

## MEMORANDUM

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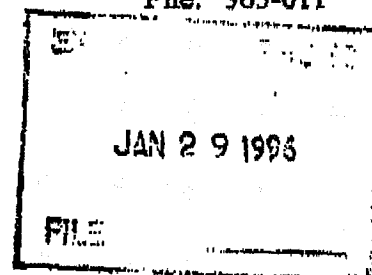
January 29 1996

File: 365-011

TO: Doug Lagore  
City Administrator

FROM: Dan Levert, Director  
Public Works & Engineering

RE: Giant Mine - Arsenic Issues



There are presently two separate and distinct issues regarding the release and containment of arsenic at the Giant Mine. The first issue has to do with quantities of arsenic being released to the air through the Giant Mine roaster. The second issue has to do with the arsenic by-product of the roasting operation which is captured by Royal Oak and stored in underground vaults. These two issues will be dealt with separately.

**ARSENIC IN THE AIR**

Metal production facilities such as gold mining, are the principal sources of arsenic released into the Canadian environment from human activities. Based on data from the National Pollutant Release Inventory for 1993, forty facilities in Canada reported arsenic releases totalling 23.7 tonnes to water and 71.6 tonnes to the air. These figures do not include data from the Giant Mine in Yellowknife which subsequently reported releases for 1993 of 0.6 tonnes to water and 3.0 tonnes to the air, (excluding arsenic stored underground).

In response to concerns about arsenic releases in the Northwest Territories, the Federal Departments of Environment and Health are preparing a report to deal specifically with the issue of arsenic released to the air and water. The work done to date has consisted of developing an action plan to address the various issues raised. An air sampling station has been established in N'dilo to measure airborne arsenic concentrations and they have awarded a consultant contract for the identification and assessment of commercially available technology for controlling arsenic releases and the costs involved.

I am advised by Environment Canada that the issue of underground storage of arsenic will not be dealt with at this time as they are more concerned with immediate releases of arsenic to the environment, i.e. through the roaster stack. It should be kept in mind that the City has lived with air emissions of arsenic for decades and that actual emissions have decreased significantly over the years. Although this does pose a limited risk to health, the following agencies are more concerned with the underground storage of arsenic, in the long term:

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The Miramar Con Mine has in place an autoclave which can be used to neutralize this arsenic. Presumably such technology is available to Royal Oak to process this material which would yield a measurable amount of gold. It would be difficult but not impossible to retrieve the arsenic stored underground, and to render this material harmless.

Concerns have also been expressed by the various member agencies of the Technical Advisory Committee, including Northern & Indian Affairs Canada, the Environmental Protection Division of Renewable Resources and the Department of Health & Social Services of the GNWT as well as the McKenzie Regional Health Service.

In light of the proximity of this environmental hazard to the City of Yellowknife, as well as the potential health risks involved, it may be appropriate for City Council to express its concern with this situation and require that appropriate measures be taken to neutralize this environmental hazard.



Dan

DL/gyo

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- Indian and Northern Affairs Canada - Land and Water Resources
- Environment Protection, Federal
- Department of Fisheries and Oceans, Federal
- McKenzie Regional Health
- Department of Health of the Government of the Northwest Territories
- Mine Inspector's Office, Government of the Northwest Territories
- Municipal and Community Affairs, Government of the Northwest Territories
- Renewable Resources, Government of the Northwest Territories

### UNDERGROUND STORAGE OF ARSENIC

Since 1950, the operators of the Giant Mine have stored arsenic trioxide in sealed off vaults in abandoned mine stopes underground. There is presently 264,000 tonnes of this material stored in fourteen vaults at the 200 foot level of the mine; there is presently another vault under construction.

Arsenic trioxide waste is produced at the Giant Mine as a toxic by-product of roasting arsenopyrite ore. As the ore is roasted, arsenic trioxide vapours are condensed and captured in fabric filters in the bag house. This material is subsequently removed from the bag house and stored in the underground vaults. Theoretically, the vaults are isolated from the mine workings and built within permafrost zones with a view to eventually keeping the arsenic trioxide in a frozen state. Following abandonment of the mine, it is assumed that the mine will take approximately twelve years to flood to the 200 ft. level where the arsenic trioxide is stored. Royal Oak assumes that the permafrost will return to this area. Royal Oak has hired a consulting engineer to evaluate the safety of the vaults to contain the arsenic following abandonment, as well as the likelihood of the permafrost being re-instated to this area.

Since arsenic trioxide is water soluble, should Royal Oak's assumptions be incorrect, the arsenic would eventually leak into the water table and then into Great Slave Lake which would pose a severe threat to the lake, the McKenzie River system and beyond.

During the 1993 Public Hearing into Royal Oak's renewal of its water license, the City expressed concerns with the integrity of the arsenic vaults, and the abandonment plans; this resulted in the Water Board requiring Royal Oak to implement a study into the matter. The final study is to be completed in 1997. A meeting was held on December 14th, 1995 between the Technical Advisory Committee to the Water Board and Royal Oak to discuss the progress of Royal Oak's study. Concern was expressed at the lack of progress with the Royal Oak study and in particular with the proposed method of abandonment. In light of the potential risks involved, it may be more appropriate for Royal Oak to consider methods of disposal as opposed to permanent storage.