Australian Government
Department of the Environment and Energy
Supervising Scientist

Public Radiation — Rehabilitation Standard for the Ranger uranium mine

Radiation protection theme

Preface

The Supervising Scientist developed this Rehabilitation Standard to describe the radiation protection requirements for members of the public using the land within and outside of the Ranger Project Area in the Alligator Rivers Region of the Northern Territory.

This document is part of a series of Rehabilitation Standards for Ranger uranium mine. It may be updated as additional relevant knowledge becomes available.

This Standard should be cited as follows:

Supervising Scientist 2018. Public Radiation — Rehabilitation Standard for the Ranger uranium mine (version 1). Supervising Scientist Branch, Darwin, NT. http://www.environment.gov.au/science/supervising-scientist/publications/ss-rehabilitation-standards. Cited [Date].

1. General elements

Scope

1.1 The Rehabilitation Standards for Ranger uranium mine have been developed in accordance with section 5c of the *Environment Protection (Alligator Rivers Region) Act 1978* and are advisory only.

1.2 The *Environmental requirements of the Commonwealth of Australia for the operation of the Ranger uranium mine* (Environmental Requirements) (Australian Government 1999) specify the environmental objectives for the rehabilitation of Ranger uranium mine.

1.3 The Supervising Scientist's Rehabilitation Standards quantify the rehabilitation objectives and recommend specific values based on the best available science that will ensure a high level of environmental protection. These values can be used to

assess the achievement of, or progress towards, the rehabilitation objectives, some of which may not be reached for a significant period of time.

1.4 The rehabilitation of the Ranger uranium mine is a planned exposure situation (ARPANSA 2016). Until it can be determined that the rehabilitation objectives have or will be reached, there will be an ongoing need to ensure the protection of the public against radiation risks, through continued radiation monitoring and the associated comparison of dose estimates with relevant dose constraints and limits.

Objective

1.5 The Public Radiation Rehabilitation Standard aims to protect the health of Traditional Owners and other members of the public from the harmful effects of radiation resulting from the Ranger uranium mine on and outside of the Ranger Project Area.

Application

1.6 This Rehabilitation Standard should be assessed against the effective dose to the representative person (defined in 4.2 to 4.4).

1.7 Radiation doses received from natural background sources or as the result of undergoing medical procedures are not subject to this Rehabilitation Standard and are not to be included in the calculation of effective dose.

2. Relevant requirements

Environmental Requirements

2.1 The primary environmental objectives in the Environmental Requirements require that operations at Ranger uranium mine protect the health of Indigenous Australians and other members of the regional community, outside of the Ranger Project Area, including during or following rehabilitation. The objectives also require that, after rehabilitation, any effects within the Ranger Project Area are as low as reasonably achievable and conform with Australian law. This Rehabilitation Standard is relevant to the Environmental Requirements listed in Box 1.

Aspirations of Traditional Owners

2.2 The Mirrar Traditional Owners desire that residual radioactivity in the environment after rehabilitation will not make it unsafe to access or use the land (including water bodies) on or outside of the Ranger Project Area for their activities, such as collecting and consuming bush foods, seasonal camping, recreation, land management and monitoring, rituals and ceremonies. In addition, the Traditional Owners desire that, after rehabilitation of the Ranger Project Area, the cover design for the mined-out pits and the construction of the final landform will achieve a level of radiation no higher than the pre-mining level.

Box 1: Ranger Environmental Requirements relevant to the Radiation Rehabilitation Standard

1 Environmental protection

1.1 The company must ensure that operations at Ranger are undertaken in such a way as to be consistent with the following primary environmental objectives:

(c) protect the health of Aboriginals and other members of the regional community

1.2 In particular, the company must ensure that operations at Ranger do not result in:

(c) an adverse effect on the health of Aboriginals and other members of the regional community by ensuring that exposure to radiation and chemical pollutants is as low as reasonably achievable and conforms with relevant Australian law, and in particular, in relation to radiological exposure, complies with the most recently published and relevant Australian standards, codes of practice, and guidelines

2 Rehabilitation

2.2 The major objectives of rehabilitation are:

(b) stable radiological conditions on areas impacted by mining so that, the health risk to members of the public, including traditional owners, is as low as reasonably achievable; members of the public do not receive a radiation dose which exceeds applicable limits recommended by the most recently published and relevant Australian standards, codes of practice, and guidelines; and there is a minimum of restrictions on the use of the area

11 Management of tailings

11.3 Final disposal of tailings must be undertaken, to the satisfaction of the Minister with the advice of the Supervising Scientist on the basis of best available modelling, in such a way as to ensure that:

(iii) radiation doses to members of the public will comply with relevant Australian law and be less than limits recommended by the most recently published and relevant Australian standards, codes of practice, and guidelines effective at the time of the final tailings disposal.

3. Recommended values for public radiation protection

3.1 To protect the health of Traditional Owners and other members of the public on and outside the Ranger Project Area in accordance with the rehabilitation objectives, radiation doses to the public should not exceed the recommended values shown in Table 1.

Table 1 Rehabilitation standard for public radiation protection for Ranger uranium mine

Rehabilitation standard	Measure of success
Dose constraint of 0.3 mSv in a year	Effective dose to members of the public is as low as reasonably achievable below the dose constraint for conditions of agreed future land use
Dose limit of 1.0 mSv in a year	Effective dose to members of the public is as low as reasonably achievable below the dose limit for conditions of future land use different to those agreed

4. Scientific basis

Guidelines and standards used to develop the recommended values

4.1 This Rehabilitation Standard has been developed from the international safety guide *WS-G-5.1 Release of sites from regulatory control on termination of practices* (IAEA 2006).

4.2 The representative person is the individual, either real or hypothetical, who receives a dose that is representative of the more highly exposed individuals in the population (ICRP 2006). On and outside of the Ranger Project Area, this is anticipated to be Traditional Owners, due to their expected future land use for activities such as seasonal camping and collecting bush foods.

4.3 The effective dose is the sum of the doses obtained from assessment of relevant radiation exposure pathways:

i) external gamma radiation
ii) ingestion of bush foods
iii) ingestion of water
iv) inhalation of long-lived alpha-emitting radionuclides in dust
v) inhalation of radon progeny.

4.4 Effective dose to members of the public is as low as reasonably achievable if the best option to reduce radiation exposures of the public has been selected and implemented from the available options, after considering economic and societal factors.

4.5 The dose constraint and dose limit proposed in this standard align with values currently recommended by relevant international bodies (ICRP 2007, IAEA 2014) and by the most recently published and relevant Australian Standards, codes of practice and guidelines (ARPANSA 2005, 2017).

Scientific evidence summary

4.6 The internationally accepted system of radiological protection is summarised in ICRP (2007).

4.7 Application of the dose constraint and dose limit in the context of this Rehabilitation Standard is summarised in IAEA (2006).

5. Future knowledge needs

5.1 Rehabilitation planning can only be based on the best available information at a given time, but this should not preclude the continual improvement of the knowledge base and its subsequent application where directly relevant and possible.

5.2 No additional knowledge needs related to this rehabilitation standard have been identified.

6. References

ARPANSA 2005. *Code of practice for radiation protection and radioactive waste management in mining and mineral processing*. Radiation Protection Series Publication No. 9, ARPANSA, Commonwealth of Australia.

ARPANSA 2016. *Code for radiation protection in planned exposure situations*. Radiation Protection Series Publication C-1, ARPANSA, Commonwealth of Australia.

ARPANSA 2017. *National directory for radiation protection (including amendments 1–7)*. Radiation Protection Series Publication No. 6, ARPANSA, Commonwealth of Australia.

Australian Government 1999. *Environmental requirements of the Commonwealth of Australia for the operation of the Ranger uranium mine*. Australian Government Department of the Environment and Heritage, Canberra.

IAEA 2006. *Release of sites from regulatory control on termination of practices*. Safety Guide No. WS-G-5.1, International Atomic Energy Agency, Vienna.

IAEA 2014. *Radiation protection and safety of radiation sources: international basic safety standards*. General Safety Requirements Part 3, International Atomic Energy Agency, Vienna.

ICRP 2006. Assessing dose of the representative person for the purpose of radiation protection of the public and the optimisation of radiological protection: broadening the process. ICRP Publication 101, *Annals of the ICRP* 36(3), vii-viii, 5-62.

ICRP 2007. The 2007 recommendations of the International Commission on Radiological Protection. ICRP Publication 103, *Annals of the ICRP* 37, 2–4.