



# **PROSPECTOR** RESOURCE INVESTMENT NEWS

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## **GEOMICROBIOLOGY AT ITS BEST.**

**BIOLEACHING OF ALBERTA'S POLYMETALLIC BLACK SHALES IS AN INNOVATIVE AND TRANSFORMATIVE SYMBIOTIC LINK ON THE SUSTAINABILITY PATHWAY TO NET ZERO**

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**ABORIGINAL MINER**  
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# GEOMICROBIOLOGY AT ITS BEST

## BIOLEACHING ALBERTA'S PLYMETALLIC BLACK SHALES INNOVATIVE TRANSFORMATIVE SYMBIOTIC LINK IN SUSTAINABILITY CHAIN TO NET-ZERO

By Lynnel Reinson

**Critical Minerals Americas Inc.**, launches innovative projects advancing development of its metalliferous Alberta black shales as a long-term domestic supply for critical minerals while also consuming waste sulfur and CO<sub>2</sub> from the adjacent region.

**W**hile heap leaching is a recognized processing method in mining, extracting metals with naturally occurring micro-organisms instead of chemicals and smelting is a technical leap in metallurgy and has management at Critical Minerals America Inc. (CMAI) revisiting prior discoveries made by other companies under their management in the past. The Company

is formulating plans to advance prior discoveries to the development stage. CMAI was incorporated in January this year as a private Canadian company with a 100% interest in its 850 km<sup>2</sup> SBH Property north of Fort McMurray, AB. The property has already been extensively sampled and partly drill-confirmed and one third is previously confirmed to contain metals-enriched black shales at the surface.

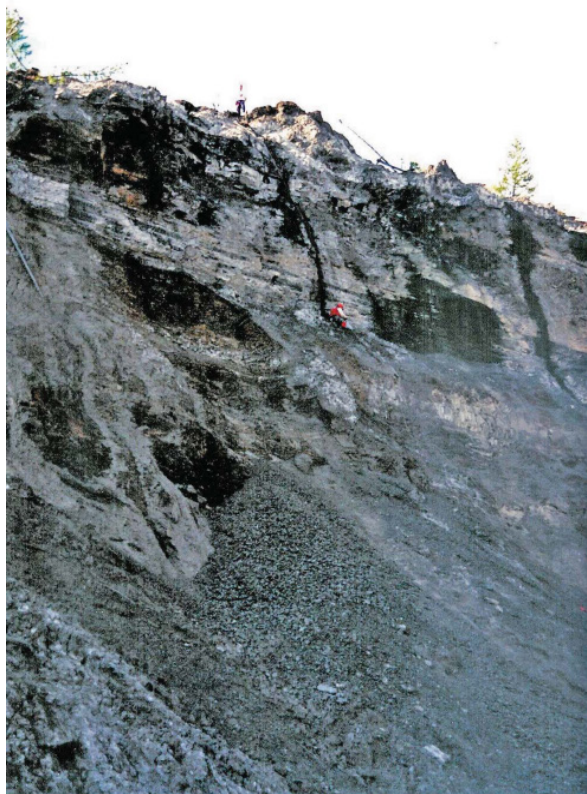
The possibility of extracting metals and REEs makes for a compelling story in current times of global and national hunger for critical minerals and energy metals. The CMAI team shares a long history, not only from their prior work on the Property, but also with each other. This team consists of Denis Clement (President & CEO), Shahé Sabag (Technical Director), John MacKenzie (CFO), and Bill Kerr (Operations Manager), who together bring decades of shared mining industry experience to the Company. Their enthusiasm for the project is grounded in their intimate and specific knowledge of the mineralized zones discovered at the Property, and their confidence in suitability of bioleaching for collective metals extraction, along with their understanding of the successful bioleaching mining operations at Talivaara in Finland. As the only other bioheapleaching mining operation worldwide processing black shales, the Finnish project is a working model for what might be achieved in Alberta, and it operates at one-third of the carbon footprint of comparable miners.

The Alberta black shales are typical of black shales worldwide known to carry low concentrations of a long



list of metals, of which no single metal occurs in sufficient concentration to support mining operations by itself, but if collectively recovered in a single circuit, they can offer enticing bulk mining opportunities. The Alberta shales at the Property were first discovered in the early 1990s, but despite much exploration and drilling, their advancement was shelved in 1998, revisited and worked on between 2006-2014 to confirm, via more research and development, that bioleaching technology was suitable for collective recovery of metals from the Alberta shales. In that period, two resources were delineated, with one designated a Mineral Resource in a positive Preliminary Economic Assessment (PEA) in 2014. The Company is currently launching advancements of the Project with a massive head start in planning thanks to the team's prior experience at the property.

The Company has thoroughly reviewed the legacy of considerable historic information from the Property through a modern lens focusing on critical metals, rare earth elements (REEs) and in particular, lithium (Li) and scandium (Sc) discovered in the black shales decades ago. CMAI's management will use the advantage of having been on the ground for so much of the discovery, resource delineation, and leaching testwork to drive toward profitable, sustainable, mining operations with both low energy demands and a low ecological



footprint. Importantly, in these pursuits are collateral opportunities to improve the area's ecology by cleaning up and consuming waste products from the nearby Athabasca Oilsands.

To date, approximately \$12MM has been spent by other groups previously under the direction of CMAI's current management team, as far back as their first discovery, advancing through exhaustive surface sampling, several drilling campaigns, through leaching and recovery R&D, several resource studies and a historic Preliminary Economic Assessment Study which classified one of the discoveries as a Deposit. As it stands, metals-rich black shales are known to extend under approximately one third of the property and represent one of the largest known accumulations of critical minerals, including base metals and rare earth elements (REEs), in addition to lithium (Li) and scandium (Sc). This collective historic work shows that the recoverable multi-metal mineralization in the near-surface black shale formations holds



S.Sabag circa 2011-2014

demonstrable potential to become a large Canadian domestic long-term recoverable source of critical metals, REEs, Li and Sc, to supply increasingly hungry global markets.

Shahé Sabag, PGeo, the Company's Technical Director, notes "Bioleaching has its roots in the 1970s. It was primarily used for copper and hard to recover ores."<sup>1</sup> Bioleaching was first adapted for collective recovery of metals relevant to the markets of the

era e.g., copper and uranium in the 1990s, and then engineered for large-scale application with heaped crushed ores, as heap leaching. Bioheap leaching relies on the Thiobacilli digesting sulfur for energy and CO<sub>2</sub> for biomass. Interestingly, this was only a possibility decades ago, and was noted by K. Bosecker in 1997 as having the potential for not only metal recovery, but also for "detoxification of industrial waste products, sewage sludge, and soil contaminated with heavy metals".<sup>2</sup>

Typical bioleaching 'heap' anatomy, after Talivaara Mine, Finland. Bio-Organic inoculant, Sulfur, CO<sub>2</sub> and H<sub>2</sub>S to be added.

Compelled by advances in bioheap leaching these projects were re-launched in 2006 by CMAI's current team, and through substantive testing and leaching R&D programs at accredited facilities in both France and Canada they confirmed significant recoveries of metals from the Alberta black shales, including nickel, zinc, copper, cobalt, cadmium, uranium, lithium.

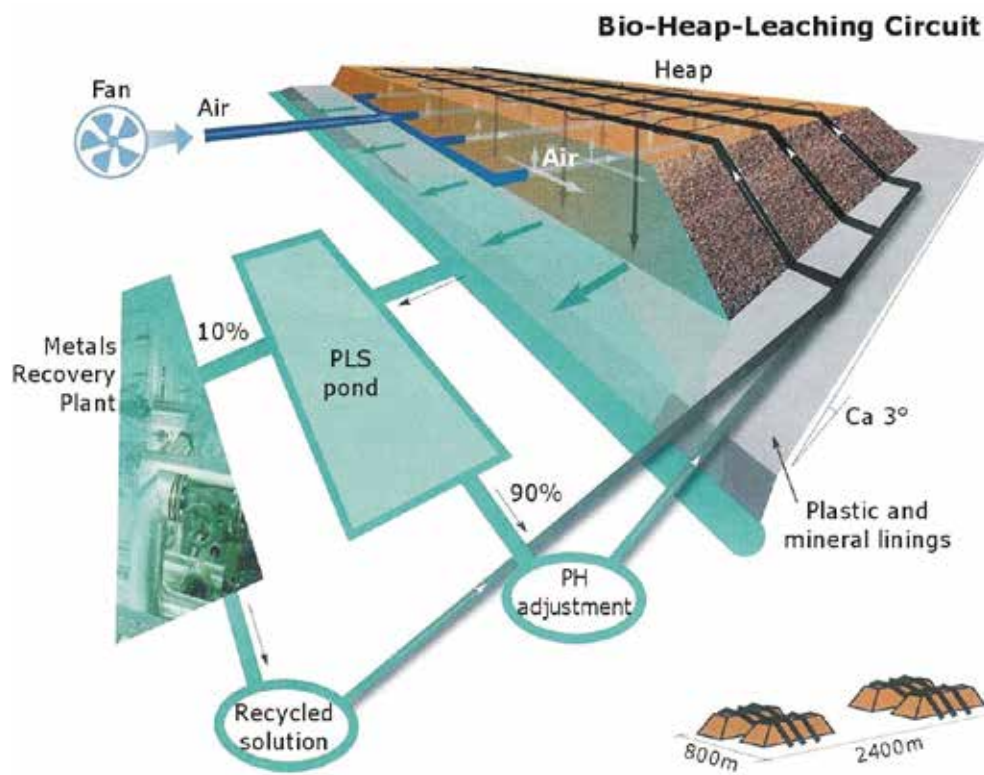


## Exploring and Developing Large and High-grade Green Metals Resources in Nunavut, Canada



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Relying on subsequent processing refinements identified during prior work the Company will be advancing quickly to larger scale testwork programs to further explore and quantify recovery, reagent consumption and faster metals recoveries. One of the more significant discoveries identified in prior work is the potential for using CO<sub>2</sub> as a pre-treatment reagent, which would be an opportunity to develop a welcome CO<sub>2</sub> 'sink'. Sabag indicates that the Company intends to aggressively advance toward large-scale testing to process larger, multi-tonnage samples from the Property than those previously tested, to also better evaluate use of CO<sub>2</sub> as a leaching reagent.

The collective of prior engineering and hydrometallurgical testwork for the shales at the Property indicates that these polymetallic black shales are well-suited to bulk mining and are amenable to bioleaching for collective recovery of all the contained metals, similar to the Talivaara operation. Unlike Talivaara's bioheaping, however, which requires many months to complete a full leaching cycle, metals from the Alberta shales leach much faster, offering opportunities for higher mining throughput than previously envisaged. Of significance to the Athabasca region

surrounding the Property is that any mining operation to extract metals from the black shales by bioleaching offers an exceptionally rare opportunity to consume sulfur (hydrogen sulfides) and CO<sub>2</sub> while mining for metals- all of which are waste products from oil sands processes- meaning the project has the potential to improve environmental health in the Athabasca region surrounding the oilsands. The Company is planning upcoming activities envisioning a future in which its black shales mining could yield significant metallic and rare earth elements recoveries from multiple circuits, while also consuming these 'waste' products from adjacent oil sands operations. This type of circularity is the kind of fundamental change hoped for in more sustainable mining: providing the critical minerals, with environmentally and socially responsible processes.

The ESG potential of the Company's planned operations reflects vision and care beyond its own operations, demonstrating thinking along the lines of regional and generational scales, well beyond the normal constraints of project

owners. Seeing a future for the region that includes transgenerational economic development and opportunities is yet another compelling driver for the team at CMAI. Actively caring for the environment is important to this group of leaders who have always been recognized for proactive environmental stewardship. Back in 2007 as management of Dumont Nickel Inc. the CMAI team were recognized by the Utah Board of Oil, Gas, and Mining and received an Earth Day Award for "proactive reclamation work that exceeded regulatory requirements" and their "continuing efforts to protect Utah's environment".

Comparable metal mining operations elsewhere have historically, and unfortunately, polluted water bodies while also creating high energy demand. Unlike these traditional processes, bioheaping for extraction of metals from the Alberta black shale are "green" and also offer opportunity for consuming CO<sub>2</sub> as shown by prior R&D. With additional R&D, Sabag sees possibilities for driving this CO<sub>2</sub> consumption further, toward a low eco footprint not only for the Company's own Projects, but those of Alberta's oilsands region as well.

These kinds of project initiatives exceed profitable business creation, and work with the ideals of sustainable business creation and operation. The Company's management team takes inspiration from their knowledge of the Property geology, land, communities of the region, and answering to many of the United Nations Sustainable Development Goals (UNSDGs) calls to action while building and developing the project into a profitable venture, based on their decades of mining exploration, development, and enthusiasm.





Heap leach pad configuration at Talivaara, Finland

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