



Submission No 80

**Review of Australia's Relationship with the
Countries of Africa**

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Dr John Carter
Africa Inquiry Secretary
Joint Standing Committee on Foreign Affairs, Defence and Trade
Parliament House
CANBERRA ACT 2600

Dear Dr Carter

I refer to your correspondence of 6 June 2010 requesting advice on the required isolation time for the storage of uranium mine tailings.

There are numerous extant best practice or leading practice guidelines on tailings management, however I am not aware of any definitive agreement on the required period of isolation of tailings from the surrounding environment. There is however general agreement that the objective of isolating mine tailings is to prevent contamination of the surrounding environment from any deleterious effects of those process residues. Different environmental settings will have different risks that must be managed in order to achieve this principal objective and the approach may be different in each case.

As identified in your letter, the Environmental Requirements (ERs) for the Ranger uranium mine in the Northern Territory require isolation of the tailings for 10 000 years. In this context it would seem that this figure first appeared as an undertaking in the original Environmental Impact Statement for the Ranger project and this was then reflected in the ERs. It should be noted that the current plan for Ranger is that all tailings will be returned to the mined out pits at a level which will be below the surrounding ground level. These pits will then be capped with waste rock at the completion of mining. This effectively means that physical isolation of tailings will be relatively easy to achieve for a very long time, well in excess of the 10 000 year requirement.

I am unaware of any other mine which has a stipulated requirement for isolation of tailings for 10 000 years and tailings management requirements, including physical isolation and the engineering specifications for tailings dams or process residue storage facilities vary from jurisdiction to jurisdiction and from site to site depending on local conditions. A transcript that you provided with your letter referred to 1 000 years being an international standard for tailings isolation. The International

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Atomic Energy Agency paper quoted in the transcript actually notes that 1 000 years is a period required under a US Code of Regulations, but the paper does acknowledge that “many regulatory procedures around the world” rely on these prescriptive US standards, so it would be reasonable to state that 1 000 years reflects an international standard.

While process residues from uranium mining have the added complication of needing to take radioactivity into consideration, the other potential environmental risks from acid rock drainage, heavy metal contamination and dust are shared with most other mine sites. Many of these, again dependent on their setting, are designed with engineering specifications that are nominally for 1 000 years or less, however the expectation must be that they will stabilise over time and not become a future environmental liability. Contemporary leading practice designs must reflect this objective as it would be inconscionable for a mining company to deliberately design, and illogical for any regulatory authority to approve, an alternative which would be to leave an environmental time bomb as a legacy.

Although the risk from radioactive components in tailings decreases over time as radionuclides decay to a stable non-radioactive isotope (mainly lead-206), there is little diminution (less than a 10% reduction) in the levels of radioactivity in uranium mine tailings between the 1 000 year and 10 000 year mark. This is because the rate-controlling step in the radioactive decay of the tailings is the decay of the longest lived isotope in the decay series, thorium-230, which has a half life of 75 000 years. Extending the period of isolation from 1 000 to 10 000 years is therefore not a particularly useful strategy in the reduction of radiological risk being achieved in the intervening period and any other risks such as heavy metals remain unchanged.

It is suggested that the long periods of isolation time now being contemplated in the design of tailings repositories, be they 1 000 years or 10 000 years are largely symbolic. In a regulatory sense they should not be taken in isolation from other complementary requirements which will mean that they may be viewed as being indicative that the design is sufficiently robust to stabilise and provide ongoing protection, effectively in perpetuity, rather than to assume that the facilities are intended to fail at the end of their designated design life.

Please contact me if you believe I can be of further assistance.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Alan Hughes', with a stylized flourish at the end.

Alan Hughes

Supervising Scientist