

A Rock and a Hard Place: Negotiating Geochemistry Challenges for Lithium Project Approvals

T Robson¹, D Allen², M North³ and G Du Plessis⁴

1. Environmental Geochemist, MBS Environmental, Perth WA 6005. Email: TRobson@mbsenvironmental.com.au
2. Principal Environmental Geochemist, MBS Environmental, Perth WA 6005. Email: DAllen@mbsenvironmental.com.au
3. Principal Environmental Geochemist, MBS Environmental, Perth WA 6005. Email: MNorth@mbsenvironmental.com.au
4. Graduate Environmental Geochemist, MBS Environmental, Perth WA 6005. Email: GDuPlessis@mbsenvironmental.com.au

ABSTRACT

Demand for battery-grade lithium (e.g. lithium hydroxide/carbonate) is driving new and old mine development in Western Australia (WA). Several large commercially viable pegmatite deposits in WA are on minesites previously operated for gold or rare elements (e.g. tin, niobium, tantalum and beryllium). These sites have complex operational histories and mineralisation, which brings about unique geochemical and environmental challenges (e.g. waste legacy, asbestos, radionuclides). Also, because spodumene beneficiation and downstream lithium refining are relatively recent developments in Australia, regulators and stakeholders are cautious and expect extensive baseline characterisation and impact studies to define financial, safety and environmental risk.

By completing several studies supporting new/proposed lithium projects in WA, MBS Environmental have identified emerging issues to consider when seeking approvals. Firstly, these projects raise concerns over the ecotoxicity, mobility and fate of lithium and associated, often rarely encountered, chemical species (e.g. fluoride, thallium, rubidium, caesium and beryllium) in freshwater and groundwater-dependent ecosystems (i.e. stygofauna). This is driven by a lack of reliable case studies and research relevant to Australian climatic and ecological contexts. Secondly, unlike other mineral flotations, spodumene beneficiation (including oleic acid flotation) and processing requires high-purity water. This is a cost challenge in saline groundwater environments, or risks impact from brine/salt disposal in fresh-to-brackish groundwater environments. Thirdly, lithium extraction involves roasting spodumene with sulfuric acid, neutralisation and precipitation of carbonate/hydroxide. By-products of this are new to WA mining and include leached expanded spodumene, volatile hydrofluoric acid and large volumes of sodium sulfate that can present considerable environmental management challenges. Finally, regulators are beginning to require the use of new materials characterisation techniques, such as USEPA LEAF leachate testing (pH and liquid/solid ratio dependent element solubility assessment).

This presentation will address these emerging challenges and will include case studies from recent WA lithium projects.