CASE STUDY #3

Katherine Gorge provides drinking water to the town of Katherine.

A PROBLEM WITH PFAS

PROJECT:
Pilot PFAS Water Treatment Plant

REGION:
Katherine, NT

STARTED:
October 2017

LEADER:
Skefos Tsoukalis

Following the detection of PFAS chemicals in the water, largely due to the past use of firefighting foams at the Royal Australian Air Force (RAAF) Tindal base, providing the community in Katherine with safe drinking water became a critical project.

By Martin Kovacs

The Northern Territory town of Katherine's pilot PFAS water treatment plant has been providing residents with safe drinking water for more than three years, with Power and Water Corporation using a leading-edge ion exchange resin technology to address contamination of the town's groundwater supply.

As explained by Water Services Manager Assets, Skefos Tsoukalis, Power and Water needed to overhaul its approach following the detection of PFAS chemicals, that resulted from the past use of firefighting foams at the RAAF's Tindal base, south of Katherine.

A 22-25km PFAS plume had been identified, and Katherine, which relies on both groundwater and surface water from Katherine River, was faced with the looming prospect of a significant supply

shortfall heading into its peak demand season towards the end of 2017. "We worked closely with the Department of Defence in developing a contingency plan," Tsoukalis says. "A one ML per day treatment plant was being constructed in Maine, which had been scheduled to go to the Oakey Air Force base, and we expedited its manufacture. All this occurred over August-September 2017, and we had a fully customised pilot plant – using a technology that had never been used before for potable water treatment – delivered and operational by October 2017."

CATERING TO SPECIFIC CONDITIONS

With the plant slated for a new destination, US-headquartered manufacturer ECT2 set about making a number of alterations, ensuring it would cater to Katherine's specific conditions.

"ECT2 needed to quite quickly look at the design and make a few changes to facilitate the new requirements," says Mark Kuffer, Project Delivery Manager.

"The plant was fabricated in the US and flown into Darwin via an Antonov aircraft, and then went by road from Darwin to Katherine. It was about eight weeks after the requirements changed that the plant arrived in Australia."

Kuffer says that, due to a high presence of calcium in the water, there was a requirement to add on a dosing system upfront, avoiding build-up or issues across the system.

He explains that the Katherine plant initially draws groundwater via a single extraction bore, which then undergoes pre-treatment processing, ensuring it is of a clean enough quality to then focus on the PFAS extraction.

"PFAS is notoriously difficult to extract from water," he explains. "We have a series of pre-treatment steps that knock out any other contaminants that might compete for the ion exchange sites on our ion exchange resin.

"These upfront steps remove things like total dissolved solids and total suspended solids, leaving the resin to do the bulk of the PFAS extraction. The water is ultimately treated through our SORBIX™ resin, which is the PFAS extraction powerhouse."

A NEW AND NOVEL APPROACH

Tsoukalis says that an innovative approach was required in Katherine, with there being little precedent for dealing with the impacts of PFAS contamination of a groundwater community supply source.

"The ion exchange resin was new and novel," he says. "It's the first time in the world that it's been used for solely treating groundwater to service the potable water needs of a community."

The plant uses two types of resins, with the SORBIX RePure resin regenerable via use of a solvent, removing PFAS from the vessel and resin beads, which is ultimately condensed down to a solid waste stream, while the single-use SORBIX Pure resin is treated as a solid waste stream from the site.

Power and Water has undertaken the regeneration process at the Katherine plant, with 60 per cent of the resin transported by Defence to the RAAF Tindal base, and the other 40 per ➤

KATHERINE IN KEY MILESTONES

OCTOBER 2017 – Installation of the one ML per day plant, producing 12.5L of drinking water per second.

JANUARY 2019 – With more than 400ML of groundwater having been treated, the resin is changed as part of routine maintenance.

JUNE 2020 – More than one billion litres (one gigalitre) of groundwater treated, with no waste streams discharged into the environment.

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>
> **Mark Kuffer, Project Delivery Manager, ECT2**

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THREE STAGES OF THE PFAS WATER TREATMENT PROCESS

STAGE 1

PRE-TREATMENT GROUNDWATER FILTERING, REMOVING ORGANIC MATTER, WITH AN ANTISCALANT THEN ADDED.

STAGE 2

THE WATER IS PASSED THROUGH A SERIES OF FILTERS CONTAINING THE ION EXCHANGE RESIN, REMOVING PFAS FROM THE WATER.

STAGE 3

THE FILTERED WATER IS MIXED WITH TREATED KATHERINE RIVER WATER (90 PER CENT RIVER WATER AND 10 PER CENT GROUNDWATER), WITH SMALL AMOUNTS OF CHLORINE ADDED.

cent transported interstate for destruction.

Tsoukalis notes that waste streams had been a strong area of focus ahead of the plant's installation, however he points to its small waste footprint during the course of its operations.

"To date, the plant has not discharged any waste streams into the environment," he explains. "That's something that's unheard of when it comes to any type of treatment technology that involves direct filtration."

> *"We took a leap of faith with the pilot treatment plant – we didn't know it would be the success it has been.*
>
> **Jane Dellow, Strategic Communications, Power and Water Corp**

RELYING ON THE COMMUNITY

With the plant's one megalitre (ML) per day capacity covering a small portion of the potential supply shortfall being faced by Katherine, Power and Water also needed to embark other measures to ensure the continuity of water services. This included significant demand mitigation, with Power and Water's Living Water Smart team undertaking extensive community engagement, including auditing for leak detection and providing rebates to assist with repairs.

Against this backdrop, Jane Dellow, Strategic Communications and Engagement, points to the importance of both reassuring and educating the community, with initiatives including community workshops conducted in conjunction with Defence.

"There wasn't a lot of trust because of the way the whole situation had occurred, and that was obviously a big concern for us," Dellow says. "Part of our strategy was very much focused on engaging our own people to build trust within the community that the technology was working and that the water supply was safe, as they're part of the community as well."

This community partnership has seen a reduction in peak demand from 15ML to less than 10ML per day, with Power and Water and Defence now preparing for the commissioning of a new permanent plant later this year.

BUILDING A NEW PLANT

Senior Project Manager, Liam Early, says that the new plant – which uses the same ECT2 technology – will process 10ML per day, making it the largest PFAS treatment plant in Australia.

Based on 30-year planning, the plant is designed to account for Katherine's growth, and includes a spare train, with all three trains capable of processing 15ML per day.

"The plant's being built as an industrial plant, in a robust building designed for the Northern Territory climate," Early advises. "It has overhead cranes to facilitate the removal of the vessels in an expeditious way, and those vessels will then go to Tindal to recharge the media."

As noted by Dellow, it has been a difficult few years for Katherine, however the measures implemented in response have been paying off. "We took a leap of faith with the pilot treatment plant – we didn't know it would be the success it has been," she says. "The level of community concern is not there so much anymore – the turnaround has been quite phenomenal."