

*Section 7 of Chapter 2 is titled 'Waste Disposal'.
Sub-section 7(a) discusses the concrete vaults.*

Cluff Lake Board of Inquiry – Saskatchewan Government Final Report [1978]

Chapter 2 The Amok Proposal

Concrete Vaults

2.44 The company proposes to minimize any hazards arising from the radium and its daughter products in the active residue produced in Phase 1 operations by burying the residue in **specialty-built concrete vaults. The proposed thickness of the vault, 38 centimetres, is designed to attenuate the gamma radiation to within safe working limits. The inside and outside walls of the vaults are to be coated with a layer of asphaltic material to minimize seepage either into or out of the container.**

2.45 The site selected for the burial of the active tailings is on a knoll of high ground about 700 metres south of the mill site. This particular location was chosen because it will allow the **placement of the vaults above the groundwater level, and surface and groundwater drainage is toward the Snake Lake rather than the Cluff Lake basin. The vaults are to be surrounded by one or two metres of sand and gravel with arrangements for drainage to a sump where the water is to be monitored regularly and removed to appropriate treatment ponds if necessary.**

2.46 Since the stored active residue contains about 50 percent water by volume, concern has been expressed regarding the **possibility of escape of some of this water, which will contain dissolved radium.** As a result of questions raised at the hearings, Amok has agreed to use a combination of neutron and gamma logging techniques to monitor the possible movement of contaminated groundwater in the unlikely event that such will occur. A suggestion was made at the hearings that the water in these tailings could be immobilized by adding sufficient Portland cement to cause the slurry to set to concrete. The company has been loath to accept this suggestion because of the increased **difficulty of retrieving the radium should it become desirable to do so sometime in the future.** Such a procedure could also increase the difficulty of introducing **alternative methods of disposal which might be required as the result of future legislation.** The company's proposal for the burial of these active tailings, it is

contended, probably lessens the likelihood of groundwater contamination by radium, as compared to its present location which is below the water table in the 'D' ore body.

2.47 The diffusion of radon through the walls of the vaults will be hindered by the emulsified asphalt coating on the inside and outside walls, and also by the fact that the residue will be more than two metres below the surface covering. Therefore, most of the radon that succeeds in diffusing into this covering material will decompose to its solid daughter elements before the gas can escape to the atmosphere. We were told that the proposed precautions most probably ensure that the radon from this residue does not constitute any greater hazard to the environment that it does in the present natural location in the 'D' ore body.

2.48 The active tailings burial site is to be securely fenced and marked as a radioactive hazard area. It will not be used after the completion of Phase 1 operations, but Amok proposes to continue to monitor the area during Phase 2 operations. Amok has no plans for monitoring the site after the completion of Phase 2, but one of its representatives stated that it would comply with the law in this regard.

Chapter 5 Environmental Considerations

Section 6 Long-Term Considerations of the Concrete Vaults and Tailings Piles

5.74 Tailings and wastes from uranium mines remaining after the completion of mining operations may create environmental problems in the future. They constitute a possible source of gamma radiation, radon gas, airborne dust contamination and water contamination from possible leaching of components of the residue.

The Concrete Vaults

5.75 Because of the high grade of the ore processed during Phase 1 operations, most of the radioactive residues from the ore will be placed in concrete vaults, as described in Chapter 2. Amok's representatives stated that during Amok's period of operation at Cluff Lake, Amok will undertake neutron and gamma logging to detect possible seepage of radioactive material from the vaults into the surrounding soil. However, potential hazards may persist for many years into the future. It is our opinion that the environmental hazards are minimal as long as the concrete vaults remain intact, but the lifetime of these structures is uncertain. It would be reasonable to anticipate that they might endure for more than one hundred years, perhaps much more, but the radioactivity will persist for thousands of years.

5.76 As long as the proposed covering of sand and soil over the residue and vaults remains in place, and no transport of the active residues occurs, it is our opinion that any effects due to gamma radiation, radon gas emissions or dust hazards will be minimal. The proposed asphalt covering should minimize erosion by water or wind. Periodic inspection of the area should be one aspect of a long-term surveillance program desirable for all uranium tailings sites.

5.77 Should the concrete structure deteriorate, possible leaching of radioactive materials and other trace metals into the surrounding soil, groundwater and possibly into the river systems would be a matter of concern. At the present time the vaults are above the existing water table, and the radioactive residues they contain will be well below the frost line. As long as these conditions persist, we believe that the material is more secure in the vaults than in the original ore body, since much of the 'D' deposit is currently below the water table, and is subject to leaching. Escape of materials into the environment would be a possibility should the concrete weaken and hydrological conditions change. We recommend that long term surveillance of the vaults continue. Either by the proposed neutron and gamma logging techniques or other acceptable methods.

5.78 On abandonment, the area should be fenced, and appropriate signs posted.