



**Royal Oak
Mines**

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Dr. Joseph Lazarovich
Director, Mineral Resources
Natural Resources and Environment Branch
Les Terrasses de la Chaudiere
6th Floor, Room 603
10 Wellington Street
Ottawa, Ontario K1A 0H4

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Dear Dr. Lazarovich,

As you are aware, Royal Oak Mines Inc. operates the Giant Mine in Yellowknife NWT. The Giant Mine has operated for 50 years. A byproduct of the gold roasting process is stored underground. This byproduct, or baghouse dust (BHD), contains from 40 % to 90 % arsenic trioxide (As_2O_3), historically

Although the underground storage practice has been accepted since 1950, questions have been raised regarding this practice as a permanent solution to the disposal of these wastes.

This letter outlines the progress of test work to develop a process that could be utilized to upgrade arsenic trioxide currently stored underground at the Giant Mine. If the process is successful, the material could be removed from underground, upgraded, and marketed outside of the NWT.

Royal Oak has been conducting lab scale tests at its Giant Mine since October of 1997. These tests involve the treatment of arsenic trioxide bearing dusts in order to upgrade the quality of the arsenic trioxide to a potentially marketable form. The lab at Giant has undergone significant upgrading in order to carry out the required test work. It was decided to do the testing at Giant where the personnel are more experienced at handling the material, and where transportation and disposal issues were not a concern.



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Wood preservative (CCA) producers are potential clients for Giant's arsenic trioxide. Current baghouse dusts (BHD) grade approximately 90% arsenic trioxide and contain iron and antimony as impurities. In order to meet CCA producers requirements, Giant's BHD has to be upgraded to an arsenic trioxide concentration higher than 95%. Iron and antimony have to be removed to lower their concentrations in the final product.

Initially, four different upgrading options were considered. The selected process (Hot Water Leach) is based on the arsenic trioxide solubility curve (as a function of temperature). Arsenic trioxide is dissolved in hot water to produce a saturated solution that is separated from the residue and cooled. As the solution cools, arsenic trioxide crystallizes and is recovered.

Extensive bench scale test work has been conducted to date and further testing is needed in certain areas.

- Co-dissolution of iron and antimony with arsenic. A technique to remove iron and antimony from solution prior to arsenic crystallization has been successfully tested on bench scale. Scale up of these tests is required.
- The solubility of the BHD is lower than that reported for reagent grade arsenic trioxide. This has a negative impact on the process economics due to the high volumes of water required in the process. Additional scientific investigation is required in order to identify and control the mechanisms resulting in this low solubility.
- Crystallization technology has improved significantly in the last 15 years and various options should be investigated and tested. This work can be included in the 'scale up' tests.
- The residue from the arsenic trioxide dissolution stage contains significant quantities of gold which has to be recovered to make the process economic. The amount of residue produced in bench scale tests is insufficient to conduct a reliable gold recovery test. Residues obtained in 'scale up' tests could be used for this purpose.



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Royal Oak would like to request assistance, though DIAND, in areas where research and additional laboratory facilities are required, in order to meet the challenges in furthering the development of a process to treat Giant's baghouse dust. CANMET may be ideally suited to provide the scientific support, as well as, the physical facilities to conduct research and test work in the following key areas:

- Investigation and control of the mechanisms that result in low feed solution strengths (arsenic trioxide solubility).
- Scale up tests (10 to 25 kg BHD) to investigate iron and antimony removal, crystallization of arsenic trioxide, and gold recovery.

I would appreciate the opportunity to discuss the process, and our needs in moving forward, with you at the earliest convenience.

I can be reached at the Kirkland, Washington office at 425-822-8992.

Yours truly,
Royal Oak Mines Inc.

Richard Allan P. Eng.
Manager - Mining Projects

cc. E Szol, Chief Operating Officer, Royal Oak Mines Inc.