ACARP matters because it

# supports innovative management of acid mine lakes

A major legacy of open cut coal mining is large pits that ideally need to be backfilled. However, backfill is not always possible or desirable. When this happens, they sometimes become mine lakes due to groundwater and surface inflows filling them up. Depending on the geology of rocks and minerals surrounding the lakes, water can become acidic with elevated concentrations of toxic metals/metalloids.

There is limited data on mine lake remediation world-wide and particularly in Australia.

In the absence of effective alternatives to high-cost, long-term (often in perpetuity), “active remediation” involving lime dosing, mine lakes are likely to remain biologically sterile, hazardous to recreational users and to wildlife, and unable to be used in industry or agriculture/aquaculture for many decades.

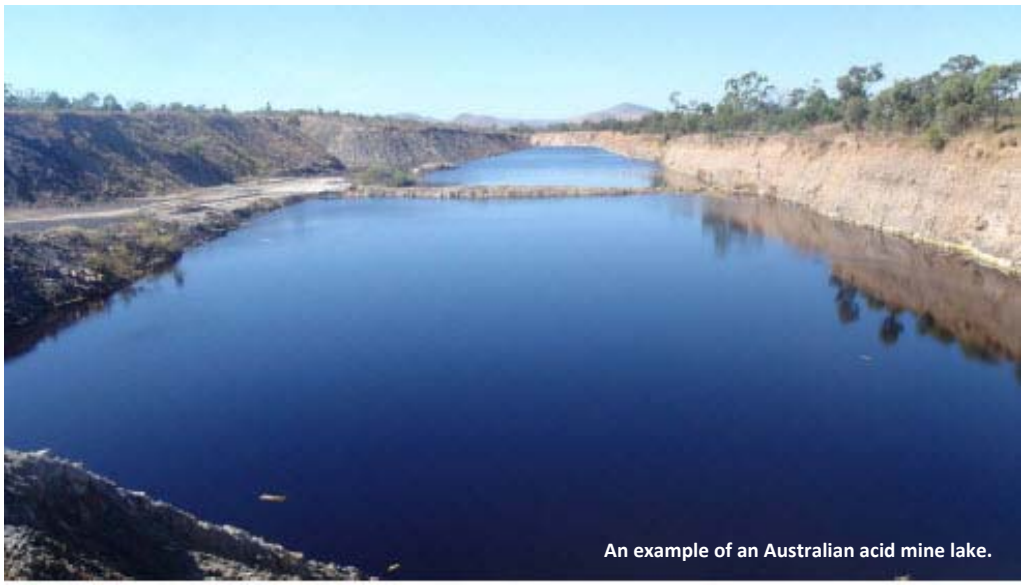
Australian state governments are becoming increasingly reluctant to accept mine closure plans and to authorise the relinquishment of rehabilitated mine areas back to the Crown when there is some risk of ongoing acid mine drainage.

## Industry target

- Understand the behaviour of mine lake water over time
- Develop test protocols to characterise mine lake water
- Find low-cost remediation solutions for acid mine lakes
- Develop practical approaches to mine closure where pit lakes are involved.

## Industry investment

- ACARP: $986,000, plus industry funding.



An example of an Australian acid mine lake.

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## Results

- Development of a mine lake water quality model to predict short-term and long-term water behaviour
- Development of a suite of bioassay test protocols and test species which can estimate the aggregate toxicity of all constituents in water for a wide spectrum of aquatic organisms
- Innovative, low-cost cylindrical and conical fluidised limestone reactors were developed, installed and trialled at two Western Australian mines. They increased pH and removed iron and aluminium. However, further testing was required to overcome scaling-up design issues.
- Bioremediation trials at Collinsville using sewage sludge showed strong potential to treat acid mine lakes. The research found that this technology was promising but still needed further development and was likely to need to be tailored to individual sites
- The use of nutrient additions (such as those from aquaculture) to stimulate biodiversity in pit lakes and use this to provide other criteria for closure in addition to water quality
- Determined that catchments around mine lakes were much more important to maintaining water quality and developing biodiversity than previously understood.

## Return on investment

- Reduction of future liability associated with mine closure for sites with acid mine lakes
- Increased stakeholder (local communities and regional EPA regulatory staff) trust in mining companies' commitment to managing acidic mine water.