Belubula River water sampling 4 July 2024: Summary of results

Foam in the Belubula River

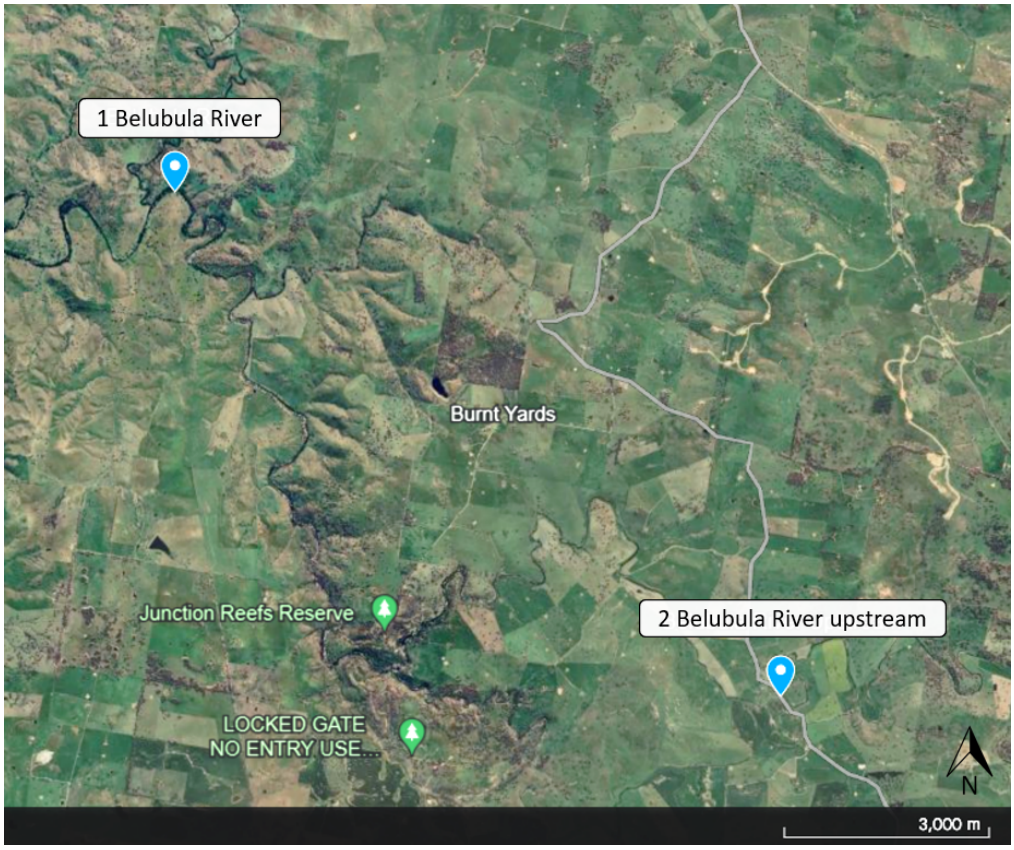
On 4 July 2024, NSW EPA officers collected water samples from the Belubula River in response to community reports of foam in the river, including potential PFAS contamination of the Belubula River catchment.

Three samples were collected from:

- Site 1 – Foam/water mixture supplied in an esky by a community member
- Site 1 – Belubula River at the location at which the community member said they had collected the foam in an esky. This location is just upstream of where the Cadiangullong Creek flows into the Belubula River.
- Site 2 – Upstream on the Belubula River at Burnt Yards Rd bridge, Mandurama. This is about 18 km upstream of Site 1. This sample location was chosen as it is generally representative of the upstream water quality.

The samples were submitted to the NSW Environmental Forensics laboratory for surfactant and PFAS testing.

Figure 1 Sampling locations on the Belubula River



Foam and chemical contamination in waterways

Foams can occur naturally or be caused by synthetic chemicals. Natural and synthetic foams look different, but they can both collect and concentrate chemicals from the surrounding water, including chemical contaminants. Due to this behaviour, chemical levels in foam can be significantly higher than in the surrounding water.

It is not unusual to find foam in water bodies. Foam is produced by 'surfactant' chemicals that produce a thin film floating on the water surface. When this film is agitated by waves, strong currents or wind, the surfactant molecules trap small bubbles, producing foam. There are four types of surfactants: cationic, anionic, nonionic and amphoteric. Surfactant chemicals can be natural or synthetic.

Naturally occurring surfactants are a by-product of the breakdown of decaying natural material such as leaves and algae. The foam that occurs as a result of these natural surfactants can start off white in colour but then becomes brown or tan coloured as it collects sediment and organic matter. These natural foams are often seen on windy days or following heavy rain and can persist for some time, gradually disintegrating and disseminating in the surrounding waterway.

Not all foams are naturally occurring. Synthetic surfactants such as detergents, shampoos and weed killer can be introduced to water bodies by accident or as a result of a pollution incident. Synthetic foams will generally stay bright white in colour. They will often break down faster in the water than natural foam and are likely to appear close to the original source. Natural foams are typically harmless but synthetic foams can be harmful to aquatic life.

Chemical contamination in a foam does not necessarily mean that the foam itself is synthetic. EPA analysis of the type of foam (natural or synthetic) considers the known ability for both natural and synthetic foams to concentrate chemicals. High levels of a chemical in a foam are also not considered to be an indication of the level of contamination in the surrounding environment, due to this known behaviour. Higher levels of a chemical contaminant in a foam compared to the level in the surrounding water, does not necessarily result in additional risk to human health, if contact is avoided.

Test results

PFAS was detected, including PFOS, PFHxS and PFOA, but not at concentrations expected for a foam based on these chemicals. The PFAS compounds that were analysed are anionic surfactants. The concentrated foam sample had 3000 µg/L anionic surfactants, with a corresponding 36 µg/L PFAS. The presence of non-anionic and cationic surfactants confirms that the foam is probably coming from some other source containing a mixture of surfactants.

PFOS was detected in the Belubula River above the ecological water quality guideline, with the highest concentration (0.071 µg/L) measured in the water sample collected at the site of the observed foam. PFOS was also detected above the ecological water quality guideline in the upstream sample but at a lower concentration (0.013 µg/L).

There are no livestock and irrigation water guidelines for PFAS. The presence of PFOS in water samples does not necessarily mean there is a risk to human health or livestock.

The sample collected from the esky was a concentrated sample of the collapsed foam mixture, not representative of the Belubula river and therefore not appropriate to compare with water quality guidelines. The properties of PFAS make it accumulate in foam and therefore the higher concentration of PFAS measured in the foam sample is expected.

Results of PFOS, PFOA and PFHxS, total anionic, non-ionic and cationic surfactants are tabulated below. The NSW Environmental Forensics laboratory is working on identifying the surfactants in the samples.

Table 1 Sampling results

Analyte (µg/L)	Ecological water quality guideline[1]	Site 1 Esky/foam/water	Site 1 Belubula River	Site 2 Belubula River U/S
PFHxS	-	0.089	0.0030	0.0043
PFOS	0.00023	36	**0.071**	**0.013**
PFOA	19	0.052	0.0008	0.0008
Anionic surfactants	-	3000	<100	<100
Non-ionic surfactants	-	2000	<100	<100
Cationic surfactants	-	3000	400	300

Figure 2 Site 1 on day of sampling – Belubula River at the location a community member collected foam in an esky, just upstream of the Cadiangullong Creek confluence

Figure 3 Site 2 on day of sampling – upstream on the Belubula River at Burnt Yards Rd bridge, Mandurama, which is about 18 km upstream of Site 1

What happens next?

This sampling provides a snapshot of water quality at a point in time and does not capture variability over time, limiting how the data is interpreted and the conclusions that can be drawn.

We have begun a catchment-wide sampling program of the upper Belubula River to further investigate the potential source of the anionic surfactants and PFAS, and we will provide ongoing updates to the community as new data becomes available. If any situation involving the water quality changes, the EPA will immediately inform the community.

References

[1] PFAS NEMP 2.0 (2020), National Environmental Management Plan Version 2.0, Heads of EPA Australia and New Zealand. Available at https://www.dcceew.gov.au/environment/protection/publications/pfas-nemp-2

NSW Environment Protection Authority
Email: info@epa.nsw.gov.au
Website: www.epa.nsw.gov.au
EPA 2024P4538
August 2024