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Development of a rehabilitation plan for the abandoned uranium mines of Kakadu National Park, Australia

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Abstract

Uranium was mined in the South Alligator Valley in northern Australia from 1955 until 1964. At the completion of the program the mines were abandoned without rehabilitation. The valley was incorporated into Stage 3 of Kakadu National Park in 1987. The Aboriginal Traditional Owners made a claim for the land, which was granted in 1996. The Traditional Owners immediately leased the area back to Parks Australia to remain as part of Kakadu National Park, which is World Heritage listed. One condition of the lease was that all evidence of former mining activity would be rehabilitated by 2015. The paper describes the uranium mining history of the area, a hazard reduction program carried out in 1991-92, and the processes that have been used to facilitate the development of the current rehabilitation plan.

L'extraction de l'uranium dans la région du "South Alligator Valley" a duré de 1955 jusqu'a 1964 et les mines ont été abandonnées sans travaux de réhabilitation. En 1987, la vallée fut incorporée au Parc National de Kakadu qui est considéré comme héritage mondial. Après avoir obtenu des droits ancestraux en 1967, les propriétaires traditionnels qui sont les Aborigènes ont immédiatement loué la région à Parcs Australie avec la condition que toute évidence de la mine soit remédiée avant 2015. Cet article présente l'historique des opérations des mines; le programme de mitigation qui a été mené en 1991-92; et le processus qui a été élaboré pour faciliter le développement du programme de réhabilitation.

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ABSTRACT

Uranium was mined in the South Alligator Valley in northern Australia from 1955 until 1964. At the completion of the program the mines were abandoned without rehabilitation. The valley was incorporated into Stage 3 of Kakadu National Park in 1987. The Aboriginal Traditional Owners made a claim for the land, which was granted in 1996. The Traditional Owners immediately leased the area back to Parks Australia to remain as part of Kakadu National Park, which is World Heritage listed. One condition of the lease was that all evidence of former mining activity would be rehabilitated by 2015. The paper describes the uranium mining history of the area, a hazard reduction program carried out in 1991-92, and the processes that have been used to facilitate the development of the current rehabilitation plan.

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INTRODUCTION AND BACKGROUND

Following the discovery of the nuclear fuel cycle, in the post 1945 world uranium was regarded as a strategic commodity and there was great interest in discovering and exploiting deposits of what was considered a relatively rare mineral. Exploration located uranium in a number of areas including the Northern Territory of Australia. Whilst the first major operation was the mine at Rum Jungle, from 1949 onwards, other deposits were soon located nearby (Annabel, 1977). A general map of the area is shown as Figure 1.

Early exploration programs identified more than 50 radiological anomalies in the South Alligator Valley in northern Australia (Needham, 1988). Uranium was mined at 13 of these locations from 1955 until 1964. Development was centred on the mining township of El Sherana (Fisher, 2003). After producing about 950 tonnes of U_3O_8, the economics of production became unattractive and the mines were simply abandoned. Rehabilitation at the completion of the program was not required as there was no applicable environmental legislation (Waggitt & Zapantis, 2000). Exploration efforts continued intermittently throughout the next twenty years. The minerals of interest were gold, platinum and palladium. The valley was incorporated into Stage 3 of Kakadu National Park in 1987, and later added to the register of World Heritage sites for both natural and cultural properties.

The former uranium mines had been subject to a hazard reduction program in 1991-92 (Waggitt, 1998). The objective of the program was to reduce radiological and physical hazards to a level of risk acceptable in a national park. The Aboriginal Traditional Owners made a claim for the land under the provisions of the *Aboriginal Land Rights (Northern Territory) Act (1976)*. This claim was granted in 1996, whereupon the Aboriginal Traditional Owners leased the area back to Parks Australia to remain as part of Kakadu National Park. The lease required that all evidence of former mining activity would be rehabilitated by 2015, and a program of rehabilitation would be completed and ready for implementation by the end of 2000. This plan would have to be acceptable to the Aboriginal Traditional Owners as well as all the supervising and regulating authorities.

In drawing up the plan particular attention has had to be paid to issues of erosion and sediment control and revegetation as well as a range of cultural and social issues (Waggitt, 2000). As the first major intervention at an Australian uranium mine site the program has provided a number of challenges for the stakeholder group which includes regulators at both Territory and Federal level, the Office of the Supervising Scientist (OSS), Parks Australia (PAN), the Northern Land Council (NLC) and, most importantly, the Aboriginal Traditional Owners themselves (ATO). The plan has had to be developed to meet the requirements of regulators for a number of environmental issues. In particular, the radiological standards to be applied to the clean up operations have had to be derived specifically for this project. Above all, the plan has to meet the current cultural and social requirements of the Aboriginal Traditional Owners whilst remaining practical and compatible with their long-term aspirations and the Plan of Management for the Park.

THE NATURAL ENVIRONMENT

The South Alligator valley is located in the Northern Territory of Australia, about 250km south-east of Darwin (Figure 1). The natural climate of the region is wet-dry tropics with an annual average rainfall of approximately 1400mm, of which over 90% falls between October and April. The annual evaporation approaches 2500mm and the weather is hot with annual average temperatures of about 21°C, with a range from 14°C to 50°C. The natural vegetation is a dry sclerophyll savannah dominated by *Acacia* and *Eucalyptus* woodland with *Melaleuca* and *Pandanus* species dominating drainage lines and poorly drained areas. The valley is generally "U" shaped with steep Kombolgie sandstone sides rising up to 250 metres above the valley floor. The mineralisation occurs mostly in rocks of early Proterozoic and Archean origin, which tend to be found beneath the ridges of the valley sides, thus the mines were usually high up in the landscape.

THE HUMAN ENVIRONMENT

The population of the area is located in a small number of settlements, many of which owe their existence to mining operations. For example, the townships of Batchelor and Pine Creek have populations of barely a hundred, somewhat less than the days of the mining booms of the 50s, 60s and early 70s. There is an Aboriginal population in the region living in outstations as well as in the townships. The eastern portion of the region is Arnhemland, a region where Aboriginal people live a mixture of traditional and western lifestyles; access for non-Aboriginals is restricted to assist in the preservation of the Aboriginal culture. The town of Jabiru has a total population of around one thousand persons and serves as a regional centre as well as the township for the

Ranger uranium mine. There are no permanent residents in the Upper South Alligator Valley as the area is cut off by floods each wet season for periods of days at a time.

THE INITIAL PLANNING PROCESS

The need for a plan arose from the new lease signed in 1996. So it was that in 1997 the Commonwealth Government's agency Parks Australia, through their northern office (Parks Australia North–PAN) organised a meeting of stakeholders to begin discussing the issues. This meeting was held "on country". That is to say the venue was a camp site within the boundaries of the valley. In fact it was a former field camp set up by the Office of the Supervising Scientists (OSS) the Commonwealth agency responsible for overseeing all environmental aspects of uranium mining within the Alligator Rivers Region. The camp had been used as a headquarters for baseline environmental studies and data collection as well as the inspection regime checking on environmental protection levels and procedures at the adjacent Guratba (Coronation Hill) site during the mineral exploration campaign of 1988 to 1991.

The meeting was attended by over 50 persons representing the Aboriginal Traditional Owners (The Jawoyn Association and the Gunlom Land Trust), the Northern Land Council (a statutory authority responsible for overseeing the interests of Aboriginal Traditional Owners), Parks Australia North (the managers of the National Park) the Northern Territory Government (NTG-regulators of mining) and the OSS (responsible for oversight of environmental protection). The main business of the day was to brief the Aboriginal Traditional Owners (ATO) about the current state of the former mine workings and to explain the history of the mining, the rationale and outcomes of a hazard reduction program completed in 1991-92 and to explain what the rights and obligations were for each of the various stakeholder groups present.

During these discussions it transpired that there was a surprising knowledge gap for both ATOs and the government staff. The ATOs had extensive knowledge of the cultural history and significance of areas in the valley but were not always certain about the history and locations of some of the mining sites, particularly those in the less accessible areas. On the other hand the non-indigenous staff of the OSS, and to a limited extent the NLC and the NTG, were familiar with the former mine sites. This was as a result of the various surveys and hazard reduction works undertaken in previous years.

Thus the need to exchange information and knowledge to fill the "gap" offered the opportunity to set up a good working relationship involving all the parties. As a consequence the meeting ended in a good atmosphere of cooperation and with the intention of starting work to draft a rehabilitation plan very soon. Unfortunately these intentions soon foundered when staffing changes at PAN and the NLC resulted in a loss of impetus. For the following two years there was effectively no progress.

THE NEW START

The process was restarted 1999 with the idea of developing the consultation process by creating a committee. A meeting was held at the community that is home to the majority of the Gunlom Trust members. The objective was to discuss, in an informal atmosphere, how best to get the process back on track, in particular how the concerns and aspirations of the Traditional Owners could be addressed. Initially the group discussed the size and scope of the issue. The main

agreement at the meeting was that Aboriginal Traditional Owners should form the majority of the committee. The issue of who else should have a "permanent seat" was discussed at length and the final composition of the group was agreed as follows:

- Aboriginal Traditional Owners, selected by the community because they were custodians of sites and ceremonies within the affected areas and also some of them lived in the valley at times in the dry season. This group includes men and women from the various communities and forms the majority.
- PAN-The lessees and so the agency having responsibility to carry out the rehabilitation under the terms of their lease.
- NLC-Representing the interests of the Aboriginal community and providing them with specialist advice.
- OSS-Technical advisers to PAN as well as having responsibility for uranium mining environmental affairs in the region.
- NTDBIRD-The regulator of mining activity in the Northern Territory and so having some statutory obligations.

This group was called the Consultative Committee, a title that was deemed to be the most expressive of their primary function. The Committee then agreed to a timetable for meetings and activities to try and ensure that the program would be completed in accordance with the deadlines set in the lease. The concept was that technical experts could meet as often as they wished, but at reasonable, agreed, intervals progress reports would be presented to the whole group and decisions made as to the next step.

The outcome was agreed to be a major gathering every 6 to 8 weeks with any member of the Aboriginal communities concerned being welcome to attend. These meetings would hear presentations from the experts and then discuss the information. The style of the presentations was difficult to work out at first but great emphasis was put on the use of models, posters, pictures, diagrams and computer graphics. These techniques were very successful.

Also the choice of venue was important as people must be comfortable with their surroundings to relax and discuss issues. Consequently conventional meeting rooms were not an option. However, this led to another problem. Having meetings in the open air at a shade house in the Ranger station or under trees at a campsite was fine in the dry season. But once the wet season approached it was essential to find venues that were sheltered and cool and where the group could be catered for easily. Two different hotels were used in rural locations to try and achieve an acceptable ambience. This was partly successful but ATOs generally prefer to hold meetings on their own country.

Thus, whenever possible, meetings have been held in the valley. This not only reinforces the links between the people and the land, but also enables site visits to be undertaken quickly and easily to compare the presentation with the reality. Also the group members become more familiar with each other when camping in one location and having discussions at meals as well as in more formal sessions. The build up of mutual trust and respect within the group has been the most gratifying and satisfying part of the process to date. However, from time to time the Traditional Owners ask to have a private discussion so they can debate a point amongst themselves.

Throughout the sessions all outcomes, questions raised and points agreed are written up on a flip chart. Each page is digitally photographed as it is completed and these images are used to make up the meeting record. In this way the community are confident that the record is accurate. Also they easily remember the context in which ideas were discussed or agreements reached.

During the meetings a number of significant issues have become apparent which explain earlier reluctance to deal with some of the problems. For example, cultural issues have been discussed more frequently and openly as the process has advanced. These have included the need to exclude women from discussions of sites sacred specifically to men. A further issue is that materials may not be brought into, or taken out of, the boundaries of some sites. This has obvious implications for what options are feasible at certain sites, e.g. when considering backfilling open cuts. An innovative solution has yet to be developed in order to be able to provide a cover over a site to ensure that the required radiological standards can be achieved.

The ATO have repeatedly advised the committee that disturbance to the land must be minimized. Consequently plans are drawn where smaller machines are preferred for earthworks. Equally no drilling or blasting is going to be allowed in the valley for fear of arousing malevolent forces. This last point creates a challenge as clean rock will be required as capping material and erosion control works at several locations. The design team have looked at rock breakers and scalping loose rock from outcrops as possible ways around the blasting issue.

As part of the information transfer process a radiological protection seminar was organised for the Traditional Owners to explain what radioactivity is and how it relates to their everyday life. This was carried out by a specialist trainer and has certainly been very well received, so much so that the exercise is to be repeated for other communities in the region who are involved with uranium mining.

As time progressed it became necessary to negotiate an extension to the original schedule, a reflection of the time required to advance each stage. Communities will not be hurried and the spacing of meetings enables people to relax before the next round of discussions and actions. Also out-of-session work such as field investigations and intra-community discussions can take place. Fieldwork is tasked to provide the data needed for the rehabilitation planning but also has to address issues raised at meetings. The safety of traditional foodstuffs, sourced locally through hunting and gathering activities, and water obtained from the valley area, are the questions raised most frequently in discussion. As a consequence sampling programs have been undertaken for food items and the results presented to the meetings. Whilst there is no routine sampling program for foodstuffs, specific issues are usually addressed as they are raised. Test results have indicated that there are no radiological concerns in this regard at any location in the valley in respect of either foodstuffs or water under a wide range of scenarios.

OUTCOMES

The rehabilitation plan for the 80% of the sites that have no significant radiological issues has been completed and will be submitted to the regulating authorities during the dry season of 2003. The plan for the remaining sites cannot be completed until issues related to containment of low-level radioactive wastes have been resolved. The bulk of the waste material is an estimated 8000 cubic metres of uranium mill tailings and associated contaminated soils. The final planning process will require input from all the existing stakeholders as well as some additional federal authorities. However, initial discussions with ATOs about the concept of this containment have been very open and successful to date, to the extent that preliminary field work has begun. The

existing Australian Code of Practice for Low Level Radioactive Waste Disposal refers only to arid zones. Hence the design team are having to develop their own set of standards to put before the regulators for approval. To date criteria in relation to flooding risk, topographical situation, access and special sites such as endemic plant species and sacred sites have been developed. This has enabled a number of preferred options to be identified and work is continuing in those areas.

The Traditional Owners are now confident that they understand what is being done in the rehabilitation process, and that they share ownership of the plan. They acknowledge that the plan has been adapted to take account of their own ideas and aspirations. The Gunlom Land Trust members are looking forward to seeing their plan being implemented and participating fully in its implementation, as well as being main players in the long term stewardship of these former mining areas. All these activities will also fit within the overall Plan of Management for Kakadu National Park.

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REFERENCES

Annabel RI 1977. The Uranium Hunters. Rigby, Adelaide.

Fisher WJ. (2002). Trials and triumphs in the Northern Territory and Northern Australia: From Cape York to the Kimberleys 1954-2002. pub. WJ&EE Fisher, Darwin

Needham RS 1988.Geology of the Alligator Rivers Uranium Field, Northern Territory. Bulletin 224 Bureau of Mineral Resources. Australian Government Publishing Service, Canberra.

Waggitt PW 1998. Hazard reduction works at abandoned uranium mines in the upper South Alligator valley, Northern Territory in Radiological aspects of the rehabilitation of contaminated sites, Editors, Akber RA & Martin P, *Workshop Proceedings, Darwin & Jabiru 20-22 June 1996*. pub. South Pacific Environmental Radioactivity Association (SPERA), Christchurch, New Zealand.

Waggitt PW 2000. The South Alligator Valley, Northern Australia, Then and Now: Rehabilitating 60's uranium mines to 2000 standards. in *Proceedings of the SWEMP 2000 Conference, Calgary, Canada. May30 – June 2, 2000.* pub: Balkema.

Waggitt PW & Zapantis A 2000. Improving rehabilitation standards to meet changing community concerns: A history of uranium mine rehabilitation with particular reference to northern Australia. In *Proceedings of the International Symposium "The Uranium Production Cycle and the Environment" (IAEA-SM-362/51), 2-6 October 2000*. pub: International Atomic Energy Agency, Vienna.

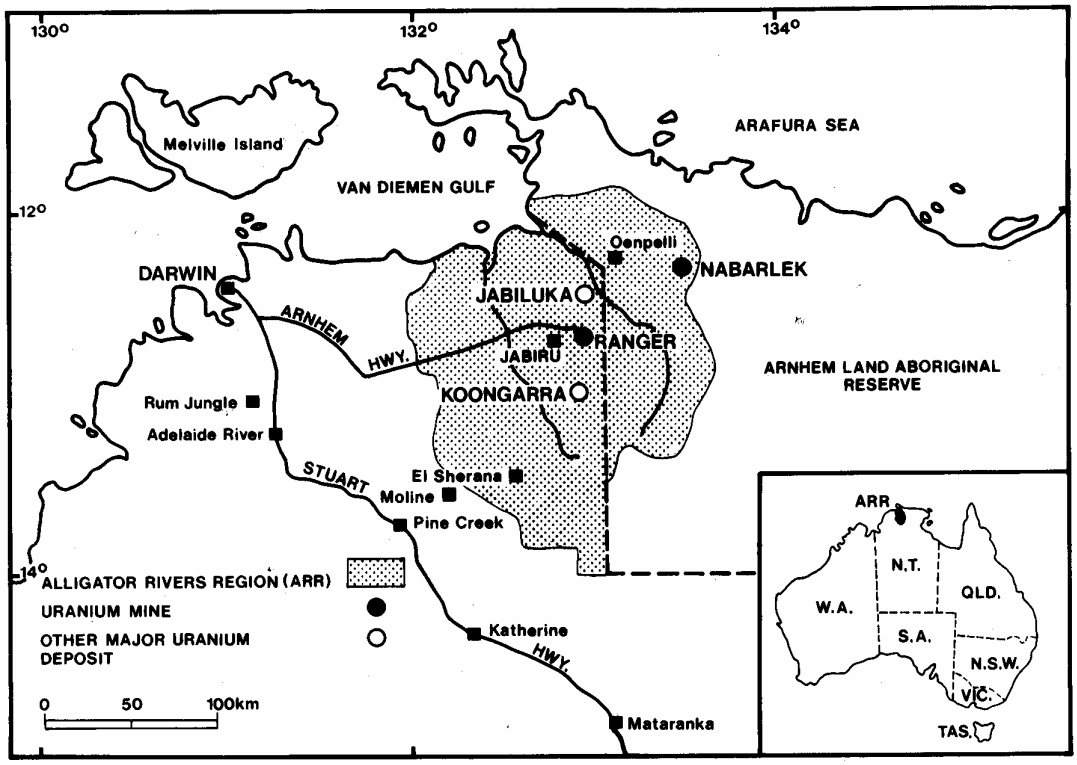

Figure 1. Location Map of the Alligator Rivers Region