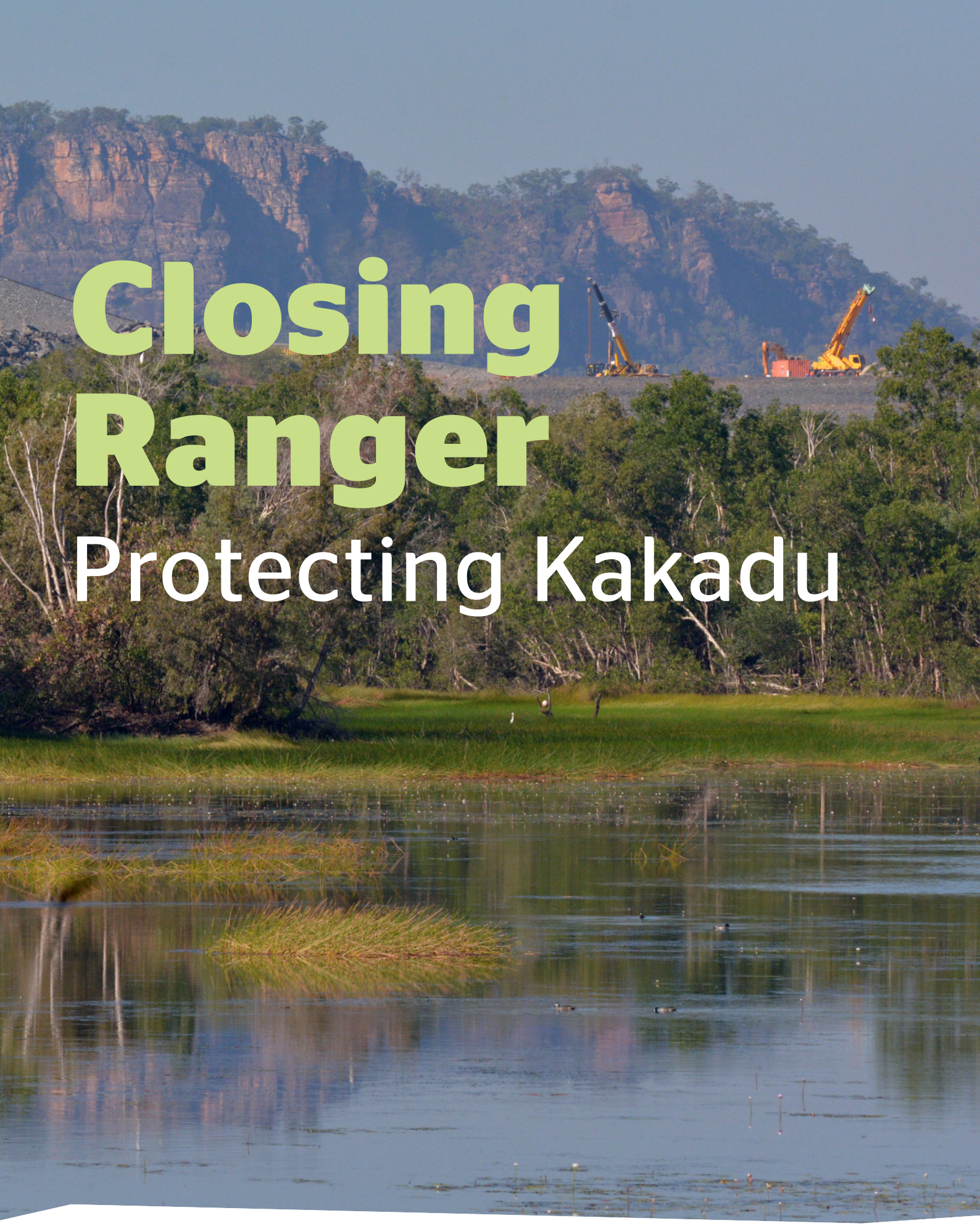

Closing Ranger

Protecting Kakadu

AUSTRALIAN CONSERVATION FOUNDATION

THE UNIVERSITY OF SYDNEY
Sydney Environment Institute

mpi
mineral policy institute

Environment Centre NT
protecting nature | living sustainably | creating a climate for change

Front cover. Ranger uranium mine. *Photo.* ChameleonsEye/Shutterstock.com. *Below.* Ranger uranium mine. *Photo.* John Carnemolla/Shutterstock.com

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We acknowledge the Mirarr people as the Traditional Owners of the land where the Ranger mine is sited and thank them for their sustained efforts to protect Country and culture.

To cite this report: Mia Pepper, Rebecca Lawrence, Dave Sweeney, Gavin Mudd, Kirsty Howey, Justin Tutty. 2020. Closing Ranger – Protecting Kakadu.

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Ranger is clearly the most complex mine rehabilitation project in Australia's history **yet there is not commensurate regulatory attention**

Executive **summary**

From the escarpment country and rainforests to the wetlands and tidal mudflats, Kakadu National Park encompasses a unique and precious natural heritage and protects ecosystems of outstanding value, diversity and beauty.[1]

The Ranger uranium mine, which has operated since 1980, is surrounded by the dual World Heritage listed 20,000 hectare Kakadu National Park.

Kakadu contains some of the world's oldest and most important archaeological and art sites and is home to the living cultural tradition and practise of the Aboriginal Traditional Owners. Recent archaeological work at Madjedbebe on Mirarr lands shows that people have been continuously living in the area for around 65,000 years.

The cultural legacy of 65,000 years of occupation and ownership is imprinted on the region and witnessed by the many visitors to Kakadu each year. For the Mirarr people the issue is simple and irrefutable: "Mirarr cultural values are integral to the cultural values of Kakadu National Park."[2]

These are historic times for Kakadu. In January 2021, following four decades of imposed uranium mining and milling, operations at the Ranger uranium mine will end. This will leave a heavily impacted site that requires extensive rehabilitation. The rehabilitation will be complex and costly. It must be of a very high standard to realise the company's obligation to rehabilitate the site to a standard suitable for incorporation into Kakadu National Park and to meet the clear expectations of multiple stakeholders.

Australia has a long history of sub-standard mine closure and rehabilitation in both the uranium and wider mining sector. Two former Rio Tinto uranium operations at Rum Jungle (NT) and Mary Kathleen (Qld) remain highly problematic. A far better approach and outcome is needed at Ranger.

ERA and Rio Tinto are required to "...rehabilitate the Ranger Project Area to establish an environment similar to the adjacent areas of Kakadu National Park such that, in the opinion of the Minister with the advice of the Supervising Scientist, the rehabilitated area could be incorporated into the Kakadu National Park." (Clause 2.1, Ranger Environmental Requirements, Section 41 Authority)

The company must also ensure that "(i) the tailings are physically isolated from the environment for at least 10,000 years; (ii) any contaminants arising from the tailings will not result in any detrimental environmental impacts for at least 10,000 years." (Clause 11.3, Environmental Requirements, Section 41 Authority)

Previous page. Jabiru bird, Kakadu. *Photo.* Shutterstock.com

[1] In terms of natural values, Kakadu is home to 21 of Australia's 29 mangrove species, 900 plant species, 300 bird species, 50 native mammals, 100 species of amphibians and reptiles, one quarter of Australia's freshwater fish and an estimated 10,000 insect types. It is one of the most biodiverse environments in Australia and many of these species are endemic to the region. Kakadu contains the world's richest breeding grounds for migratory tropical waterbirds.

[2] Submission from the Mirarr people to the World Heritage Committee, ICCROM and ICOMOS, 1999, p.7

Our joint review of the 2020 Ranger Mine Closure Plan (RMCP) identifies some key issues and barriers to achieving the environmental requirements and objectives at Ranger. In raising these issues we seek to improve the prospects for achieving a rehabilitated Ranger site that can be incorporated into Kakadu National Park. Efforts to meet this obligation and objective are currently being hindered by:

- an unrealistic mandated rehabilitation timeframe
- information and data deficiencies and continuing technical uncertainties
- persistent technical challenges relating to groundwater and tailings management
- a lack of remediation planning and the unexplained de-prioritisation of rehabilitating the large and long-lived radioactive tailings plume beneath the site
- a proposal to leave the floor of the tailings dam in situ, risking contaminants entering Kakadu
- inadequate contingency planning and a lack of consideration of climate change impacts and scenarios
- an absence of social impact analysis and engagement
- a lack of clarity around the post-closure regulatory framework and the oversight and accountability needed to ensure compliance with the RMCP and closure criteria
- uncertainty over the adequacy of current and future financing – especially in relation to post-closure site monitoring and mitigation works
- lack of clarity on the United Nations Educational, Scientific and Cultural Organisation's (UNESCO) World Heritage Committee standards for incorporation of the remediated Ranger site into Kakadu National Park
- a lack of transparency around the status and process for assessing the separate stand-alone applications for significant aspects of the rehabilitation work.

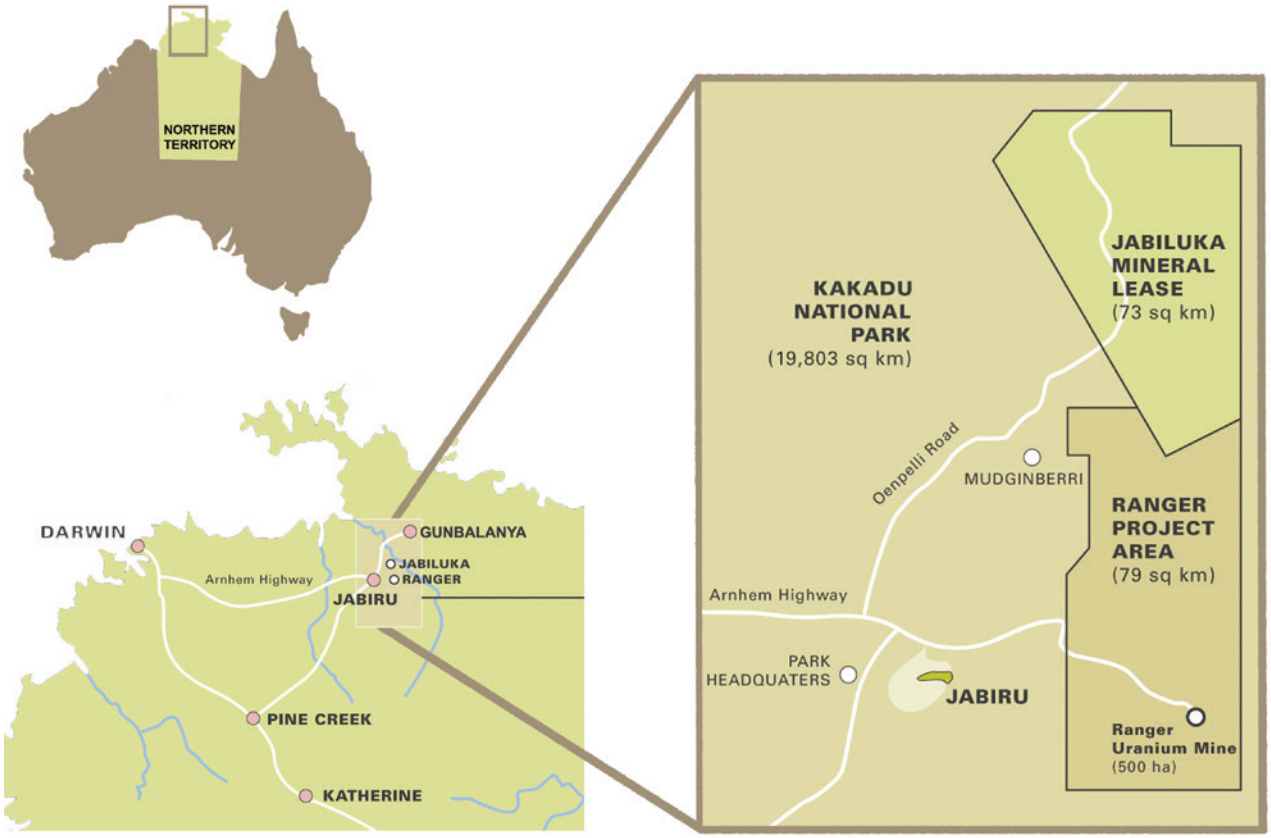
There is a high level of national and international interest in the rehabilitation of Ranger. Realising a successful outcome is a key challenge for both the Commonwealth and the mining company. There is a need for the Commonwealth to more actively engage to establish strong closure and post-closure requirements for the Ranger site. This is particularly important given the Commonwealth made promises to the Aboriginal community even before mining began that are yet to be realised.

Eyes are also firmly on the performance of the mine operator Energy Resources Australia and Rio Tinto, as ERA's largest (86%) shareholder. Rio Tinto has suffered significant reputational damage over its recent and deliberate destruction of Aboriginal cultural heritage at Juukan Gorge in the Pilbara. There is no room for company error or complacency at Ranger. We acknowledge Rio Tinto's commitment to rehabilitate the Ranger site. However, we are concerned by recent ERA comments to adopt 'best-in-class' rehabilitation.[3] This standard is vague, lacks clear definition and is a variation from earlier commitments to meet the Environmental Requirements (ERs). We urge both companies to commit to and realise the comprehensive and successful rehabilitation of the site. Rehabilitation success should be measured on the ability to meet all ER's and statutory requirements and for these outcomes to be enduring over a significant time period.

[3] NT News December 3rd 2020 "ERA committed to best practice rehabilitation of Ranger uranium mine"

https://www.ntnews.com.au/business/era-committed-to-best-practice-rehabilitation-of-ranger-uranium-mine/news-story/25b7172c0182247a3e44d980752ed75b#:~:text=THE%20operator%20of%20Ranger%20uranium,did%20not%20accurately%20portray%E2%80%9D%20this.

Ranger is surrounded by Kakadu and must **be rehabilitated to a World Heritage standard**



History and **context**

Uranium mining and processing in the Alligator Rivers Region started in the 1950s. It ends with the closure of Ranger.

In this context it is important to reflect on the history of the Ranger mine, and the surrounding Alligator Rivers region. The Commonwealth made early commitments to the community, which has now endured four decades of imposed mining at Ranger and nearly 70 years of uranium exploration and mining in the region.

The first uranium deposit in the Alligator Rivers Region was identified at Coronation Hill in the Upper South Alligator River Valley in 1953. This find led to the establishment of 13 small-scale uranium mines and two processing mills between 1959 and 1965. However, it was not until 2006 that the Commonwealth provided funding for four years of rehabilitation works at some of these sites and in 2009 built a containment area for historic uranium mine wastes.[4] Uranium was first produced in large quantities in Australia from 1954 at Rum Jungle, approximately 100km south of Darwin. This former Rio Tinto legacy mine remains unrehabilitated and is the focus of a renewed publicly funded clean up effort. This experience of inadequate rehabilitation and corporate cost shifting must not be replicated at Ranger.

While much of the uranium from these early mines was destined for the nuclear arsenals of Australia's allies, in the 1970s a 'second wave' of uranium exploration in the region was spurred by the burgeoning international nuclear power industry. A range of deposits were discovered including the Ranger orebody and the Jabiluka, Koongarra and Nabarlek deposits.

The Nabarlek mine, on the eastern side of the East Alligator River, was mined in 1979 and ore was processed from 1980 to 1988. After further exploration failed to identify economic deposits, rehabilitation works were undertaken in 1994 and 1995. At the time, there were no closure criteria and no clarity about the process to achieve closure and site safety or about enforcability. The Northern Territory Government, however, still held $10 million in a rehabilitation bond for financial security. In consultation between stakeholders it was mutually agreed that further work was needed, including at an eroded area with higher radiation levels (the 'radiologically anomalous area'). Other rehabilitation work was needed to tackle weeds and feral animals, protect areas against fire, remove remaining infrastructure, assess contaminated sites and revegetate the land.[5]

Despite the incomplete works, the Northern Territory government reduced the Nabarlek bond from $10 to $0.4 million in August 2003. This cash was returned to the company Pioneer International Ltd (then owned by UK based Hanson Plc) with no agreed process for formal mine closure and in the absence of key criteria to assess rehabilitation success. In early 2008, the site was purchased by a junior explorer, Uranium Equities Ltd (now DevEx Resources Ltd), raising further concerns about the financial capacity to finish the rehabilitation works required for the Nabarlek site[6] given there was no ongoing revenue from production. As of late 2020 virtually nothing has changed.[7] Today, more than three decades after production ceased, Nabarlek has still not been rehabilitated to an acceptable standard.

[4] Supervising Scientist 2018 – Uranium Mining in the Alligator Rivers Region Fact Sheet https://www.environment.gov.au/science/supervising-scientist/publications/uranium-mining-in-alligator-rivers-region

[5] Nabarlek Minesite Technical Committee Meeting 3 September 2003, Minutes.

[6] Annual Technical Report 2019-20, Supervising Scientist Branch, Department of Agriculture, Water and the Environment, Darwin, Australia.

[7] Ibid.

There is a clear history of repeated government and corporate failure in the Alligator Rivers region (and at nearby Rum Jungle) to ensure appropriate closure and rehabilitation of uranium mines in the Northern Territory. This highlights the need for enhaced regulatory engagement and clarity.

The Commonwealth government drove the "second wave" of uranium development in the Alligator Rivers region, including at Ranger. The Commonwealth established the Ranger Uranium Environmental Inquiry (also known as the Fox Inquiry) to examine proposals to develop uranium deposits in the Alligator Rivers region, including Ranger, Jabiluka, Koongarra and Nabarlek. The Inquiry explored the tensions between environmental, Aboriginal, commercial and national interests around uranium mining in the Alligator Rivers region. Of particular relevance was the proposed enactment of the Aboriginal Land Rights (Northern Territory) Act (1976) Cth (Land Rights Act), the first Indigenous land rights legislation in Australia, the centrepiece of which was the right of Aboriginal Traditional Owners to veto mining on their land. However when it was eventually enacted, the Land Rights Act removed the veto for mining in the Ranger Project Area, thus robbing the Mirarr people of their land rights before they had even won them. Perhaps unsurprisingly the Fox Inquiry, while acknowledging the opposition of Aboriginal people to Ranger, recommended that "their opposition should not be allowed to prevail".

In 1978 the Land Rights Act was amended to exclude veto rights at Ranger and the Commonwealth imposed a framework to facilitate mining.

Eventually private companies took over and mined under the Commonwealth's authority, granted via the Atomic Energy Act (Cth). It is important to note that mining at Ranger was the direct consequence of a number of Commonwealth interventions, despite Mirarr opposition. The promises made by the Commonwealth government on approving the Ranger mine were substantial and ambitious and have been unfulfilled. The legacy of these early Commonwealth decisions is significant as we enter this new closure and rehabilitation phase at Ranger.

It is now critical that the Commonwealth establish a rigorous framework for closure – one that can deliver on the early promises to the community made following both the Fox Inquiry and a suite of subsequent legislation and policy commitments.

Today there are two primary entities with boots on the ground and skin in the game when it comes to the delivery of successful rehabilitation works - the mining company and the Commonwealth. It is crucial that both these players take full responsibility for the clean-up at the Ranger mine: passing the buck will not provide the best outcomes for Kakadu, the Mirarr people or Traditional Owners from the surrounding area.

At the point of relinquishment Ranger, like the other former uranium mines, will become the responsibility of the Commonwealth. The risk of a continuing cost and liability to the government is real and substantial, as are the ongoing risks to the environment and adverse impacts on regional communities. It is critical the Commonwealth delivers the regulatory framework needed to ensure the mine closure at Ranger is successful and enduring.

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[8] Fagan, M. (2002). Broken promises: Land rights, mining and the Mirrar people. Indigenous Law Bulletin, 5(18), p. 12.

[9] https://pmtranscripts.pmc.gov.au/sites/default/files/original/00006007.pdf Uranium. Australia's Decision. Statement by The RT Hon. Malcolm Fraser. See pg 1. Four fundamental considerations – "the need to reduce the risk of nuclear proliferations; the need to supply essential sources of energy to an energy-deficient world; the need to protect effectively the environment in which mining development will take place; the need to ensure that proper provisions is made for the welfare and interests of the Aboriginal people in the Alligator Rivers Region and of all other people living in the Region and working on the development projects." And pg 7 "that uranium development projects will be permitted to proceed only if they satisfy certain conditions: the mining operation must conform with a mandatory 'code of practice' which the Government shall progressively prescribe; the requirements of the Environmental Protection (Impact of Proposals) Act 1974 must be complied with; the Government must be satisfied as to the acceptability of the development on the environment and on the Aboriginal people – the total level of activity will be taken into account in this regard; the sale contracts for the uranium produced must conform with the Government's safeguards policy." And pg 10 "The Government will adopt special measures designed to advance the wellbeing of Aboriginals and Aboriginal interests in the Region."

History of **Ranger uranium mine**

1969 An aerial survey **identified the Ranger uranium deposits.** Soon after, the Electrolytic Zinc Company of Australasia (EZ) and Peko-Wallsend Operations Limited (Peko) began development work in the area.

1974 EZ and Peko consortium **expanded to include the Australian Atomic Energy Commission** and advance the commercial development of Ranger.

1974 The Australian Whitlam government signed the 'Lodge Agreement' with Peko and EZ for the Ranger mine to provide uranium ore to Japan. With this agreement in place, the mine was a *fait accompli*.[7] **Decades of imposed and opposed industrial activity ensued.** The Ranger uranium mine was authorised by the Australian government using the Atomic Energy Act (1953) — Cold War-era legislation that allowed the mining of uranium for military purposes. As a consequence, the primary legal power at Ranger resides today with the federal Resources Minister.

1975 *The Ranger Uranium Environmental Inquiry* (Fox Report) explored the tensions between environmental, Aboriginal, commercial and national interests around uranium mining in Kakadu. **It clearly acknowledged the opposition of Aboriginal people** but recommended "their opposition should not be allowed to prevail".[8]

1976 The Aboriginal Land Rights Act **explicitly excluded Ranger from its veto provisions.**

1978 Ranger was finally approved against the backdrop of a Northern Territory push for greater political autonomy from the national government. Through a combination of ministerial deals and informal institutional agreements, **the Australian government ceded regulatory power** over Ranger's day-to-day operations to the Northern Territory government.

1978 The Australian government established the Office of the Supervising Scientist (OSS), now called the Supervising Scientist Branch (SSB), to research and track the impacts of uranium mining in the Kakadu region. Although SSB is often perceived as the chief regulator, **their primary role is environmental research and to provide advice** to the federal Environment Minister who shares this with the federal Resources Minister.

1979 **The Ranger uranium mine began operations on Mirarr land,** following a no-consent Commonwealth 'Authority to Mine'. This was a profound social injustice for the Mirarr people, who had consistently opposed uranium mining on their traditional lands.

1979 — **The Australian government sold its stake in the mine,** leading to the formation of current mine operator Energy Resources of Australia (ERA).

1981 — The first ore was milled in August and the operation was formally opened in October. **Around 20 million tonnes of ore was extracted from the original open cut mine** (Pit 1) from 1981 until the deposit was exhausted in December 1994.

1988 — North Broken Hill Holdings (North) became the **principal shareholder** acquiring a 68% stake in ERA.

1995 — The Gundjeihmi Aboriginal Corporation was formed to **represent the interests of the Mirarr Traditional Owners** to the wider regional Aboriginal representative body — the Northern Land Council — and to the Northern Territory and Australian governments.

1997 — ERA started a **second open cut pit** at Ranger (Pit 3).

1998 — North and ERA tried to develop the adjacent Jabiluka deposit but were **stopped by sustained opposition from the Mirarr Traditional Owners,** with strong civil society and wider community support.

2000 — Rio Tinto purchased North and ERA — becoming **the largest shareholder in the Ranger uranium mine.**

2009 — ERA announced a Ranger 3 Deeps (R3D) underground resource on the Ranger site. However, despite development approvals and some initial work, **the project was abandoned in June 2015 due to depressed commodity prices and stakeholder concern.**[9]

2012 — The Ranger mine continued to process stockpiled ore but **no longer extracted new supply.** Over 40 years, Ranger has produced more than 120,000 tonnes of uranium oxide — one of only three uranium operations globally to have reached this scale.

2018 — ERA releases its first Mine Closure plan **detailing the rehabilitation approach.**

2021 — ERA required to **end all mining and processing at the Ranger site.**

2026 — End of the **current mandated rehabilitation period at Ranger.**

It is crucial that both the mining company and the Commonwealth take full responsibility for the clean-up at Ranger mine: passing the buck will not provide the best outcomes

In 2020 ERA released an updated Mine Closure Plan outlining the rehabilitation approach.

To understand the scale of the rehabilitation project at Ranger, it is useful to compare it to other former Australian uranium mines, shown in Table 1. The table demonstrates that the Ranger mine has produced a significantly greater volume of waste rock than other uranium projects. This adds scale and complexity to the rehabilitation task ahead. Smaller and less complex mines than Ranger have failed to be successfully rehabilitated and this pattern must not be replicated.

Table 1[13]: Uranium mine production and rehabilitation across Australia (updated from Mudd, 2002a[14], 2002b)[15]

Project	Period	Mine Production				Rehabilitation Period
		Mt ore	%U3O8	t U3O8	Mt WR	
Rum Jungle[A]	1954-1971	1.5	0.32	3,530	14.3	1983-1986; 2021 to ??
USAV-Moline[B]	1956-1964	0.135	0.46	716	no data	2006-2010
USAV-Rockhole[C]	1959-1962	0.013	1.11	140	no data	2006-2010
Mary Kathleen	1958-1963 1976-1982	2.71 6.2	0.16 0.10	4,092 4,801	4.43 17.57	1983-1986
Radium Hill[D] Port Pirie[D]	1954-1961 1955-1962	0.969 0.152[D]	~0.12 ~0.7	- 852	no data	1981
Olympic Dam[E]	1988-2020[E]	209.3	0.073	92,897	~21	still operating
Nabarlek	1979-1988 1989[F]	0.598 0.157	1.84 0.05	10,955 80	2.33	1994-1995
Ranger	1981-2020[G]	64.5[G]	0.23[G]	132,100[G]	~255	2021-2026

[13] Notes: Mt – million tonnes; WR – waste rock (includes low grade uranium ore not processed); USAV – Upper South Alligator Valley; ~ – approximately; [A]Uranium ores only (excludes additional base metal ores); [B]Moline was the central mill just outside the USAV receiving ore from numerous small uranium mines in the USAV; [C]Rockhole received ore from three very small uranium mines and the mill was located in the USAV; [D]Radium Hill supplied a uranium ore concentrate for chemical processing at Port Pirie; [E]Olympic Dam ore also extracts copper, gold and silver (but not rare earths, cobalt or tellurium); [F]small heap leach project; [G]Ranger production extrapolated to 8 January 2021 (i.e. assumes 0.625 Mt ore at 0.07% U^3O^8 to produce 385 t U^3O^8 in the December 2020 quarter).

[14] Mudd, G M, 2002a, Uranium Mill Tailings in the Pine Creek Geosyncline, Northern Australia : Past, Present and Future Hydrogeological Impacts. Proc. "Uranium in the Aquatic Environment : Uranium Mining and Hydrogeology III (UMH-3) - 3RD International Conference Including the International Mine Water Association Symposium", B J Merkel, B Planer-Friedrich & C Wolkersdorfer (Ed's), Springer, Freiberg, Germany, September 15-21, 2002, pp 831-840.

[15] Mudd, G M, 2002b, Uranium Mining in Australia : Environmental Impact, Radiation Releases and Rehabilitation. Proc. "SPEIR 3: 3RD International Symposium on the Protection of the Environment From Ionising Radiation", International Atomic Energy Agency (IAEA) & Office of the Supervising Scientist (OSS) (Ed's), Waste Safety Section, International Atomic Energy Agency (IAEA), Darwin, NT, July 22-26, 2002, pp 179-189.

All parties need to ensure there is sufficient time **to make informed decisions**

Previous page. Ranger uranium mine.
Photo. ChameleonsEye/Shutterstock.com

Timeline
and beyond 2026

It is increasingly apparent that the rehabilitation works at Ranger will not be achieved by 2026. In short, they will not be completed within the currently legislated five-year timeframe. Attempts to limit remediation works to comply with this arbitrary timeframe, rather than achieve the optimum outcome, will compromise the effectiveness of rehabilitation efforts.

There is a growing sentiment that the closure period should be extended through an amendment to the Atomic Energy Act 1953 that provides for site access for rehabilitation purposes post-2026. Currently some dates for completion of works are being pushed back further to the point that they may not be completed in time. **The rehabilitation period must be extended as a matter of priority.**

Poor rehabilitation decisions are being made within the constraints of this time-frame, risking adverse impacts on Kakadu National Park. These include the decision to leave the tailings wall and the floor of the tailings dam in situ rather than be actively remediated; the unexplained de-priorisation of the tailings plume as a high-risk issue and the consequent failure to clearly articulate a remediation plan for the tailings plume.

These decisions demonstrate that working to a constrained time-frame will significantly impact on the success and outcomes of the rehabilitation works. All parties need to ensure that there is sufficient time to make informed decisions about what is optimal, rather than being constrained by what is possible in the limited time currently allocated for rehabilitation works.

For example, the application for deconstruction works of the Tailings Storage Facility (TSF) should have been lodged one year ago. These crucial plans and subsequent works have been delayed by nearly four years and are now expected in 2023 with closure to be completed by 2026. This leaves little or no time for deploying any contingency planning and may lead to decisions being made that prioritise the works being completed on time, but at the cost of compromising the overall rehabilitation effort.

Application	Forecast in 2020 RMCP	Forecast in 2019 RMCP	Forecast in 2018 RMCP
TSF deconstruction	4 August 2023	Oct – Nov 2021	1 December 2019 – 1 Jan 2021

The delayed rehabilitation of the TSF has already meant that ERA is now proposing to leave the floor of the TSF in situ rather than burying it in the mined-out pits along with all other tailings, as required by the Ranger Environmental Requirements (ERs). There is a cascading effect on completing the capping and revegetation, all of which are likely to have their own problems and delays. Working to such a constrained time-frame has already led to compromise and limits the ability to develop and adopt contingency plans.

Moreover, if the legislated period for closure is not extended, we would expect that the Commonwealth would resume all responsibility for completion of rehabilitation past the 2026 deadline. The 2020 RMCP suggests the net present cost for the preferred plan is $744 million,[16] but what is included and what may be omitted in that figure remains unclear. There was an absence of discussion of post-closure monitoring and maintenance and costs associated with that important work. It is unclear what financial provisions are held by the Commonwealth to complete the rehabilitation in the case that the legislated time-frame for completing rehabilitation works is neither extended nor met.

The time-frame limitations are also directly relevant in the development of closure criteria. The prolific use of the "As Low as Reasonably Achievable" (ALARA) principle in closure criteria is problematic and allows a range of factors to be considered in deciding what is "reasonably achievable". With a legislated limit on the time allowed for rehabilitation work we are concerned that ERA/Rio Tinto may argue that constrained timelines constitute a "reasonability" factor. This could see rehabilitation decisions being increasingly driven by what is feasible in the time-frame, not by what is either best or necessary to achieve the ER's and legislated commitments and obligations. We contend that the ALATA – As Low as Technically Achievable – principle should be adopted instead. This approach prioritises best environmental and wider outcomes and is more likely to realise both legal obligations and stakeholder expectations.

There is legitimate concern that Ranger could be heading towards the same outcome as Nabarlek – the rehabilitation works are supposedly finished but the site remains far from formal closure with decades to pass before it could even come close to being considered to be in an acceptable state.

Significant decisions are being made about what to remove & what to leave in situ **with no clear understanding of the cumulative impact**

[16] Section 11.1 Ranger Mine Closure Plan 2020.

Environmental **concerns**

Inadequate information and deficient Key Knowledge Needs

An overarching concern regarding both rehabilitation and post-closure thinking and work at Ranger is the current lack of knowledge and attention around key social and environmental risks and their management.

It is surprising and deeply concerning that despite the often repeated claim that the Ranger uranium mine is the most regulated and monitored mine site in the world, so little is known about some of the most fundamental environmental and rehabilitation challenges, and how they will be regulated. This is evidenced, for example, by the continuing uncertainty over how contaminated groundwater beneath the tailings dam will be remediated – will it move off-site and towards Kakadu National Park or will it rise and be appropriately managed? This is just one example of the important knowledge deficits in the current rehabilitation planning process.

The Supervising Scientist Branch (SSB) calls these knowledge gaps "Key Knowledge Needs (KKNs)"and provides a list of KKNs in their assessment report of the RMCP. This long list contains many questions and uncertainties but very few answers.

This demonstrates that there is still a lot we don't know about what will happen to the site and the surrounding Kakadu World Heritage region, either during rehabilitation works or post-closure. This is alarming given that rehabilitation works have already begun and are due to be completed in 2026. For example, in the 2020 RMCP, only 14 of the 80 KKNs highlighted by the SBB have been addressed.[17]

None of the 13 KKN questions posed by SSB on "Characterising contaminant sources on the RPA", "Predicting transport of contaminants in groundwater" or "Predicting transport of contaminants in surface water" have been addressed by ERA in their 2020 RMCP. Critical questions remain unanswered, yet the rehabilitation works have already begun.

Significant decisions are being made about what to remove and what to leave in situ with no clear understanding of the cumulative impact. This inspires no community confidence in the rigour of the decision making around these works. Given the long industry history of failed attempts to rehabilitate uranium mine tailings we remain highly sceptical that ERA has the information needed to meet its legislated requirement of isolating tailings from the environment for at least 10,000 years.

"The main area of concern for the Supervising Scientist is in relation to contaminant transport modelling, which is required to assess whether or not the planned rehabilitation activities will prevent future environmental impacts from mine contaminants…. **At this point in time, the Supervising Scientist does not believe there is sufficient information provided to support the statements in the RMCP that contaminants from the landform do not pose a risk to the downstream environment." (SSB Assessment Report 2019, iv-v).**

This remains an outstanding issue in the 2020 RMCP as contaminant transport modelling has still not been completed. Given the purpose of the rehabilitation process is to give effect to the clear and long-standing ERs, this absence of attention to the deficiencies in the KKNs demands a response. **For a key Commonwealth agency to indicate this late in the rehabilitation process that success is not assured should be a clear red flag for the Commonwealth government, as it should be for ERA and Rio Tinto.**

[17] See Appendix 5.5 of Section 5 of the 2020 RMCP.

Tailings management

Environmental concerns about the management and rehabilitation of tailings are underpinned by four broader issues: i) an arbitrary and constrained timeframe ii) a lack of contingency planning iii) unaddressed KKNs and, iv) a lack of transparency.

In 2008 the CSIRO released a report identifying that an estimated 150,000 litres[18] of contaminants were leaking daily from the tailings dam. In 2009 it was confirmed that at least 100,000 litres were leaking each day.[19] **Tailings seepage has now resulted in a contaminated plume of groundwater of at least 1GL (1 billion litres) under the tailings dam.[20]**

"In previous groundwater models that take explicit account of potential for fracture flow, seepage of TSF pore fluids to groundwater is found to be of the order of 150 m3 /d (Puhalovich et al., 2008). If we conservatively assume that this rate has applied evenly for 20 years, then approximately 1 GL of contaminated groundwater may be located under the TSF, which is in line with previous conservative estimates" (Townley, 2005; Puhalovich et al., 2008).

We have deep concerns about the size and scope of the plume and its downstream and long-term impacts. We are concerned about the decommissioning of the Tailing Storage Facility's pit wall, the proposal to leave sub floor tailings in situ[21] and the unexplained de-prioritisation of the remediation of the tailings plume.[22] The plume and contaminated site management plan is not finalised or public and yet this is crucial to the success of the rehabilitation project. These concerns are exacerbated by unresolved KKNs, the lack of transparency on modelling and public exclusion from future decision making about tailings management. The deferral of contingency planning, including for the TSF deconstruction, to the 2023 RMCP furthers this uncertainty. There is no clear contingency plan and there remain significant deficiencies in the KKNs. We strongly advocate for the KKNs to be addressed as a matter of priority and for greater transparency and engagement with stakeholders on tailings management.

Tailings wall, floor and plume

In past years environment groups were assured that the hydraulic head of the 1km sq 50+m high tailings dam was holding in place an estimated 1 billion litres of toxic plume. Serious concerns remain that removal of that dam is one of the greatest single changes to management on site and is anticipated to impact on the plume.

During the Wet seasons between 2014–2016 there were discharges of contaminated groundwater from Ranger to Gulungul Creek through Gulungul Creek Tributary 2 (GCT2). It was reported that the released water had an elevated electrical conductivity (EC) and was high in Mg, Ca, Mn, and SO4 (EC; maximum 120 μS/cm measured at the downstream monitoring station in Gulungul Creek in 2015).[23]

At the time, environment groups were concerned to learn of emergency works to divert contaminated seepage from the tailings dam to Gulungul Creek Tributary 2 (GCT2). This was an unplanned off-site impact. Once the scope of the problem was realised, ERA began pumping millions of litres from a hastily constructed interception trench. This was described as an unintended side effect of their land application area (LAA) experiments and starkly demonstrates how changed land management activities can impact and alter shallow groundwater flows. The same type of risk is posed by the plan to remove the hydraulic head of tailings from the 1 billion litres of plume currently being held in static equilibrium under the tailings dam.

In the 2018 RMCP the tailings plume was identified as the single greatest rehabilitation risk[24] (Class III, high). However this issue has now apparently been parked by ERA as not requiring rehabilitation. Current plans are to leave these contaminants in situ. ERA seeks to justify doing so by "inbuilt conservatism" in modelling but the INTERA 2016 and 2019[25] modelling this approach is based on, was not provided in the RMCP. This absence raises serious questions about the robustness, legitimacy and transparency of the ERA modelling.

It remains unclear what ERA considers to be conservative and if their definition is reasonable. There is also a lack of detailed reasoning or evidence for the "low probability" risk ranking. **Put simply, there is no comprehensive plan for addressing the tailings plume.**

Further, there is no assessment of the additional risks from the deconstruction of the tailings storage facility (TSF), which may add additional pollution flows into the existing plume. The August 2020 approval for TSF subfloor material management was based on information limited to the wall and floor material, not the plume. The 2020 RMCP suggests removing the subfloor material from below the TSF and placing it in Pit 3 would result in higher solute loadings to the environment.[26] There is little discussion about the impacts of leaving the material in situ and there is an absence of discussion on how this will impact the plume beneath the TSF, or whether this decision is even consistent with the ERs and other existing commitments and obligations.

The approval for TSF subfloor material management has occurred despite many unanswered issues in the 2020 RMCP. The details that informed the August 2020 decision to approve leaving the TSF sub floor material in situ are opaque and problematic. This approach sets a poor precedent for transparency and engagement on significant technical aspects of the rehabilitation works. We remain unclear on the process for the standalone assessment of the tailings storage facility floor and unconvinced about the rationale for leaving the material in situ.

In response to the 2019 RMCP, the SSB sought further information about the extent of the contamination within the floor and walls of the dam; the movement of contaminated groundwater beneath the dam and plans for remediation. They also specifically identified a lack of related contingency planning.[27] Best practice for contingency planning for contaminated sites is to, in the first instance, use Best Practicable Technology (BPT). Other options that are not BPT then make up the contingency.

However there are no details on what the BPT or alternatives are. This issue remains unaddressed in the 2020 RMCP, with ERA simply deferring details regarding contingency planning to future iterations of the RMCP.

The current RMCP states that natural attenuation will be the proposed method for management of these plumes and that impacts to groundwater after site closure from the reclaimed TSF will be less than those observed during the operational period. It is proposed that sub floor contaminants and the tailings plume will be left in situ.[28] There is limited evidence provided through the RMCP and no comprehensive discussion about the long-term consequences of this approach or any alternatives. **It is a deep concern that at this stage of closure there is still so much uncertainty about the extent of the contamination and no plans or clear intention to develop plans to remediate the tailings plume.**

[18] M. G. Trefry, 14 November 2008. Ranger Tailings Storage Facility: Review of hydrogeological issues for a wall lift to RL+54m. Report to Energy Resources of Australia Ltd, CSIRO, Canberra.

[19] https://www.smh.com.au/national/polluted-water-leaking-into-kakadu-from-uranium-mine-20090312-8whw.html

[20] ibid

[21] 2020 RMCP - 9.3.3.3.3 TSF subfloor material management

[22] 2020 RMCP - Risk Assessment S07 RISK ID 504602

[23] Supervising Scientist, Department of the Environment and Energy, Australian Government. 2017. Toxicity of contaminated waters from Gulungul Creek Tributary 2 in 2015 and 2016. Internal Report 652

[24] Section 10.4.1 - 2018 Ranger Mine Closure Plan

[25] The INTERA reports are referred to in section 5, referenced 165 times, as key source of information on groundwater modelling.

[26] See section 9.3.3.3

[28] "Tailings Storage Facility (11.4.3) - only includes contingencies for the risk of dredge disposal i.e. missing contingencies for risks for potential issues such as Tailings Storage Facility wall breach while still in use, management of contaminated materials (i.e. residual tailings on inside walls, floor, clay core, rip rap), and the contaminated groundwater plume." SSB, Appendix A, Comment #67, pgA17.

[29] S07 Risk ID 504602 (p49)

Climate change impacts

In the short term, more rainfall than planned for could put extra pressure and delay treatment of mine process water. The RMCP identifies this possibility as a Class IV critical risk. In the long term, the Kakadu region is set to experience rapid rates in sea level rise due to climate change. By 2030 the region will see some saltwater inundation of floodplains due to sea level rise. By 2070 this saltwater inundation will be widespread, affecting around 65% of freshwater floodplains.[29] This will create significant ecological and management challenges for the region[30] as rapid and complex transformations take place.

This is the fast-changing environment in which the rehabilitation of the Ranger uranium mine will take place. The impacts of climate change will make their mark in profound and often unpredictable ways. Recent research has highlighted the uncertainties and risks inherent in the cumulative impacts of both climate change and the rehabilitation of the Ranger uranium mine on the surrounding environment, including on groundwater[31] and ecosystems.[32]

Although acknowledged in the SSBs modelling, these analyses appear conspicuously absent in ERA's closure planning. While ERA states that global climate change scenarios have informed the studies underpinning the RMCP, it is unclear how. There does not seem to be any detail on how climate change risks have been considered in the modelling of contaminants being transported off-site via surface and groundwater. The RMCP discussion on risk management does not explicitly address climate change risks at all.

There is a clear regulatory requirement that the Ranger tailings be isolated from the surrounding environment, and that migrating solutes do not cause impacts for 10,000 years. Given this key requirement **it is profoundly deficient that the RMCP does not provide any detailed risk analysis or assessment of climate change impacts in an unpredictable and fast-changing monsoonal environment.**

Closure criteria

There are two fundamental problems with the current closure criteria. First, the criteria presented are weak, vague and contested. Second, the continuing uncertainty about the extent of contaminants coming from the site means that even if criteria are agreed upon, the material coming off site may well exceed them. Closure criteria that have been put forward for Ministerial approval should therefore be deferred until (at the very least) there is a complete and robust contaminant transport model which is supported by all stakeholders.

We are also critical of the existing process of ERA/Rio Tinto establishing their own criteria which are generally weak, vague, unenforceable and require revision to meet SSB rehabilitation standards. We note that in the 2019 RMCP ERA proposed rehabilitation standards in the Magela and Gulungul creeks that would have accepted contaminant levels much higher than those proposed by the SSB. We note that in the 2020 closure criteria ERA has adopted SSB standards (Criteria W3). We welcome this trajectory, however, this is largely theoretical given there is still so much we do not know about the extent and nature of contaminants coming off the site.

[29] See Bayliss, P., Saunders, K., Dutra, L.X., Melo, L.F., Hilton, J., Prakash, M. and Woolard, F., 2018. Assessing sea level-rise risks to coastal floodplains in the Kakadu Region, northern Australia, using a tidally driven hydrodynamic model. Marine and Freshwater Research, 69(7), pp.1064-1078.

[30] See Dutra, L.X., Bayliss, P., McGregor, S., Christophersen, P., Scheepers, K., Woodward, E., Ligtermoet, E. and Melo, L.F., 2018. Understanding climate-change adaptation on Kakadu National Park, using a combined diagnostic and modelling framework: a case study at Yellow Water wetland. Marine and Freshwater Research, 69(7), pp.1146-1158.

[31] See Kabir, M., Mudd, G.M., Ladson, A.R. and Daly, E., 2008. Groundwater-climate relationships, Ranger uranium mine, Australia: 3. Predicting climate change impacts. In Uranium, Mining and Hydrogeology (pp. 361-370). Springer, Berlin, Heidelberg.

[32] See Humphrey, C.L., Bishop, K.A. and Dostine, P.L., 2018. Vulnerability of fish and macroinvertebrates to key threats in streams of the Kakadu Region, northern Australia: assemblage dynamics, existing assessments and knowledge needs. Marine and Freshwater Research, 69(7), pp.1092-1109.

Most other draft and proposed closure criteria do not have numerical, specific or measurable criteria. We maintain that the SSB should be setting stronger closure criteria, and that ERA should not be allowed to set or play a leading role in designing their own closure criteria. SSB only has an 'advisory role', however they are the agency that will provide the ultimate advice on the adequacy of the Ranger rehabilitation works.

In considering the closure criteria we have reviewed the "Framework for developing mine site completion criteria in WA"[33] as the RMCP was required to meet the WA guidelines for developing mine closure plans. Given this, it is appropriate to reflect on WA standards for establishing closure criteria and to additionally note that Rio Tinto contributed funding to the project which developed this Framework.

Our view is that the existing set of closure criteria needs serious reform and any decision making on closure criteria should be postponed. There should be a clear and dedicated process for agreeing to closure criteria amongst multiple stakeholders. The WA guidelines advise that criteria should be evidence based, however in its current form the proposed and draft criteria are not consistently based on evidence, in part because that evidence does not yet exist. The WA guidelines advocate for criteria that are "Specific, Measurable, Achievable, Relevant and Timely" (S.M.A.R.T).[34] The proposed and draft criteria in the RMCP fall well short of the S.M.A.R.T framework.

There are very few criteria that are specific and the majority are therefore unmeasurable. There are also very few criteria that are numerical. While we hope they are achievable, there are significant knowledge gaps that make attainment highly uncertain. The WA guidelines provide details on a range of approaches to setting numerical values and show a clear preference for setting numerical values based on the pre mining reference values. Other options include basing these on the understanding of risk, common practice precedent, best practice precedent and more.

The WA guidelines provide some detailed advice on setting closure criteria. In particular they advise that criteria be agreed. ERA is currently undergoing consultation through the release of the RMCP but it is not clear what the process is for achieving agreement, and with who. Clearly this needs to include both the SSB and future users – particularly the Mirarr. We also urge a greater role for civil society input into this process.

The criteria presented by ERA do not include timelines for achieving outcomes or measurement over time. These are critical in being able to determine at what point the criteria may be considered to have been met. This is particularly problematic where criteria are based on achieving design parameters and not based on achieving an outcome. Design parameters based on computer modelling are theoretical. There must be criteria for post-closure monitoring to measure, over a significant time period, to prove the theory and demonstrate that the designs and modelling are viable and working. As we have seen with other attempts at mine site rehabilitation it is often decades after closure that problems and structural failures emerge.

'As low as reasonably achievable'

The use of the "As Low As Reasonably Achievable" (ALARA) principle has permeated through much of the RMCP plan and is the key element of many of the draft closure criteria. There must be clear, measurable and defined criteria that sets limits. The use of ALARA compromises the intent and value in developing closure criteria and has significant implications for holding ERA/Rio Tinto accountable for the outcomes at the site.

We are also concerned about the erosion of the definition of Best Practicable Technology (BPT) over time. The early origins of BPT requirements at Ranger come from the 1977 Fox Inquiry which advised that "all required rehabilitative work and all measures required for the continuing protection of the environment be carried out by the operator

[33] https://www.dmp.wa.gov.au/Documents/Environment/Framework_developing_mine-site_completion_criteria_WA.pdf

[34] ibid

at its expense." It was recommended that "the BPT (developed anywhere, which can be applied to the uranium industry in Australia) to prevent environmental pollution and degradation be adopted from the outset." In the 2020 RMCP the definition and its application in the rehabilitation of Ranger has become more convoluted: "BPT – that technology from time to time relevant to the RPA which produces the maximum environmental benefit that can reasonably be achieved having regard to all relevant matters."

The latest interpretation creates a framework that prioritises subjective corporate and economic considerations over objective environmental ones. This is a highly problematic misinterpretation of the Fox Inquiry and its expectations.

The subjective measure of "reasonability" is a dangerous precedent in setting environmental requirements, or closure criteria. It allows for the consideration of factors that could seriously compromise the overall environmental objectives and outcomes. The erosion of the definition of BPT is as concerning as the increased use of ALARA.

We support the adoption of the As Low As Technically Achievable (ALATA) model rather than the current ALARA approach. What is technically achievable is a stronger benchmark than what is 'reasonably' achievable – which can often be vague and subjective. We welcome further discussion and engagement on the approach that will deliver the best outcomes and hold ERA/Rio Tinto to the highest standards of accountability.

The use of ALARA in the current closure criteria is suboptimal. For example, the objective "ER 2.2 (c) Erosion characteristics of the rehabilitated landform, as far as can reasonably be achieved, do not vary significantly from comparable landforms in surrounding undisturbed areas." A draft closure criteria for this ER is "Accumulation of erosion products in Coonjimba and Georgetown Billabong will be ALARA". Instead of this vague and open ALARA criteria we suggest ERA look at the erosion characteristics in comparable landforms in surrounding undisturbed areas. What variation of those characteristics would be unacceptable and have a negative environmental, social or cultural impact? What accumulation of erosion products in the Coonjimba and Georgetown Billabong is acceptable?

Above. Kakadu. *Photo*. Kerry Trapnell

Following page. Saltwater crocodile, Kakadu.
Photo. EcoPrint/Shutterstock.com

The answers to these questions would form the basis for setting far clearer and more robust criteria that are specific and measurable.[35]

All but one closure criteria for "Flora and Fauna – ecosystems"[36] refers to a reference site. We would expect criteria to be able to identify reference site values for the "species richness," "number of vertebrate species," "evenness of bird species," "activity, diversity and functional diversity," "abundance of all Class B weeds", "abundance of introduced flora species," "abundance of feral species" and "chemical and biological indicators."

Contingency planning

We note and welcome the SSB's call for contingency planning for a range of factors throughout the RMCP. These include water treatment, availability of tubestock and the timing of addressing and implementing the unresolved KKN's. However, we note that **ERA seems to think it is adequate to identify contingency options, rather than actually develop them.** It is only by actual detailed planning for contingencies, and testing how these would work in the real world, that their effectiveness can be assessed. Current contingency options risk being vague, unachievable and overly optimistic.[37]

We note that ERA has asserted that there is no need for contingency planning for:

- secondary capping and bulk backfill
- the stockpile domain
- infrastructure removal or any rehabilitation elements of the Ranger 3 Deeps exploration, Gagudju Yard, Ranger Mine Village, Magela Levee, the landfill sites and bioremediation pad or explosives magazine area.

ERA has deferred contingency planning for the rehabilitation of water management areas. Contingency for the nursery is limited to securing licensing to retain the nursery but does not address the risk of failing to secure the necessary quantity of tubestock.

We also note some very rudimentary contingency planning documented in section 9 of the RMCP:

- For any delay to infrastructure deposition in Pit 3 the plan is to deposit in Ranger Pit 2.
- For borrow pits the plan is simply to delay closure until they are no longer required.
- For trial landforms the plan is a non specific proposal for "appropriate weed and fire management".
- For the airport the plan appears to be to defer responsibility and liabilities to any future operator.

ERA's overarching approach to contingency planning on an 'as-needs' basis does not inspire confidence. As discussed earlier in relation to tailings, we are frustrated and concerned about the unfolding plans for tailings management, the unexplained de-prioritisation of the risks relating to the tailings plume and the complete absence of contingency planning for this aspect. We note the GTC2 example where changed land use has significantly altered groundwater flows and poses a significant risk to the plume. There is a clear and pressing need for credible contingency planning for this aspect of the project.

[35] This is also applies to criteria L7, W5, S1 and S2 and Section 8 -34.

[36] S8 Post Closure Land use, Closure Objectives and Closure Criteria. ERA RMCP 2020. ER 2.2 (a)

[37] Appendix A (responses to comments on the 2019 plan) comment #67 re TSF (previously identified as highest risk):"Where possible the details requested have been provided, however in most cases this level of detail is not available and ERA believe not required. Contingency plans are developed to order of magnitude level and then are parked pending need. If need develops the various options are then assessed and progressed to engineering."

There are no apparent ongoing or planned monitoring activities of the social impacts of closure on Aboriginal people

Social **impact**

As the closure of the Ranger mine fast approaches, social impacts should be front and centre, yet there are no apparent ongoing or planned monitoring activities of the social impacts of closure on Aboriginal people. This is inconsistent with the Fox Inquiry and the Commonwealth Environment Protection (Alligator Rivers Region) Act (1978) which both clearly stipulate the importance of the social and cultural domains to the "environment".[38]

There are three studies that collated significant material on the social impacts of uranium mining in Kakadu which should also inform the closure planning at Ranger. The first is the Fox Inquiry itself. It explored and highlighted a broad range of social impact issues that would require monitoring and managing. The second is the "Social Impacts of Uranium Mining Project (SIUMP)"[39] undertaken during the 1980s, while the third is the Kakadu Region Social Impact Study (KRSIS) which was done during contestation over the Jabiluka mine proposal in the late 1990s. None of these studies feature in any of ERA's RMCPs. There is no discussion of how the issues raised in these original studies link back to, or might inform, the mine closure process. This means that key social baseline data collected throughout the life of the mine is not integrated into the mine closure process.

Further, there has been no publicly released Social Impact Assessment (SIA) for the mine closure at Ranger to date. Only one SIA has been undertaken, by Jacobs consultancy in 2016-2017. This SIA has not been made public and limits itself to the base-case scenario of rehabilitating the townsite.

Previous page. Ranger mine. ChameleonsEye/Shutterstock.com

It was not concerned with social aspirations to retain the town and transition to a tourism economy, nor did it address cultural and social issues.[40] While both the 2019 and 2020 RMCPs talk about a future updated SIA, it appears this will be mostly concerned with social infrastructure and housing. While social infrastructure and housing are clearly important, this approach fails to consider any regional assessment of the overall social impact of mining to date. Furthermore, it can be argued that mining has not improved overall social conditions for the Aboriginal communities of the region. We note that in response to elevated local cancer rates, regional, Northern Territory and national medical bodies have recently highlighted the lack of analysis around the social impacts of uranium mining. The lack of any publicly available SIA precludes any ability to test or review the overall impact on the community.

[38] While there has been substantial and ongoing investment in the monitoring of biophysical environmental conditions arising from the mining operations, particularly, but not solely by the SSB, there has been no parallel commitment to engagement with the social and cultural environmental consequences. This is despite the clear obligation placed on the Commonwealth, its agencies and private interests by the Commonwealth legislation (Environment Protection (Alligator Rivers Region) Act (1978)), which defines environment as specifically encompassing the social and cultural domains: environment includes:

(a) ecosystems and their constituent parts, including people and communities; and (b) natural and physical resources; and (c) the qualities and characteristics of locations, places and areas; and

(d) the social, economic and cultural aspects of a thing mentioned in paragraph (a), (b) or (c).

[39] See Australian Institute of Aboriginal Studies. Uranium Impact Project Steering Committee (1984). Aborigines and Uranium: Consolidated Report on the Social Impact of Uranium Mining on the Aborigines of the Northern Territory. Canberra, Australian Government Publishing Service. (This was the consolidated report of the Committee, which reported every 6 months directly to Parliament from 1978 to 1984.)

[40] The one social impact assessment (SIA) that is referred to in the RMCP concerns an SIA of the base case scenario and associated impacts, commissioned by ERA and undertaken by Jacobs consultancy in 2016-2017. The base case reflects ERAs obligations under the current lease agreements to rehabilitate the town and associated infrastructure (i.e. bulldoze it). It does not have a specific focus on Aboriginal cultural and social issues, but concerns the town as a whole. Moreover, the said SIA does not assess any other further scenario other than the base case, so Mirarr aspirations are not assessed. The SIA was not publicly released: for a summary of the SIA, see http://www.energyres.com.au/uploads/general/170717 ERA_SIA_-_Factsheet_FINAL.pdf

The RMCPs say very little on social impacts, aside from ad-hoc references. We note that the 2019 RMCP chapter "Environment and social setting" contains 38 pages on environment considerations and just one page on the social. The same section in the 2020 RMCP is 250 pages but still there is just one page on the social context. The 2020 RMCP discussion on social issues is scant. There is some detail on radiation uptake in bushfoods, a few mentions of ERA's exit from Jabiru and a longer discussion on the development of closure criteria for cultural values. However, the reference to closure criteria for cultural values is limited and it is unclear if that is confined to landforms or includes other rehabilitation issues such as tailings isolation, ground and surface water. It also lacks detail on how Mirarr participation in monitoring would be funded. Moreover, there is no comprehensive assessment on the social impacts of the Ranger mine nor of the wider impacts of the closure of the mine.

Key issues that have not been addressed in any of the RMCP iterations to date include: a review or assessment of the social inequalities and conflicts associated with mining royalties; how royalty funded Aboriginal programs are to be financed post mining; how Aboriginal health, housing, education and employment have been impacted by mining, and will be further impacted by closure. These are key social impact issues that have been consistently highlighted by the Fox Inquiry, SIUMP and KRSIS as requiring attention yet they are absent from the RMCP process to date by both ERA/Rio Tinto and the Supervising Scientist Branch (SSB).

The SSB has been notably quiet on social impact – an omission which is both disappointing and problematic. The SSB has stated that "the ultimate objective of rehabilitation… is to prevent long-term impacts to people and the environment surrounding the Ranger Project Area" (SSB assessment report 2019 iv) and more specifically, to "protect the health of Aboriginals and other members of the regional community" (SSB assessment report 2019 p. 4). This objective is unlikely to be realised without any comprehensive assessment of the existing social impacts or an evaluation of future impacts associated with closure. The review on social impacts to date has been limited to cultural values and radiation uptake through bush foods. This is not comprehensive and reveals a limited understanding of the complexities of social impacts of mining on communities at both the corporate and government level. This situation is far below international best practise or contemporary community expectation.

We also note that SSB's attention to gaps in ERA's RMCPs have been limited to a narrow definition of the "biophysical environment". In particular, in their assessment reports of the RMCP, the SSB has failed to identify social impacts as a knowledge gap, despite there being no ongoing or planned monitoring of the social impacts on Aboriginal people of closing the Ranger mine.

Despite the absence of a comprehensive SIA process, we note that Gundjeihmi Aboriginal Corporation (GAC) and the Mirarr community have advocated strongly for resources, and have been proactive in securing the return of Jabiru township to Aboriginal ownership. They have also taken a lead role, through complex negotiation with National Parks, in conservation and fire management as well as in local health and education.

What is needed, in addition to an open and robust RMCP, **is a wider transition plan for the Kakadu region**

This determined and proactive community faces an uncertain future without the necessary assessment and ongoing support from the company or government to transition to a post-mining economy. The omission of social impact data, and absence of a comprehensive assessment and specific requirements relating to social impacts, equates to a significant social injustice on the part of both the company and government.

The transition from commercial mining to active rehabilitation and exit preparation provides an important opportunity to review the impacts and the adequacy of wider governance frameworks. This could begin with consideration of a transition plan for the Alligator Rivers Region to release the area from the structural arrangements that were put in place to facilitate uranium mining. The Alligator Rivers Region, including Kakadu National Park, was engineered to facilitate uranium mining. It is timely and appropriate that with the conclusion of mining in the area, the effectiveness and applicability of the suite of legislation designed to create a uranium mining region is reviewed. The area will no longer have an extractive industry focus and should instead be governed by policy and legislation designed to support Traditional Owners and country.

In short, the challenges ahead are being too narrowly defined. The RMCP focusses on a limited set of technical issues that pertain mainly to the mine site (all of which are important), but broader issues concerning a just transition for the Kakadu region away from uranium mining are currently being ignored. **What is needed, in addition to an open and robust RMCP, is a wider transition plan for the Kakadu region. If the Commonwealth government was prepared to resource a major Commonwealth inquiry into developing uranium mining in Kakadu – i.e. the Fox Inquiry – it should be equally motivated to do the same as uranium mining comes to an end.**

To address this profound deficiency, we urge the Commonwealth government to:

- fund an independent regional process to assess, monitor and manage the impacts of closure on Aboriginal people in the wider region and realise a just transition to a post-mining Kakadu. This would be informed by and undertaken in close collaboration with the Mirarr people and other neighbouring Traditional Owner groups whose country is regulated under the same arrangements
- ensure future RMCPs address the data from past and future Social Impact Assessments, including the need for social impact management and monitoring programs
- translate this social impact data it into meaningful and transparent commitments, including to work with and fund Mirarr and other neighbouring Traditional Owner groups whose country is regulated under the same arrangements on the transition to a post-mining economy, and
- make social impact management and monitoring a post-closure requirement equivalent to other forms of bio-physical management and monitoring.

Further, at the very least, the Jacobs SIA and all future ERA-sponsored SIA material should be made public.

As the closure of Ranger mine approaches the Commonwealth is almost nowhere to be seen

Previous page. Kakadu.
Photo. Ashley Whitworth/Shutterstock.com

Governance and regulation

There are stakeholder concerns that ERA, the SSB and the Northern Territory and Commonwealth governments are, at least in part, making up the rehabilitation and mine closure approvals process as they go along. The regulatory landscape governing Ranger is highly complex and often unclear and difficult to navigate.[41]

Historically, there has been a great deal of role ambiguity and overlap between the Commonwealth and Northern Territory, particularly in relation to monitoring and enforcement. While ultimate regulatory responsibility for the Ranger site will rest with the Commonwealth post-closure, there are concerns that the chains of responsibility and accountability between the Commonwealth government, the Northern Territory government and ERA/Rio Tinto are not clearly or adequately defined. We are concerned this lack of clarity will continue throughout the closure process and compromise rehabilitation outcomes.

The Commonwealth government had a pivotal role and presence in the formation and development of uranium mining in Kakadu. Without the Commonwealth there would be no Ranger mine. The Commonwealth initiated the Fox Inquiry, was part owner during the exploration and early development works at Ranger, gave approval to the mine in the Australian Parliament, exerted sustained political pressure to remove and explicitly by-pass Aboriginal opposition, removed the Aboriginal veto with respect to Ranger in the Land Rights Act and also made significant promises to the Aboriginal people of Kakadu to protect them and the environment.

Yet as closure approaches the Commonwealth is almost nowhere to be seen. It is certainly not currently acting like a regulator, nor does it appear to be resourced or inclined to assume this role any time soon. The Atomic Energy Act contains none of the usual machinery of environmental regulation, including enforcement, monitoring and offence provisions. The Commonwealth's environmental monitoring authority – the SSB – has no regulatory powers and is an advisory and research group. It conducts research, advises the Commonwealth government and arguably suffers from regulatory capture and an over-emphasis on accommodating corporate imperatives. As the rehabilitation process accelerates there is a clear need for the SSB to be better resourced and engaged in order to guard against future governments inheriting a radioactive burden and legacy at Ranger. Yet in May 2020 it was revealed that almost one third of the SSB budget – provided by ERA to the Commonwealth – was not being paid any more (i.e. the loss of ~$2.5 million)[42] and as of late 2020, this funding shortfall was still being contested between ERA and the Commonwealth.[43] Perhaps more critically, the Commonwealth must have the legal capacity to enforce compliance with the RMCP, or there is little point creating closure criteria.

The virtual absence of the Commonwealth government from the process raises several major risks. One is that in the absence of clear guidance and requirements for post-closure monitoring or maintenance there will be none, or they will be deficient, and there will be no clear legal remedy for achieving their compliance. Without strong engagement and processes for developing closure criteria these will remain weak, vague and unenforceable. Another risk is that in the absence of strong Commonwealth oversight and regulation, standards and expectations will be lower and that compromises along the closure journey will increase.

[41] See, for example, Lea, T., Howey, K. and O'Brien, J., 2018. Waging Paperfare: Subverting the Damage of Extractive Capitalism in Kakadu. Oceania, 88(3), pp.305-319.

[42] Bardon, J, 2020, Ranger Mine locked in stoush over funding for Kakadu uranium rehabilitation monitoring. ABC News Online, https://www.abc.net.au/news/2020-05-19/nt-kakadu-uranium-stoush-ranger-mine-rehabilitation/12260130; Accessed 30 November 2020.

[43] Bardon, J, 2020, Rio Tinto accused of backing away from funding monitoring to prove Ranger mine rehabilitation success. ABC News Online, https://www.abc.net.au/radio/programs/pm/rio-tinto-accused-of-backing-away-from-funding-mine-monitoring/12916512; Accessed 30 November 2020.

The Australian people – via the Commonwealth government – could well end up responsible for any failed rehabilitation works at Ranger, as they have for the early Alligator Rivers uranium mines and the Rum Jungle mine. This situation has led to decades of unresolved environmental pollution and must not be replicated at Ranger.

Post-closure regulatory arrangements

Looking beyond the RMCP and the current program of works, it is critical there is strong governance, regulation and enforcement, both during and after closure. Establishing enforceable post-closure monitoring and maintenance requirements is a fundamental condition for delivering and ensuring the successful closure of the site. There has been a legacy of failed rehabilitation attempts at uranium mines in Australia that provide important lessons which should inform the post-closure governance arrangements. While the rehabilitation is primarily a responsibility of ERA and Rio Tinto, government regulatory oversight and engagement is critical, as is establishing post-closure monitoring and management requirements and response frameworks. It is currently unclear what these post-closure regulatory arrangements will be.

Near enough is not good enough. There must be protections in place that both identify post-closure failures and ensure that funding – whether through bonds, trust funds or direct government funding – is available to address any post-closure failure. This section considers the financial capacity issues, the importance of closure criteria, ongoing uncertainty and the need for post-closure monitoring.

Monitoring the status of rehabilitation works at Ranger mine during and after rehabilitation raises many challenges. The rehabilitation works themselves involve significant environmental risks, yet there is no proposed monitoring plan for the period of the active rehabilitation works. Disturbingly, there is scant detail on how the rehabilitation of the Ranger Project Area (RPA) will be monitored or managed post-closure. Most concerning is the lack of any discussion on the governance and management plan for the perpetual care and maintenance of the radioactive tailings to ensure they remain isolated from the surrounding environment.

A critical aspect of the RMCP should be the regulatory framework by which the RMCP is governed. The RMCP approach has been instigated by advocacy from GAC and alignment with Rio Tinto's internal processes. Outside of the RMCP there is a suite of discrete "stand-alone" applications. The process for approval and regulation of these is not clear and the legal requirements to implement or enforce the RMCP are not well defined. The Atomic Energy Act does not contain the usual regulatory machinery that can be used to enforce compliance and monitoring. Currently this whole process is ad-hoc and unsatisfactory.

The rehabilitation works at Ranger are occurring under the pre-existing administrative and approvals framework that facilitated the mine's operations for decades. This approach is based on a series of assumptions, relationships and understandings that are outdated and not suited to best advance the new stage of rehabilitation and closure activities. **Closure operations require dedicated and fit for purpose assessment that addresses the site-specific issues and reflects evolving industry practise and community expectation. A contemporary approach to a complex mine closure should not be based on a non-transparent, last century approvals regime.**

The post-closure regulatory framework is entirely unclear. Significant questions remain about post-closure monitoring, maintenance and relinquishment and who will enforce these requirements. To take just one example, is not clear what laws – Commonwealth or Northern Territory – apply if contamination occurs off-site including via seepage into ground and surface water. There are also outstanding questions about timing and conditions around the return of the bond and how the Ranger Trust Fund might operate in perpetuity. There is a need for greater clarity between the Commonwealth and Northern Territory government around post-closure arrangements, monitoring, maintenance and relinquishment and the ongoing role and funding for the SSB.

More specifically, a fundamental issue is that the current legal requirements only exist to January 2026. There is no certainty on arrangements beyond this date, including allowing ERA/Rio Tinto to access the Ranger Project Area for continued monitoring and site maintenance activities. At present, the RMCP suggests an allocation of just $20 million for a period of 25 years of monitoring – an amount which is demonstrably short of the funding and resources required for environmental and social monitoring as well as any future remedial works (e.g. erosion, weeds, site security). Rehabilitation of the Ranger site will require monitoring and careful scrutinty for decades to centuries into the future – yet the current regulatory regime does not even address the immediate 25 years from 2026 let alone the needs beyond 2051. **Ranger is clearly the most complex mine rehabilitation project in Australia's history yet there is not commensurate regulatory attention.**

There is an urgent need for an open review and revision of the regulatory regime governing the Ranger rehabilitation. The system that governed mining operations at Ranger was complex and opaque. There is now broad stakeholder value alignment on the desired rehabilitation outcomes, and inclusive, robust and transparent decision shaping and making processes are more likely to see these realised. We need a fresh approach and framework to meet the new challenges of rehabilitation and closure and to provide for scenarios where rehabilitation aspects fail or where ERA may become insolvent, protecting against any cost shifting of the significant liabilities associated with Ranger.

Financial capacity

We have an ongoing concern around the funding for the rehabilitation works at Ranger. We note that ERA simply does not have the solo financial capacity to fund the Ranger rehabilitation. Parent company Rio Tinto has made a commitment to a mechanism to provide some funding assurance, however the language of "a mechanism" for funding is markedly different from a comprehensive commitment to fund. It is unclear what rehabilitation costs are included in this commitment. We are specifically concerned that there are no clear commitments and obligations for financial provisions for post-closure monitoring and maintenance and to assure capacity to address any emerging post-closure issues.

Although acknowledging that the 'ultimate cost of rehabilitation is uncertain' the 2020 RMCP explains that the expected rehabilitation cost of $744 million includes a range of things outside of the actual 'boots on the ground' rehabilitation works. For example, "staff redundancies and various corporate costs" are also included in this figure. We understand that this detail is included in an annual plan of rehabilitation (APR) which is submitted to the Commonwealth for approval – another process from which the public is excluded. We would welcome access to the most recent APRs and a clear understanding of the financial securities held in the Ranger Rehabilitation Trust Fund.

We strongly advocate that details about bonding arrangements be made publicly available. Unlike the experience with Nabarlek we advocate that a formal process be determined for any future release of bonds contingent on the successful closure and post-closure monitoring of the site and the agreement of multiple stakeholders, including the NLC, SSB and GAC.

UNESCO World Heritage Committee

One of the key objectives of the rehabilitation of the Ranger uranium mine is to restore the area to a state where the rehabilitated area could be incorporated into the Kakadu National Park. However, it is unclear if there is any intention to revise the existing World Heritage boundary to facilitate any post rehabilitation inclusion of the Ranger site. Further, there is no detail on engagement with UNESCO's World Heritage Committee around pathways and pre-conditions for Ranger to be considered for incorporation into the World Heritage area. To achieve this, uncertainty and deficiencies in the KKN's need to be addressed, along with improved contingency planning and a clear strategy for addressing the tailings plume. Beyond these critical elements there must be clear, strong and enforceable (SMART) closure criteria.

In establishing these criteria there needs to be agreement not only with stakeholders and future land users, but with other relevant agencies and authorities including the World Heritage Committee and the WHC's expert advisory bodies.

We maintain there is an important role and rationale for including UNESCO and international expertise and experience in the rehabilitation process and note that to date there is no evidence that this is happening, required or seen as desirable. **In order to achieve a world class outcome, we need to encourage contributions and input from the many international agencies and bodies with expertise and standing in this arena.**

Transparency

The lack of transparency on major aspects of the project perpetuates mistrust and concern. A number of aspects of the rehabilitation project have been deferred for consideration through separate processes from which the public is excluded. These include such crucial issues as the final landform, remediation of the tailings dam, the disposal and consolidation of tailings into the mined-out pits and the rehabilitation of Ranger 3 Deeps. These pivotal issues have to date been unreasonably kept from public scrutiny.

Another example of this can be seen with the annual plan of rehabilitation (APR) in which the costings for rehabilitation are presented and which forms the basis for setting the financial securities held by the Commonwealth in the Ranger Rehabilitation Trust Fund. It is neither necessary nor helpful that this key aspect is reviewed through a non-public process.

In the current "closure obligations and commitments" there is a commitment to inform and update stakeholders on a suite of factors relating to tailings management (although unlike other "commitments" there is no reference number for the obligation). The Supervising Scientist observed that keeping stakeholders informed about matters relating to tailings management is "critical to the on-going stakeholder confidence in the rehabilitation of the mine site." We maintain that confidence would be strengthened by the public release of the Tailings Storage Facility Floor Contaminated Material Management application, addressing the KKNs concerning contaminants in ground and surface water and greater public consultation on the design and planning of tailings management.

Approval of the less-complex rehabilitation activities is being undertaken through the RMCP. However, approval of the more technically complex activities is set to occur independently of the RMCP, after consideration of discrete 'stand-alone' applications. These activities are fundamental to the success of the rehabilitation works, however there is currently no commitment by ERA, the SSB or any regulatory authorities to provide public access to these stand-alone applications or to enable public input into their assessment. This approach is unjustified and unacceptable and should be revisited.

We offer comment on the RMCP as the only avenue for civil society engagement on the closure of Ranger. The RMCP requires "acceptance" from the Commonwealth but it is not entirely clear what that means for the RMCP as a regulatory instrument. It appears the RMCP is an expression of the companies preferred and intended pathway for closure. The legal instruments for closure are the Atomic Energy Act, approved activities through the Mine Site Technical Committee, the Environmental Requirements and, at some point, the Closure Criteria.

Recommendations

The comprehensive rehabilitation of the Ranger mine is a test of the commitment, capacity and competence of both ERA/Rio Tinto and the Commonwealth. The current approach lacks clarity and needs to be improved in order to also improve the likelihood of success. The future health of the country and communities of Kakadu and the protection of a unique and much loved part of our shared national and international heritage demands the best possible effort.

We make the following recommendations in good faith with the objective of meeting these standards and increasing the likelihood of delivering a credibly rehabilitated Ranger site.

- That the closure period be extended through an amendment to the Atomic Energy Act.
- That the Commonwealth fund an independent regional process to assess, monitor and manage the impacts of closure on Aboriginal people in the region and realise a just transition to a post-mining Alligator Rivers Region. This would be informed by and undertaken in close collaboration with Mirarr people and other neighbouring Traditional Owner groups whose country is regulated under the same arrangements.
- That future RMCPs address the data from Social Impact Assessments and translate it into meaningful, transparent commitments, including to work with and fund Mirarr and other neighbouring Traditional Owner groups whose country is regulated under the same arrangements in the transition to a post-mining regional economy.
- That social impact management and monitoring be a post-closure requirement of equivalent standing to other forms of biophysical management and monitoring.
- That there be improved transparency and stakeholder engagement in setting closure criteria and closure planning.
- That the Jacobs SIA and all future ERA-sponsored SIA material be made public.
- That addressing deficiencies in the KKNs, particularly those relating to contaminants, be prioritised.
- That following the extension of the mandated timeline for the Ranger rehabilitation project key issues including the deconstruction of the Tailings Storage Facilty, the decision to leave the tailings floor in situ and crucial issues relating to the tailings plume be revisited. The public – and particularly key stakeholders such as GAC – must be given access to decision making processes on critical design aspects of the tailings rehabilitation.

- That contingency plans address a range of future climate scenarios, including those developed through the SSB, and that these findings be incorporated into future RMCPs and address isolating tailings from the environment for at least 10,000 years.
- That consideration and formal advance of the closure criteria be deferred until the deficiencies in the KKNs have been addressed and there is a clear evidence and complete contaminant transport model. Closure criteria should also undergo a separate process with clear engagement and agreement with future land users, particularly GAC.
- That the ALARA principle be replaced with As Low as Technically Achievable (ALATA) in future RMCP's and that the definition of Best Practicable Technology be defined consistently with that of the Fox Inquiry. This recommended that "all required rehabilitative work and all measures required for the continuing protection of the environment be carried out by the operator at its expense" and that "the best practicable technology (developed anywhere, which can be applied to the uranium industry in Australia) to prevent environmental pollution and degradation be adopted".
- That ERA/Rio Tinto comply with advice to develop detailed contingency plans and that these be made publicly available.
- That the Commonwealth clearly establish and articulate a closure and post-closure governance and regulatory framework that establishes a program of post-closure monitoring and maintenance, clearly articulates the processes for approval of closure requirements and criteria, and sets out requirements for seeking third-party approvals from future land users.
- That closure funding and financial securities held through the Ranger Trust Fund be clearly presented along with the arrangements and framework for securing funds for any post-closure works.
- That the Commonwealth engage with UNESCO's World Heritage Committee and its expert advisory bodies on establishing criteria for the potential inclusion of Ranger into the dual World Heritage listed Kakadu National Park.
- That there be improved transparency, including through the release of studies and agreements related to stand-alone project applications. In particular we seek the public release of the INTERA groundwater modelling studies and detail on the TSF subfloor material management approval.

Following page. Comb-Crested Jacana Bird.
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GLOSSARY

ALARA – As Low As Reasonably Achievable

ALATA – As Low as Technically Achievable

APR – Annual Plan of Rehabilitation

BPT – Best Practicable Technology

CSIRO – Commonwealth Scientific and Industrial Research Organisation

EC – Electrical Conductivity

ER – Environmental Requirements

ERA – Energy Resources Australia

GAC – Gundjeihmi Aboriginal Corporation

GCT2 – Gulungul Creek Tributary 2

INTERA – a geosciences and engineering consulting firm

KKN – Key Knowledge Needs

KRSIS – Kakadu Region Social Impact Study

RMCP – Ranger Mine Closure Plan

RPA – Ranger Project Area

NLC – Northern Land Council

SIA – Social Impact Assessment

SIUMP – Social Impacts of Uranium Mining Project

S.M.A.R.T – Specific, Measurable, Achievable, Relevant and Timely

SSB – Supervising Scientist Branch

TSF – Tailings Storage Facility

UNESCO – United Nations Educational, Scientific and Cultural Organisation

WHC – World Heritage Committee

Kakadu: time for rehabilitation and repair

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