

Constructing the Nation's Largest Ion Exchange PFAS Water Treatment Plant

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**Yorba Linda
Water District**

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Outline

- Introduction to OCWD
- Overall PFAS Program
- Yorba Linda Water District PFAS Treatment Plant



Introduction to OCWD and their PFAS Treatment Program

Orange County Water District



- OCWD was formed in 1933 to
 - Manage the OC Groundwater Basin
 - Protect rights to Santa Ana River water
- Provide groundwater to
 - 19 municipal and special water districts
 - 2.5 million residents
- Basin provides 77% of the water supply for north & central OC



Extent of PFAS Impact in OCWD Service Area

Current California DDW NL/RLs:

Notification Levels:

PFOA = 5.1 ng/L

PFOS = 6.5 ng/L

PFBS = 500 ng/L

Response Levels:

PFOA = 10 ng/L

PFOS = 40 ng/L

PFBS = 5,000 ng/L

DRAFT Federal MCL:

PFOA: 4 ng/L

PFOS: 4 ng/L

Hazardous Index Calculation

- **11 water retailers (i.e., groundwater “Producers”)** and **over 60 wells** in the OCWD service area impacted by 10 ng/L PFOA Response Level
- **Up to ~ 1/3 of groundwater basin** production (100,000 afy) unable to be served
- **~ >\$50 million/year** additional alternative water supply cost for treated *imported* surface water



Actions Taken

- **2019 - Planning Study for 10 impacted Producers**
- 2019 - pilot testing of IX and GAC, phase I done, started phase II
- Late 2019, OCWD adopted a PFAS policy to design/construct
- Early 2020, pre-purchase of 55 vessel systems between two vendors and awarded 6 on-call consultants for design





SINCE 1933



Orange County Water District
PFAS Treatment Systems Planning Study

Producer Report YORBA LINDA WATER DISTRICT

FINAL | August 2020

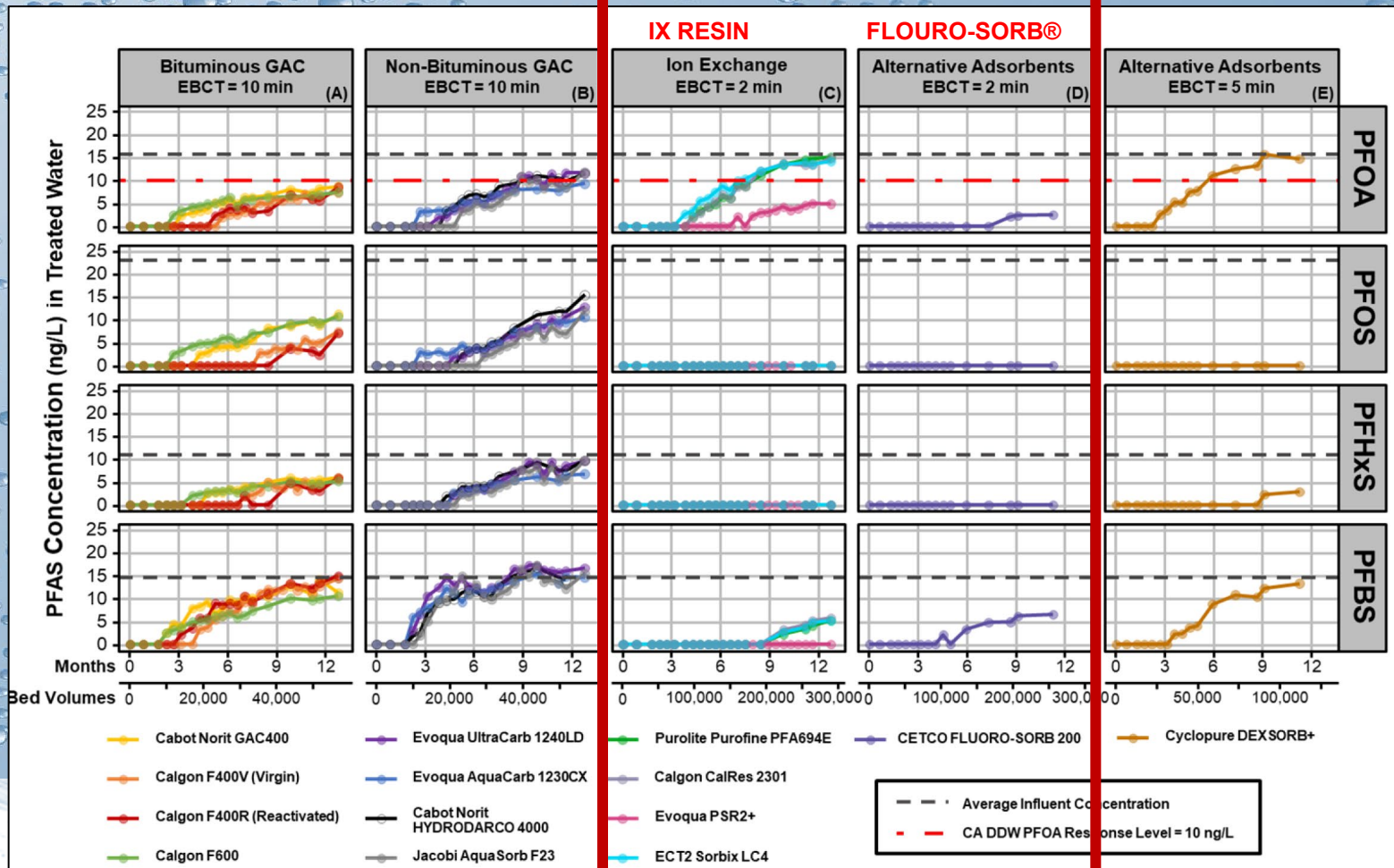


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Media Design Criteria Differences

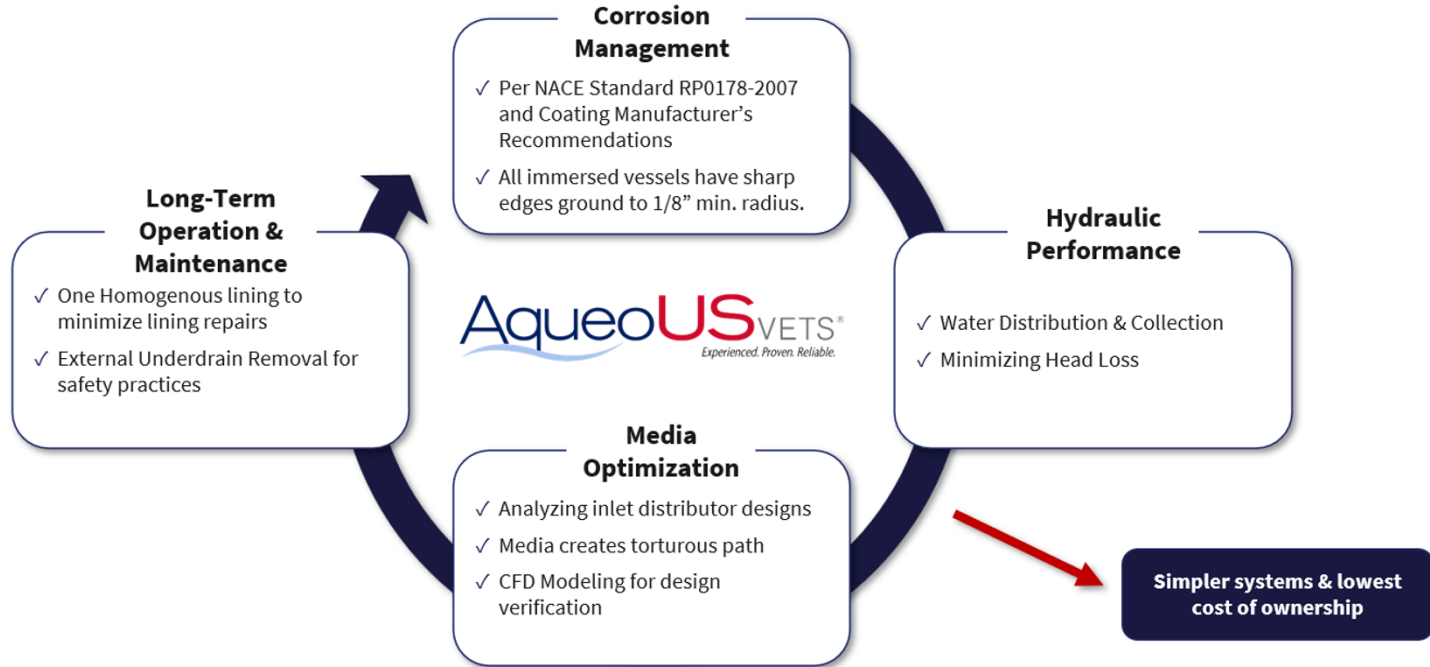
Each media is designed to difference Empty Bed Contact Times (EBCT) and Hydraulic Loading Rates.

Media Type	GAC	Ion Exchange Resin	CETCO Flouro-sorb
EBCT (minimum)	10 minutes	2 minutes	2 minutes
Hydraulic Loading Rate	$2 < X < 10$ gpm/ft ³	$6 < X < 18$ gpm/ft ³	$3 < X < 14$ gpm/ft ³ (Max. still unknown)
Start Up	Backwash	Pre-rinse *On or Off Site	Backwash

EXAMPLE: 25 MGD (17,361 gpm) Facility

Media Type	GAC	Ion Exchange Resin	CETCO Flouro-sorb
Number and Size of Lead-Lag System	17 – 12 ft. diameter	11 – 12 ft. diameter	11 – 12 ft. diameter
Side Shell Height	12 ft.	4 ft.	4 ft.
Volume per vessel	1,365 ft ³	420 ft ³ (min. bed depth)	420 ft ³

Four Tenets of Pressure Vessel Design



CapEx + Opex (media and energy) + Long Term Maintenance = Total Cost of Ownership

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Yorba Linda Water District PFAS Treatment Plant



District History

- Established in 1909
- 25,000 service accounts
- 9 groundwater wells
- 14 reservoirs
- 12 booster pump stations
- 4 imported water connections
- 25 MGD PFAS Water Treatment Plant



PFAS Treatment Plant Tours



Granulated Activated
Carbon
(GAC)

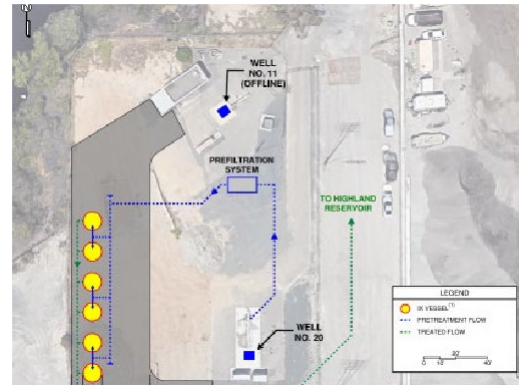
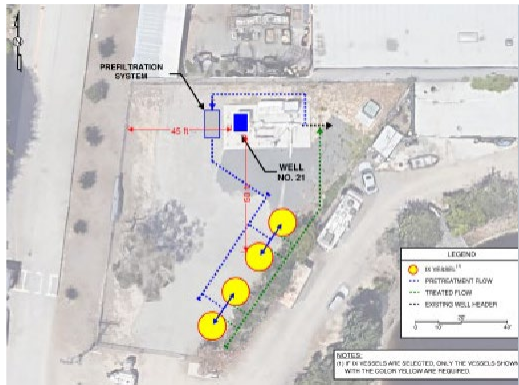
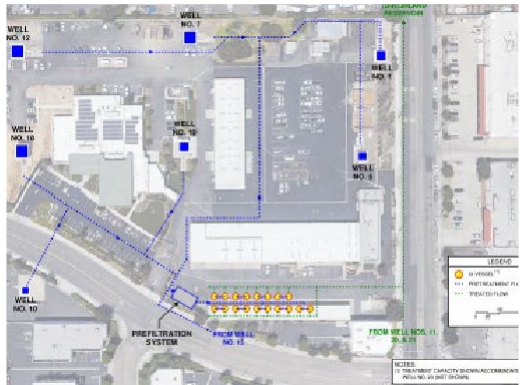


Membrane
(Reverse Osmosis or
Nanofiltration)

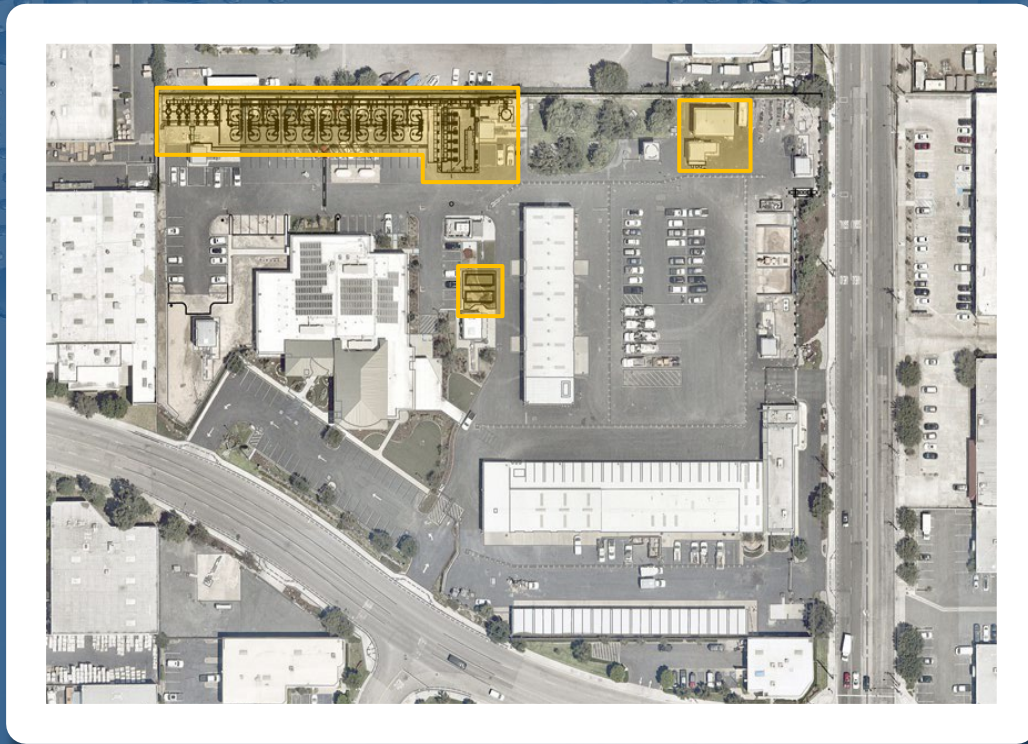


Ion Exchange
(IX)

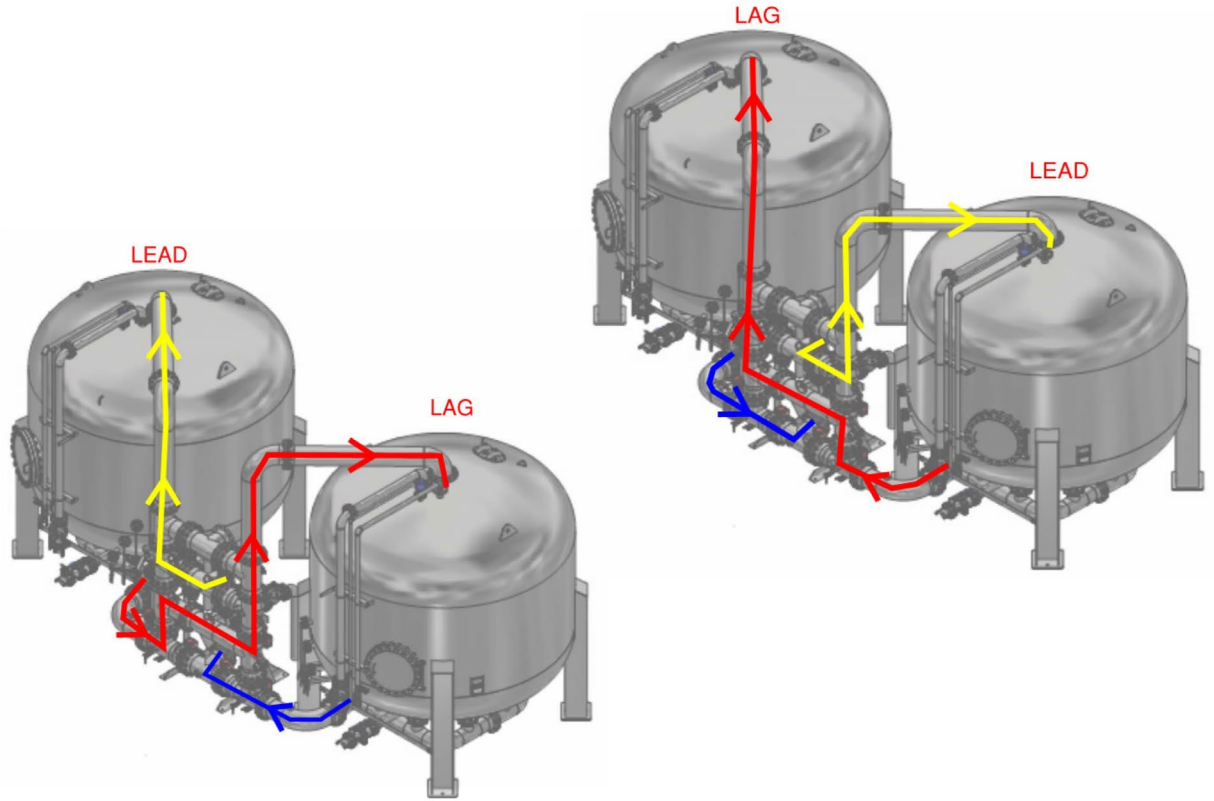
Option 1 – 3 PFAS Water Treatment Plants



Option 2 - Centralized Plant at YLWD Headquarters



Vessel Train Configuration (Lead/Lag)



PFAS Water Treatment Plant Schedule & Budget

Description	Dates
Design	May 2020 – February 2021
Construction	February 2021 – February 2022
Regulatory Approval	November 2021 (est.)
Resin Delivery (Staged)	December 2021 – February 2022
Substantial Completion (Serve Water)	December 2021
Project Completion	February 2022
Ribbon Cutting Celebration	Spring 2022 (est.)

**Total Capital Budget
\$27 million**

**Annual O&M Budget
\$150/Acre-ft**





**Yorba Linda
Water District**

Flyover of the PFAS Water Treatment Plant

Equipment	Details	Capacity
6 Pre-filters	Diameter: 6 ft Height: 8 ft-8 in	5 MGD ea. 40 Bag filters ea.(240 total)
11 IX Trains	22 Vessels Diameter: 12 ft Height: 14 ft 10 ³ / ₈ in	1.4 to 2.3 MGD each Train (14,000 gallons each vessel)
Resin for 22 Vessels	2 Minute EBCT per vessel	424 CF ea.
6 Vertical Turbine Booster Pumps, VFDs	100 Hp	5 MGD ea.
4 Surge Tanks -HQ -Well 20 -Well 21 -Future Well 22	<u>Headquarters</u> Diameter: 10 ft, Height: 19 ft <u>Wells</u> Diameter: 5 ft, Height: 13 ft-6 in	8,000 Gallons 1,000 Gallons ea.
2 (Level 2 Sound Attenuated) Generators	Length: 27 ft-6 in, Height: 11ft-6 in	1000 kW ea.
Chlorination Facilities Brine Tank 2 Hypochlorite Tanks 6 Water Softeners, 3 OSHG Trains	<u>Brine Tank</u> Diameter: 12 ft, Height: 15 ft - check <u>Hypochlorite Tanks</u> Diameter: 12 ft, Height 15 ft - check	12,690 Gallons - check ???? Gallons
Perimeter Wall	Length: 780 ft, Height: 8 ft	n/a

Construction Challenges

- Covid:
 - Labor shortage
 - Supply chain issues
 - Early submittals or equipment pre-purchase are essential
 - Increased construction costs
 - Long lead time for power and gas agency reviews
- Schedules – Delays cost \$
 - Frequent updates/ critical path items
- Conflicts with infrastructure
 - As-builts not accurate
- Geotechnical Investigation - Soils!
- Potholing
- Impact on Operations
 - Loss of gas/ electricity/ communications
 - Parking
 - Deliveries/ equipment
 - Staging area
- Operations impact on construction
- Vendors, contractors, consultants



Special Thanks to Our Team!

OCWD

Tetra Tech

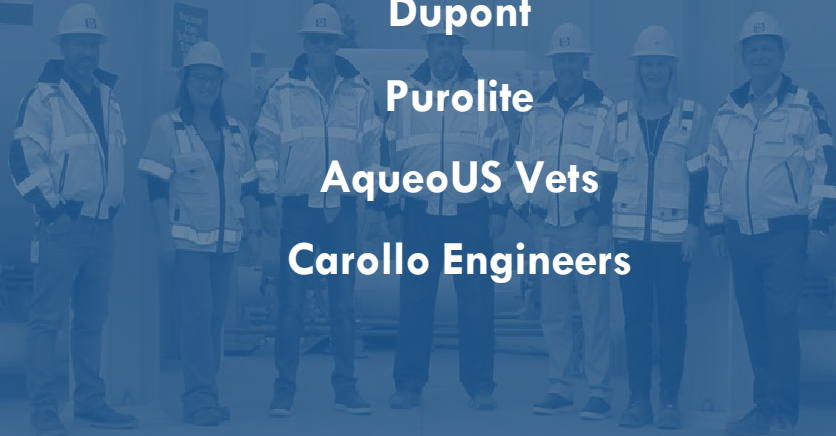
Pacific Hydrotech

Dupont

Purolite

AqueoUS Vets

Carollo Engineers



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Questions?

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