Rehabilitation concept: interconnected pit lake

Introduction to rehabilitation concepts for mine voids

Rehabilitation concepts for stabilising mine pits in the Latrobe Valley have been explored by both government and declared mine licensees. This fact sheet series focuses on general rehabilitation concepts noting that each mine site must develop a site-specific plan (called a Declared Mine Rehabilitation Plan) for community consultation and regulatory approval. Under *the Mineral Resources (Sustainable Development) Act 1990*, the sites must be left safe, stable and sustainable. Key hazards addressed by these concepts are detailed in the MLRA Key Hazards fact sheet series, with terminology specific to mine rehabilitation in Victoria defined in the MLRA Vocabulary (updated regularly).

The rehabilitation concepts discussed in this series include dry void, partial lake, full lake, and full lake interconnected.

Once sites are safe, stable, and sustainable, future land uses can be determined. The responsibility for implementing these uses will likely be shared among multiple stakeholders, including state and local governments, licensees, and the private sector, with input from the community and Traditional Owners.

After mining operations conclude, the site transitions into the closure and rehabilitation phase. Final landforms are designed to mitigate long-term hazards such as block slides, floor heave and fire. Licensees are required to conduct technical studies, evaluate risks and outline mitigation measures to address any identified issues with the proposed end landform.

Findings to date

The Hazelwood Mine Fire Inquiry (HMFI) considered six rehabilitation approaches. The Board of Inquiry was persuaded by the expert evidence provided at the time that a waterbody-based option was the most viable rehabilitation approach for each void.This finding was based on the ongoing risks of fire and instability that would need to be managed after mining ceased.

Rehabilitation concept: interconnected pit lake

An interconnected pit lake would function similarly to a pit lake (see Full Pit Lake fact sheet). However, it would include connections to existing watercourses, enabling controlled inflow and outflow. These connections would be supported by engineered structures designed to manage water flows effectively.

An interconnected pit lake over the long term

We live in an ever changing natural and social environment. A full pit lake interconnected with a river is influenced by natural and human changes, such as erosion, water quality and land use changes, which may require ongoing management and maintenance (Figure 1).

Long-term management of an interconnected pit lake would be similar to that of a full pit lake with additional considerations such as managing structures for the river flows and other requirements.

Examples of interconnected pit lakes

The concept of interconnected pit lakes as a final rehabilitated landform has been explored in other parts of the world. McCullough et al. (2023) in their study titled *Engineered river flow-through to improve mine pit lake and river values* examine the risks and opportunities associated with this approach.

Any mine licensee considering interconnected pit lakes as a final landform must identify and mitigate risk as far as reasonably practicable. These risks and opportunities will vary based on the mine site in question and will also need to include consideration of the potential impacts downstream (e.g. on agriculture and other river / lake systems).

There are a number of interconnected pit lakes in Australia and around the world. Lake Kepwari, Western Australia, a former coal mine now flooded and unintentionally connected to the local river system, highlights benefits, challenges and significant impacts associated with such transformations. This example demonstrates improved water quality within the lake itself. However, the interconnection has altered water chemistry and hydrology in the downstream river. Prolonged droughts could exacerbate these impacts by delaying or reducing river inflows, affecting water quality and decreasing downstream flow. McCullough et al. (2023) suggest that planned interconnection with river systems offers an opportunity for better risk management, potentially mitigating downstream effects.

As part of the final landform design for rehabilitation, mine licensees should consider drought periods, potential changes in water quality and other risks (such as to downstream hydrology and alterations to sediment loads) to maintain downstream flows to protect ecosystems. This may involve halting pit inflows or implementing alternative measures to ensure sufficient water downstream. To manage these risks, these systems could rely on engineered structures to control water flows, and other measures, necessitating regular monitoring and upkeep. Monitoring and maintenance activities will still be required. Some of these activities may include but are not limited to vegetation cover maintenance and water level and water quality management.

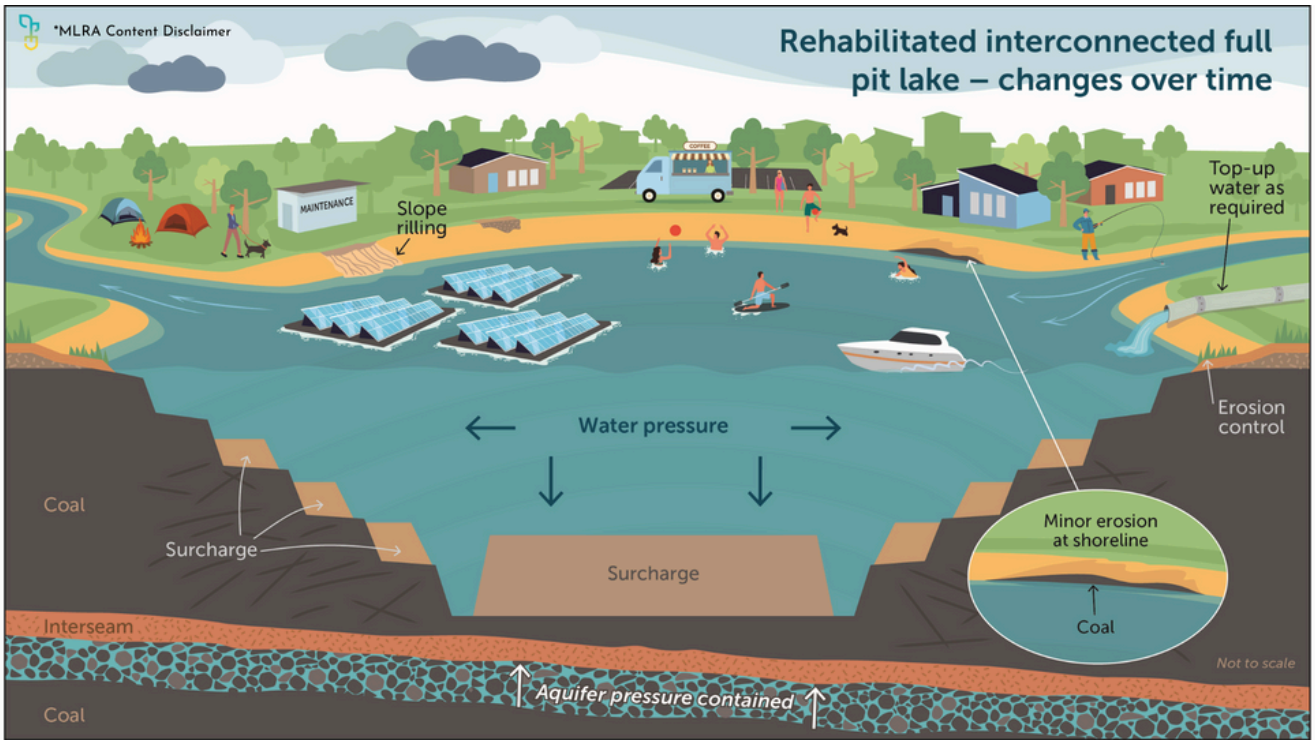

Figure 1: Potential end land uses for illustrative purposes only; significant studies would be required to confirm feasibility.

If you're reading a printed copy, you can find all hyperlinks by visiting www.mineland.vic.gov.au and searching for the relevant topic.

Disclaimer: This content provides the MLRA's high-level overview of aspects of mine rehabilitation in the Latrobe Valley. It does not reflect the opinions, pre-empt decisions or policies of Resources Victoria, mine licensees or any other government department. The information was accurate to the best of the MLRA's knowledge at the time of publication and is intended to inform the community, stakeholders and Traditional Owners.

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