ENG417 Sustainability

Shane Reynolds

Role Play 1: PFAS Contamination of the groundwater around Katherine, NT

Background

The residents of Katherine, NT have experienced perfluorooctanesulphonic acid (PFOS) and perfluorooctanoic acid (PFOA) contamination, as a result of fire fighting activities on the local RAAF base at Tindall, of the local aquifier and Katherine River from which the town drinking water supply is drawn. As a result, water treatment measures have had to be implemented at considerable cost. There is now no PFAS detectable at levels exceeding Australian Drinking Water Guidelines. Investigate alternative water supply from the perspective of a town resident, given that the alternative source may need to continue providing water for up to two years.

Has the water supply actually been contaminated?

- Aqueous film-forming foam (AFFF) is a fire-fighting foam containing PFAS compounds that was used at the RAAF Tindal base for approximately 16 years, since 1988. [1]
- PFAS has been shown to leave the base via surface water run-off to Tindal creek. [2]
- Contamination also occurred due to PFAS leaching from soils on the Tindal base to the underlying Tindal Aquifier. [3]
- Tests have been found PFAS in the Katherine River down-stream to the Sturt Highway, and in bore supplied by ground waters.
- The town water supply draws 90% of it's water from the Katherine River, and 10% of it's water from bore water, as shown in Figure 1. [4]
- It is reasonable to conclude that the town's water supply has experienced some PFAS contamination.

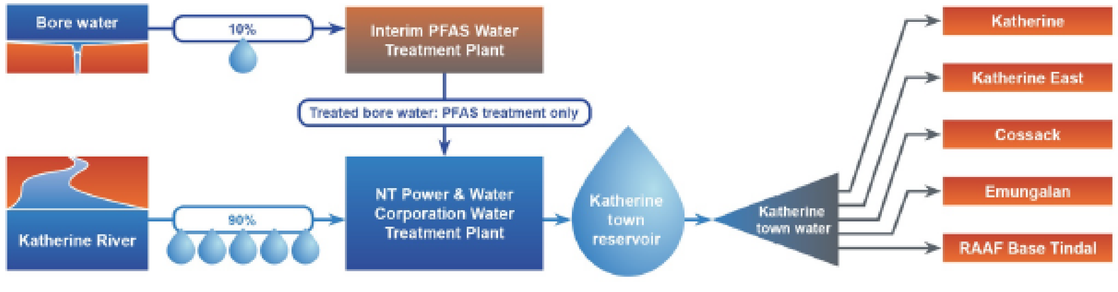

Figure 1:Katherine's water supply is made up of both water from the Katherine River and from bore water drawn from the Tindal Aquifer

Are residents really at risk?

- PFOA has been reported to be associated with thyroid disease and higher levels of cholesterol and uric acid in multiple human studies, and there is some evidence for an association between PFOA and elevation of liver enzymes, and testicular and renal cancers. [5]
- Routine testing by NT Water and Power Corporation uncovered levels of PFAS that exceeded the Health Guidance Values in bore water supplies. Levels of PFAS had also been detected in the Katherine river. [6]
- These elevated levels were spikes, and NT and federal health authorities have confirmed that Katherine town water is safe to drink since the monthly average PFAS levels remain below the Health Based Guidance Values. [2]

Argument Summary

Australian Government activities on RAAF Tindal led to release of PFAS into the water supply at Katherine. Recent monitoring from NT and federal government report PFAS levels in the water supply below the maximum allowable amounts, however, additional assurance to resident safety was provided by filtering using interim water treatment plant. Currently, there is a supply shortfall being managed with water restrictions. Town residents should lobby for rainwater harvesting infrastructure to be installed on houses to address the shortfall. Managed by local tradesmen, this would see a surge in economic activity, and leave the region with increased water storage capacity readying it for forecast economic growth.

What actions have been taken to mitigate risks posed?

- PFAS is likely to persist in bore water, due to chemical stability - it is strong, heat resistant and durable in the environment [8]. Interim water treatment plant was implemented to filter bore water prior to mixing with Katherine River supply. [4]

Alternative water supplies needed?

- Katherine experiences wet and dry seasons. Wet seasons are characterised by high rainfall, and dry seasons see little to no rainfall, as shown in Figure 2.
- During the dry season, Katherine draws on water from the Katherine River, but tops this up with bore water. [7]
- Bore water now has to pass through the interim filter and full demand during the dry cannot be met - water restrictions have been imposed to ensure water reserves are not exhausted. [4]
- Government mishap has impinged resident freedoms to enjoy existing water supplies. Whilst there may not be factual reasons for finding alternative water supplies, there are emotive ones.

What are the most desirable alternative water supplies for a resident?

- Government has responsibility to restore Katherine's water supply in both the short, and long term.
- In the short term government has three options to address the water supply shortfall: bring it in by truck, set up additional filtering equipment, or provide the community with rainwater harvesting infrastructure. [9]
- Providing town residents with rainwater harvesting infrastructure, installed by local tradesmen, would provide a small surge in economic activity which would be good for Katherine. [10]
- Additionally, when the PFAS is eventually removed from towns aquifers the town will retain the rain water harvesting infrastructures [10]. The other two options yield no such ongoing benefits.
- The additional water stored in the rainwater tanks will allow the community to expand beyond current restrictions, which may be important given that there is proposed economic expansion for the region.

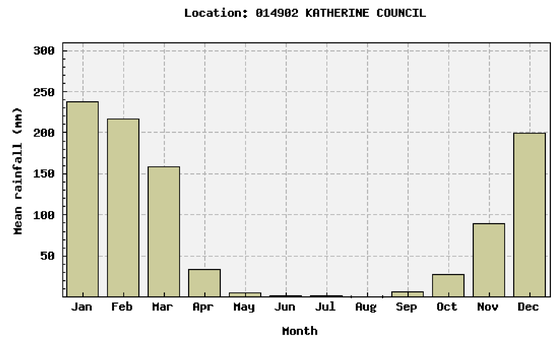

Figure 2:Katherine's mean rainfall (mm) for years 1873 to 2018

References

[1] C. McLennan.
PFAS cleanup work to begin at Tindal.
Katherine Times, 2018.

[2] S. Richards and I. Newby.
Human Health Risk Assessment (HHRA) for PFAS.
Coffey, 2018.

[3] Department of Defence.
RAAF Base Tindal - Katherine Community Update.
Australian Government, 2018.

[4] Department of Defence.
Katherine Town Water and Interim PFAS Water Treatment Plant Update.
Australian Government, 2018.

[5] Raymond M. Blackowicz M. Liu Y. Thompson B. Anderson H. Turyk M. Christensen, K.
Perfluoroalkyl substances and fish consumption.
Elsevier, 2017.

[6] S. Richards and I. Newby.
Detailed Site Investigation - Per- and Poly-fluoroalkyl Substances (PFAS).
Coffey, 2018.

[7] Bureau of Meteorology.
Climate statistics for Australian locations.
Australian Government, 2018.

[8] Davis K. Bartlett, S.
Evaluating PFAS cross contamination issues.
Wiley, 2017.

[9] Alves R. Dias T. Azevedo, E. and J. Molozzi.
How do people gain access to water resources in the Brazilian semiarid in times of climate change?
Springer, 2017.

[10] N. Pelak and A. Porporato.
Sizing a rainwater harvesting cistern by minimizing costs.
Elsevier, 2016.