21	Active	CIQ Goby	3	2.1
11/05/21	Ambient	Combtooth Blenny	3	2.0





Coupon Coatings Evaluation

- Evaluating 2 non-toxic, foul-release coatings and 1 control (no coating)
- Coupons installed on PVC frame near existing intake (0.2 - 0.5 ft/sec)
- Frame rests on natural bottom at existing intake
- 12-month duration





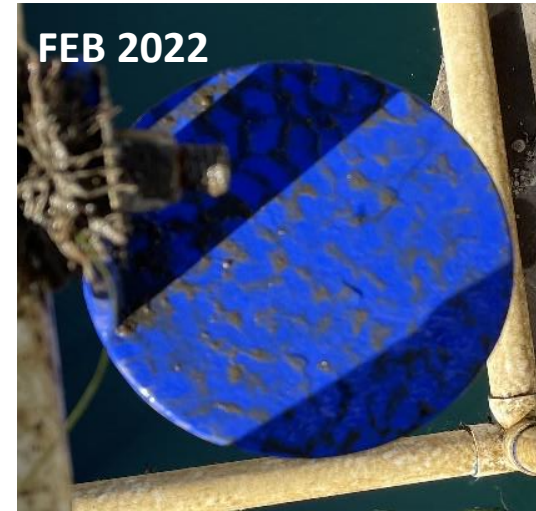
Coupon Results to Date



Control – no coating



Coupon Results to Date



Coating #1



Coupon Results to Date



Coating #2



Questions

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Environmental
Research and
Consulting