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Independent water quality assessment - Understanding Lake Enterprise science

About Trop Water

Trop Water Pty Ltd is a Northern Territory owned and operated independent scientific and technical consultancy based in Darwin. Our services cover scientific assessment, advice and associated technical services relating to water quality (e.g. monitoring), water quantity, and hydrodynamic/water quality modelling. Trop Water operates as the successor to Tropical Water Solutions, giving us a continuous service history in the Northern Territory since 2001.

Power and Water engaged Trop Water to provide independent scientific advice to support informed decision-making, including water quality testing and identifying potential risks.

Our assessment is based on 6 years of water quality monitoring, historical data (mid 1990s) and comparison against the Australian Drinking Water Guidelines (ADWG).

Why this assessment was undertaken

Pine Creek currently relies on groundwater bores for its drinking water supply. During the late dry season these bores can come under increasing pressure as groundwater levels decline.

Lake Enterprise has been investigated as a potential supplementary water source to reduce pressure on the borefield during the late dry season.

Lake Enterprise is the former open-cut mine and is not a tailings storage facility.

Our assessment looked at whether the lake could safely provide an additional source of drinking water and what safeguards would be needed.

What our monitoring and assessment found

Water quality at 2 metres below the surface was assessed against the ADWG. Most parameters met guideline values throughout the monitoring period. With appropriate operation controls and ongoing monitoring, water supplied to Pine Creek would meet the ADWG. On this basis, Lake Enterprise is considered a suitable supplementary water source.

Our assessment found that water quality can be effectively managed using standard water treatment processes together with management of when and how water is extracted.

Our key findings:

- **Seasonal changes.** After significant wet-season rainfall, we recorded short-term increases in turbidity (a measure of suspended fine particles), iron, aluminium and bacterial indicators. These changes are common in surface water bodies and are managed through extraction management and normal water treatment processes (similar to Darwin River Reservoir).
- **Manganese.** Is the main water quality concern. Elevated levels can be managed through operational controls. Levels can also increase after the wet season when the lake water column naturally mixes. Concentration can be managed by blending groundwater.

- **Naturally occurring sulphide rock.** Is present within the walls of the former mine, approximately 15 to 35 metres below the water surface. If exposed to air, this rock can produce acid leachate. The proposed water extraction would not draw the water level lower than 4.8 metres, ensuring these rock layers remain (10 metre buffer) underwater where they produce acid at much slower rates.
- **Lake Enterprise has also shown a natural capacity to neutralise acid.** This is due to the biological alkalinity cap in the water's surface layer (aquatic biota such as plants and algae). As a result, pH has trended from slightly acid to neutral over the past 3 decades.

How water quality can be managed

If Lake Enterprise becomes part of Pine Creek's drinking water supply, several safeguards are recommended:

- **Using Enterprise Lake at the right time of year.** Water could mainly be used during the late dry season and build-up (August to December), when groundwater supplies are under the most pressure and lake water quality is typically at its best.
- **Blending with groundwater.** Water from Lake Enterprise should be blended with existing groundwater to ensure manganese levels meet the Australian Drinking Water Guidelines value. This will be managed and informed by monitoring manganese levels.
- **Extracting only surface water.** Water should only be taken from the upper layers of the lake in the 'epilimnion'. This water is well oxygenated, which keeps iron and manganese in insoluble (cannot dissolve) forms that sink to the bottom, so water quality is generally of a higher quality. These exact operational controls are also in place at Darwin River Reservoir.
- **Monitoring.** Routine and non-routine water quality monitoring should continue throughout operation. Monitoring results would inform operational decisions to ensure drinking water continues to meet Australian Drinking Water Guidelines compliance.

Continued independent monitoring

If approved as a supplementary drinking water source, ongoing monitoring would continue to confirm water quality remains suitable and to support safe operation of the water supply.

Power and Water is responsible for planning, constructing and operating Pine Creek's water supply.

