



Navigating the impact of  
the La Niña climate pattern  
on the removal of PFAS  
from landfill leachate  
in QLD, Australia

**PRESENTED BY ADAM FARAHANI**



# SciDev

A leading provider of water treatment solutions and chemical services

## What we do

- › Develop and deliver **tailored** permanent, temporary & mobile water treatment systems
- › Reduce waste, **OPEX costs** and minimise environmental risk

## How we do it

- › **Innovative** water treatment technology
- › Industry-leading toolkit of **PFAS treatment technology**.
- › **Build Own Operate** and **Design & Construct** commercial models

## Leading PFAS treatment technology—FluorofIX™

- › **Advanced Ion Exchange systems** capable of treated water for the **sum of PFAS to <0.2ng/L**
- › Capable of removing both **Short and Long chain PFAS**
- › **RegenIX™** SciDev's regenerable Ion-Exchange (IX) resin technology to reduce OPEX costs



## Markets

Water Treatment

PFAS Treatment

Infrastructure and Construction

Mining and Mineral Processing

Oil and Gas



# Contaminants and Discharge Criteria Limits

Analyte	Units	Criteria	Raw water sample
pH	-	6.5 - 8.5	7.83
Electrical	µS/cm	1,500	9060
Sulfate	mg/L	1,000	<10
Ammonia as N	µg/L	900	401000*
Total N	µg/L	500	403000*
Total P	µg/L	50	1830
TDS	mg/L	1,000	5890
TSS	mg/L	6	22
BOD	mg/L	15	55
COD	mg/L	40	872
Cr	µg/L	1	27
Fe	µg/L	300	7790
Mn	µg/L	1,900	693
Ni	µg/L	11	26
Zn	µg/L	8	133
Hydrocarbons (total)	mg/L	30	5.8**
PFOS	µg/L	0.00023	2.48
PFOA	µg/L	19	1.77

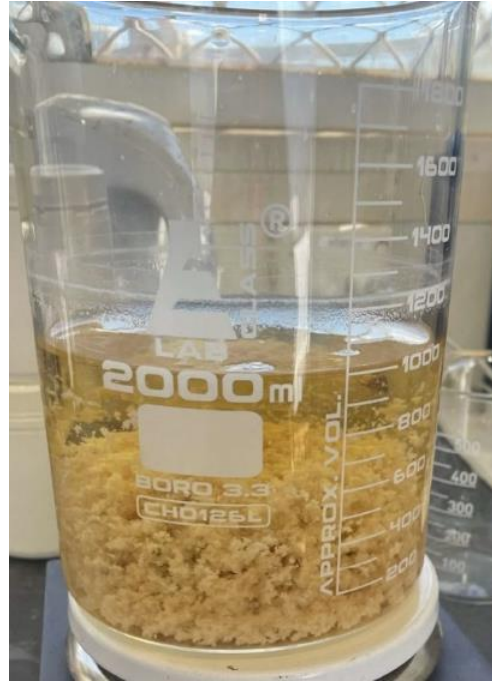
\* The ammonia level and total N increased to >800 mg/L later.

\*\* The level of organics also changed significantly later.



# Ammonia Removal

- › Low TDS discharge limit
- › Breakpoint chlorination (BPCI) was unsuitable
- › Powdered zeolite was cost-prohibitive and operationally impractical
- › Alkaline air stripping was against air pollution guidelines
- › Struvite precipitation was successful at pH ~9
- › A lamella plate separator with a conical-style bottom (50 to 60 degrees) was used as a clarifier



# Removal of Organics

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- › Powdered Activated Carbon (PAC) worked
- › Hydrocarbons, organics and long-chain PFAS molecules were targeted
- › The optimal adsorption happens at low pH
- › The optimal dose of PAC was found to be up to 5 g/L
- › PAC is hydrophobic, so PAC dosed as slurry
- › Two continuous stirred-tank reactors (CSTR) in series
- › A lamella plate separator with a conical-style bottom (50 to 60 degrees) was used as clarifier



# Physical Filtration and Adsorption

## Modified Zeolite media

- › Acid washed to increase the porosity
- › Works as a physical filter/clarifier
- › Also acts as a cation exchange unit

## Granular Activated Carbon (GAC) media:

- › Explicitly manufactured for water treatment
- › Targets long-chain PFAS molecules
- › Has the capacity for organic carbon reduction

## Glass media:

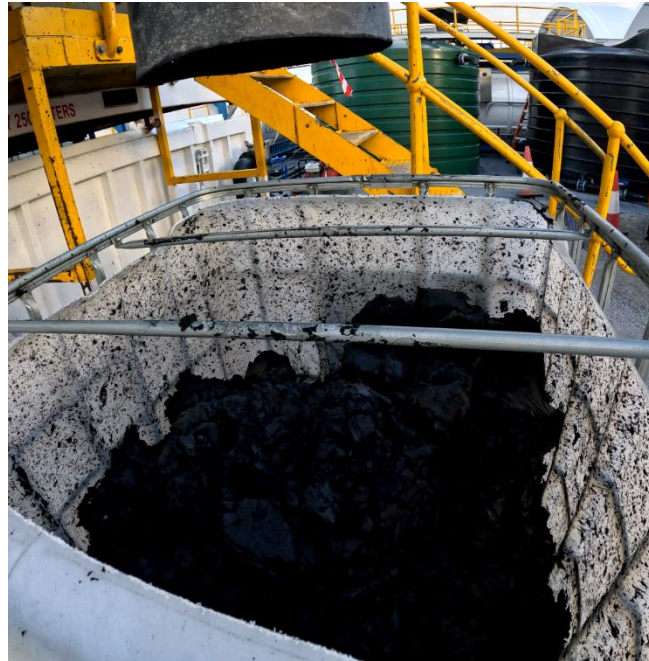
- › Filters down to the 1 NTU level
- › Is equipped with a UVT probe to detect organics



Media	BICARB (mg/L)	TOC (mg/L)	Turbidity (NTU)	UVT@2 54nm
ZEO_1	217	91	1.9	16.5
GAC_1	222	64	1.6	29.6
GI_1	221	66	1.4	28.9
GO_1	220	66	1.2	28.4

# Dewatering and Sludge Handling

- The sludge generated from the Struvite and PAC LPS go to different sludge-holding tank
- Dewatering with belt press or centrifuge once sludge levels have risen above 70%
- Additional coagulants and flocculants can be dosed inline if required
- When centrifuge processing, the centrate of each tank returns to its reactor to keep the pH stable
- The belt press remains on site as a backup for the centrifuge
- The dry cake and sludge are transferred into the solids bin for later removal and processing



# PFAS Treatment



> 7 billion litres treated to date



35 PFAS impacted sites remediated



First company to treat below the detectable limit of 0.2ng/L



First PFAS mobile treatment licence granted in NSW



First company in WA to treat and release in a drinking water catchment area



First company in VIC to continuously discharge to the environment

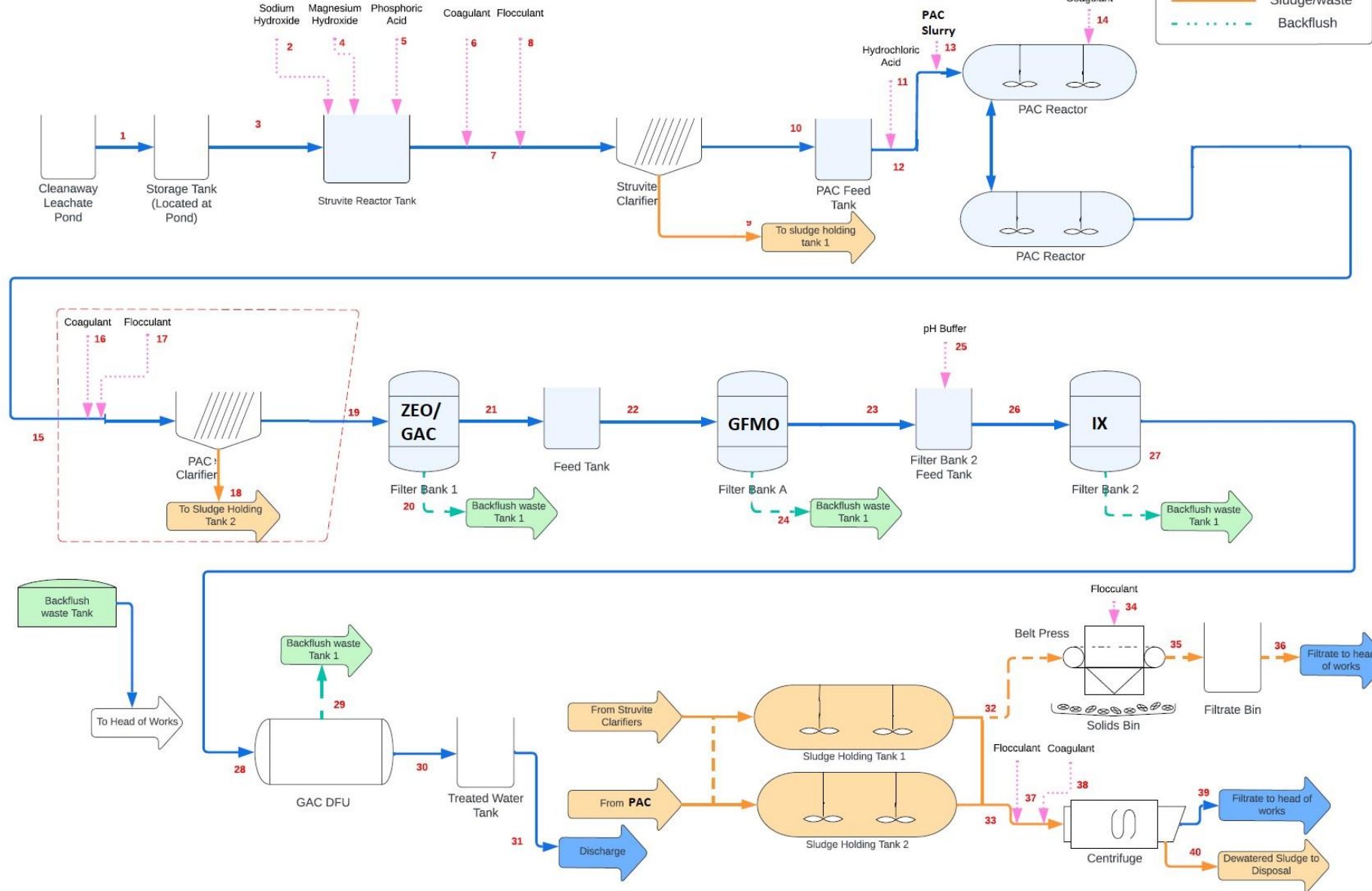
- Advanced Ion Exchange systems capable of treated water for the sum of PFAS to <math><0.2\text{ng/L}</math>
- Capable of removing both Short and Long chain PFAS
- RegenIX™ SciDev's regenerable Ion-Exchange (IX) resin technology to reduce OPEX costs

Factors affecting selection include:

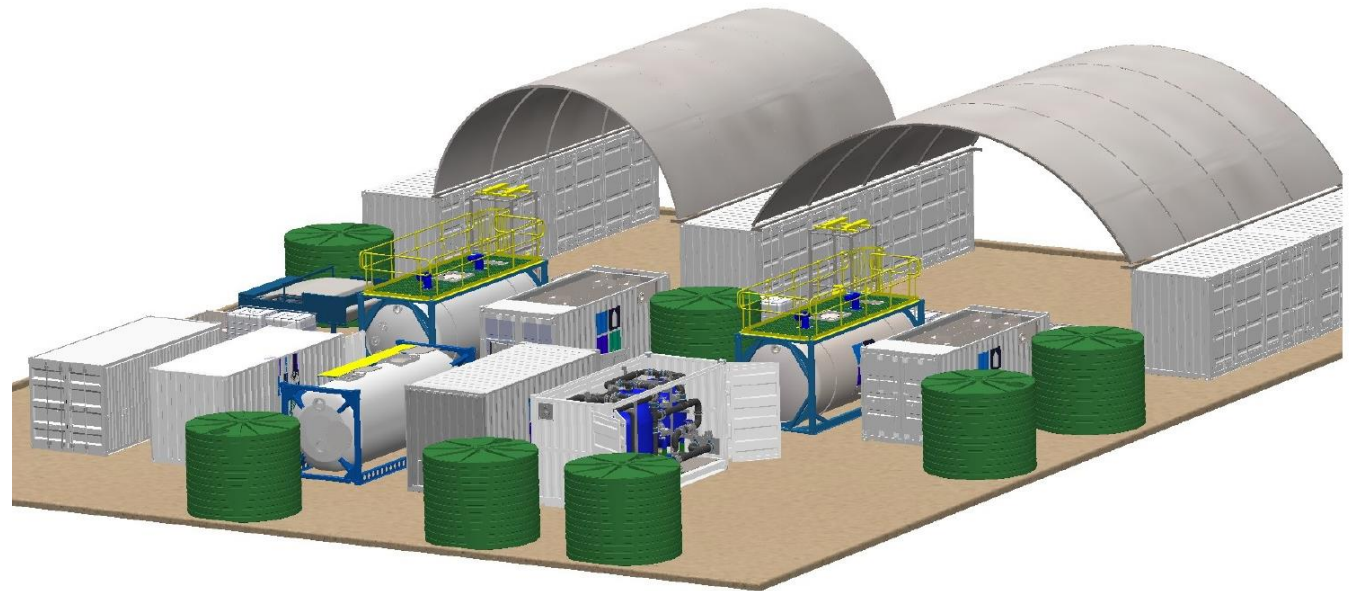
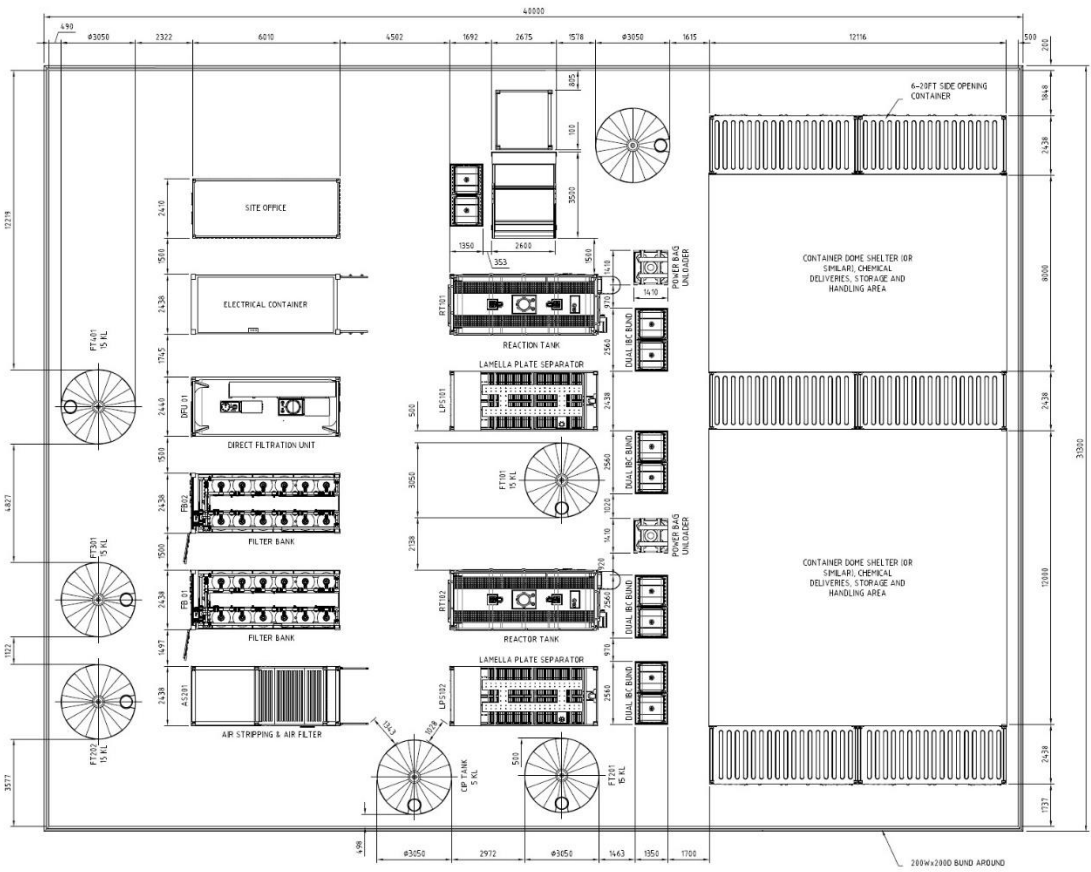
- Co-contaminates in the water
  - Options and costs for waste disposal
  - Capacity: Hydraulic and PFAS loading rates
  - Treated water quality requirements
  - Footprint limitations
  - Operator and automation requirements
- The ion exchange stage was designed to target the remaining shorter-chain PFAS compounds
  - Achieving treated water with ultra-trace (<math><2\text{ ng/L}</math>)
  - Direct filtration unit (DFU) filled with GAC for final polishing



# Process Flow Diagram



# General Arrangement and 3D Model of the Plant



NOTES:  
1. INDICATIVE FOOTPRINT: 4.0M x 31.3M = 1252M<sup>2</sup>

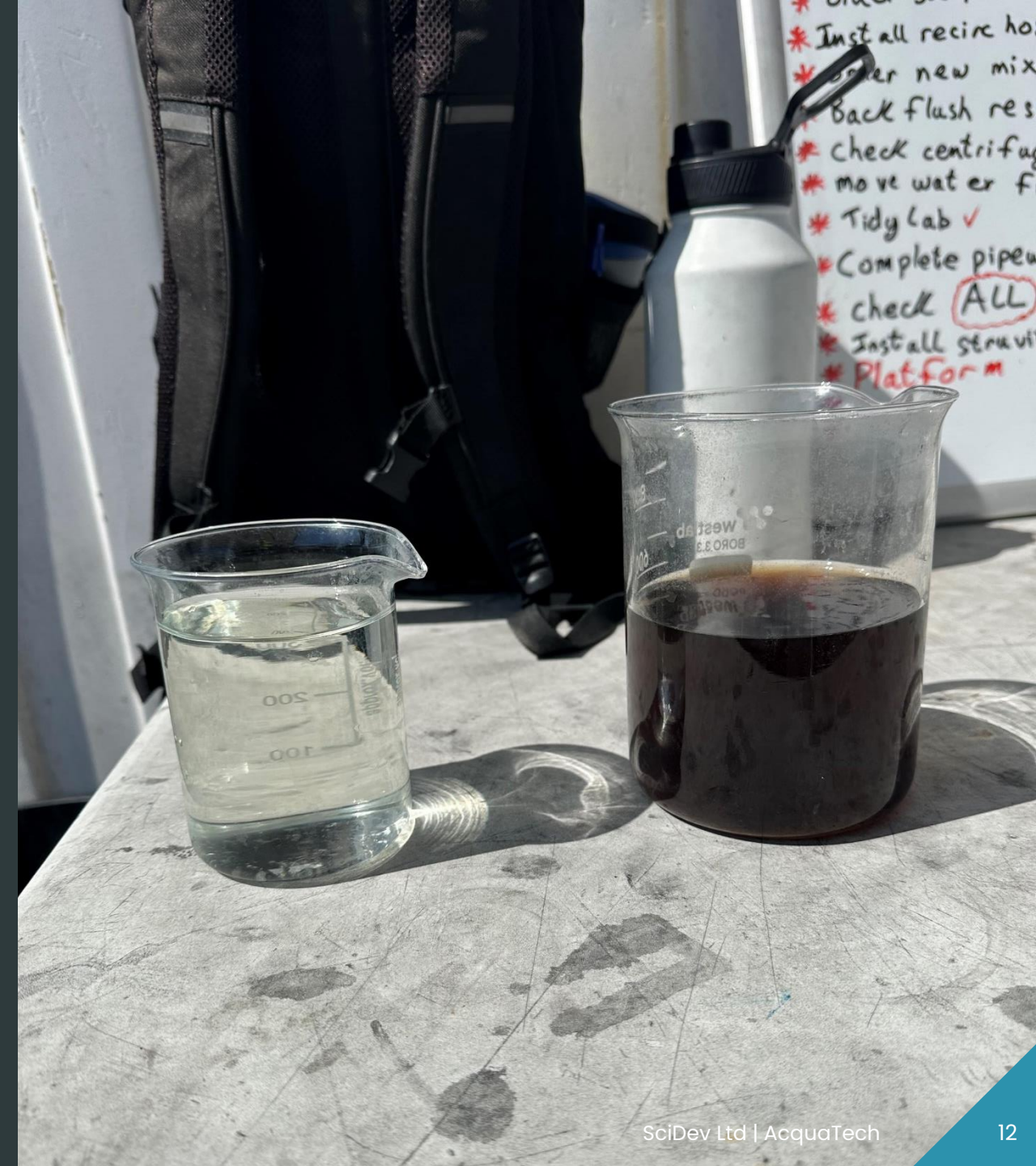
# Conclusion

## Challenges

- › Discharge TDS level
- › Complex chemistry
- › Multi-contaminant water system
- › Variable loads
- › Temperature Extremes
- › Modular design
- › Regulatory Compliance
- › Environmental Impact

## Achievements

- › 250 KL/day plant design
- › Robust design
- › Operationally Flexible design
- › Low-cost design
- › Successful effluent quality compliance
- › Health and Safety
- › Environmental Protection
- › Delivered on time



# Plant Delivered in 12 Weeks





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**Thank You!**

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