

Appendix 5

Ranger and Jabiluka – Background Information

Geology¹

The Alligator Rivers Region contains a number of uranium deposits, including Ranger and Jabiluka. These deposits are located in the eastern part of the Pine Creek Geosyncline which extends from Darwin to Pine Creek. The geology of the area is dominated by a variety of sediments and volcanics dating back some 2470 million years (Ma). The existing geological formation, which was laid down in layers over millions of years, has been subjected to extensive change, erosion and weathering. The uranium is mainly to be found in the Cahill Formation.

The ancient surface was gradually uncovered by erosion of the Kombolgie Formation (which now forms the escarpment) around the early to middle Tertiary period, some 20–30 Ma ago, and the uranium deposits were again exposed to a new regime of weathering and erosion which has continued to the present day. Therefore, the whole Alligator Rivers Region seawards of the Arnhem Escarpment, representing the retreating edge of the Kombolgie Formation cover over the ancient surface, contains many areas that have been exposed to elevated levels of uranium and radiation for millions of years. Current ecosystems have evolved naturally in this environment.

The Ranger mineralisation extends for about 14 kilometres; Ranger #1 and #3 are located in the southern portion. They occur in exactly the same stratigraphic position, their host rocks and mineralogy being identical. There are three mine sequences and ore is mined from the Lower and Upper Mine sequences. Ranger #1 produced 18.036 million tonnes of ore at an average grade of 0.338 per cent U₃O₈ for a contained metal of 60,962 tonnes U₃O₈.² On current projections, mining at Ranger #3 is expected to continue until at least 2009, after which the pit will be utilised for storage of process residue.

1 Information derived from the following sources:

T. J. East and R. J. Wasson (1992), 'Chapter 1: Introduction', in R. J. Wasson (ed), *Modern Sedimentation and Late Quaternary Evolution of the Magela Creek Plain*, Supervising Scientist for the Alligator Rivers Region Research Report No. 6, AGPS, Canberra.

R. S. Needham and P. G. Stuart-Smith, (1980), 'Geology of the Alligator Rivers Uranium Field', in *Proceedings of the International Uranium Symposium on the Pine Creek Geosyncline, 1980*, International Atomic Energy Agency (IAEA), pp 233–57.

2 <http://www.lpe.nt.gov.au/enviro/EIAREG/Jabiluka/jabear4.htm>

The Jabiluka #2 ore body is divided into two blocks: the eastern and western blocks, and is divided by the Hegge Fault which has resulted in the western block being downthrown by about 50 metres.³ The total Mineral Resource at Jabiluka is estimated at 163,000 contained (in situ) tonnes of uranium oxide (U_3O_8) at an average grade of 0.53 per cent U_3O_8 , with an estimated total Proved and Probable Ore Reserves at 71,000 tonnes U_3O_8 at an average grade of 0.51 per cent U_3O_8 . According to ERA, it is one of the world's largest high grade uranium deposits.⁴

History of Mine Development

Ranger

Energy Resources of Australia Ltd (ERA) sells uranium oxide from the Ranger mine and uranium concentrates sourced outside Australia to nuclear energy utilities in Japan, South Korea, Europe and North America. ERA, a 68.4 per cent owned subsidiary of Rio Tinto Australia, is the third-largest uranium mining company in the world.

The Ranger ore bodies were discovered by aerial radiometric survey in October 1969 by joint venturers Electrolytic Zinc Company of Australasia Ltd (EZ) and Peko-Wallsend Operations Limited (Peko). Drilling confirmed the feasibility of mining both the Ranger #1 and Ranger #3 orebodies by open cut means and the companies established Ranger Uranium Mines Pty Ltd to manage and develop the project.

The Commonwealth Government assumed half the ownership of the ore bodies in 1974. In October 1975 a Lodge Agreement was signed by the joint venture parties giving the Australian Atomic Energy Commission (AAEC), as the Commonwealth agent, ownership of the uranium. The AAEC also provided financial assistance for the development of the project.

The Ranger mine started operating in May 1980, and full production was reached in October 1981 at c.3300 tonnes per year of uranium oxide concentrate. Mining of Ranger #1 was by open pit, and from 1992-1995 this was on a campaign basis, with mining occurring for six months of the year during the dry season and the treatment plant being run for the other six months. Ranger #1 was mined out in December 1994 and stockpiles of this ore are still being utilised. In January 1996 there was a return to year-round milling, using stockpiled ore. Final approval for Ranger #3 was granted by the Northern Territory Government in May 1996 and open cut mining commenced in June of that year. This orebody was included in initial environmental

3 A. Milnes, 'Geological Summary of the Alligator Rivers Region', (unpublished), 2002.

4 Energy Resources of Australia, Press Release, August 2000.

approvals for Ranger. As at December 2001, Ranger had ore reserves of 22 million tonnes ore on stockpile and in situ at an average grade of 0.27 per cent containing 54,241 tonnes of U_3O_8 ⁵. In 2002 production at Ranger was 4470 tonnes of U_3O_8 , sales were 4517 tonnes from Ranger and 628 tonnes from purchased materials.⁶

Mining of Ranger #1 was completed in December 1994. Since 1996 the Company has extracted ore from its Ranger #3 open pit. At the completion of mining, Ranger #1 had mined 18.036 million tonnes of ore at an average grade of 0.338 per cent U_3O_8 for a contained metal of 60,962 tonnes U_3O_8 . In 2000 ERA was granted a second 26-year operating approval.

Jabiluka

The Jabiluka #1 uranium deposit in the Northern Territory was discovered in 1971 by Pancontinental Mining Limited. In 1973, further drilling located the larger Jabiluka #2 uranium orebody about one kilometre to the east.

In 1991 ERA purchased the lease on the Jabiluka ore body from Pancontinental Mining for \$125 million. The Jabiluka uranium deposit is considered to be one of the largest undeveloped ore bodies of its type in the world.

ERA undertook a feasibility study of the Jabiluka development in 1993 and significantly altered the design of the project from that envisaged in the original Pancontinental plan. Construction commenced at Jabiluka in June 1998. To date, the mine consists of:

- An underground decline for access, mine development and exploration with a main tunnel approximately 1,150 metres long with cross-cuts and drives totalling about 667 metres
- Office and workshop facilities, including diesel storage tanks
- An 'Interim Water Management Pond' intended for one wet season
- A 'mineralised' stockpile of 47,000 tonnes of uranium ore and potentially acid-forming rock containing reactive sulphide minerals

5 Energy Resources of Australia Pty Ltd, website: www.energyres.com.au/ranger/geology.shtml

6 Energy Resources of Australia Media Release and Stock Exchange Announcement, 29 January 2003, p1.

- A 57,000 tonne 'non-mineralised' stockpile
- A 140 metre ventilation shaft for the underground decline
- Contaminated soils and other industrial wastes, and
- Sediment traps for erosion and drainage control

Work stopped on the mine in September 1999 after 47,000 tonnes of radioactive material and 57,000 tonnes of non-mineralised material was extracted in constructing the decline. The site is now in a 'long term environmental care and maintenance' mode.

Extraction and Processing Methods

Ore is currently being mined and milled at the Ranger open cut uranium mine. By contrast, Jabiluka is an underground, long-hole open stoping uranium mine and no extraction or processing has yet taken place there. If Jabiluka proceeded, processing methods would closely resemble those at Ranger⁷.

The ore is crushed initially to a size finer than 19mm, mixed with water and ground to a size finer than 0.22mm in a grinding circuit that includes one rod and two ball mills to increase leaching efficiency. Excess water is removed in the thickener prior to it being pumped into leaching tanks containing sulfuric acid. Ninety per cent of the uranium is removed over a 24 hour period. The uranium solution is then separated from the depleted ore which is neutralised with lime before being deposited in the tailings dam. Next, the uranium solution is put through a clarifier and sand filters to remove any residual solids, after which the solution enters the solvent extraction plant where the uranium is selectively removed from the water into a kerosene solution. Ammonia is then used to precipitate the uranium from the strip solution. The uranium compound (ammonium diuranate) goes into a thickener to remove excess water and the commonly called yellowcake is produced. The latter is heated to a temperature of 800 degrees celsius in a calciner where the ammonia is driven from it to produce uranium oxide (U_3O_8). The product is then packed into 200 litre steel drums and loaded into shipping containers for transportation.⁸

7 Long-hole open stoping: A mining/stoping method employing long blast holes to fragment ore between/above developed levels or sub levels.

8 http://www.energyres.com.au/ranger/mill_diagram.pdf

The Approvals History

Ranger

For mining at Ranger to commence, a number of approvals were required from the Commonwealth, the Northern Territory Government and the traditional owners. For further detail of this see Chapter 1.

Table A5.1: Overview of Ranger Uranium Mine Approvals Process

	Action	Date
1.	Proponents of Ranger, Peko and EZ entered into contracts to supply Japanese nuclear utilities with uranium	1972
2.	Commonwealth Government approved contracts	November 1972
3.	Ranger Environmental Impact Statement completed	February 1974
4.	Justice Woodward delivered his Second Report to the Whitlam Government recommending a new form of Aboriginal statutory title and the right of veto over mining on their land	April 1974
5.	Environment Protection (Impact of Proposals) Act 1974 enacted	1974
6.	“Lodge Agreement” for Peko and EZ to mine uranium at Ranger entered into with the Whitlam Government providing for a 50% equity stake for the Commonwealth and for 72.5% of the capital costs to be met by the Commonwealth	October 1974
7.	Ranger Uranium Environmental Inquiry (Fox Inquiry) established to inquire into the proposal for the development by the AAEC in association with Ranger Uranium Mines Pty Ltd of uranium deposits in the Northern Territory	July 1975
8.	Fox delivered his first report which while not ruling out Ranger, recommended the	October 1976

	Government proceed with caution and that any decision be postponed until the second report is presented	
9.	First Fox report interpreted by Government and media as a green light for the mine	October 1976
10.	<i>Aboriginal Land Rights (Northern Territory) Act 1976</i> enacted by Fraser Government removing the Mirrar right of veto over Ranger	1976
11.	<p>The Fox Inquiry presented its second and final report, finding that the ‘hazards of mining and milling uranium, if those activities are properly regulated and controlled, are not such as to justify a decision not to develop Australian uranium mines.’ But recommended that ‘Policy respecting Australian uranium exports, for the time being at least, should be based on a full recognition of the hazards, dangers and problems of and associated with, the production of nuclear energy, and should therefore seek to limit or restrict expansion of that production.’</p> <p>Fox recommended that construction of uranium mines in Kakadu commence sequentially, that a national park be created, the Aboriginal land claimants be granted title and that Ranger and Jabiluka mine sites would be excluded from the national park</p> <p>Two weeks after publication of the Fox Report the Fraser Liberal Government announced that existing contracts for uranium supply would be filled, opening the door for future development</p>	May 1977
12.	Ranger EIS approved by the Fraser Government	August 1977
13.	Agreement to mine at Ranger reached between the Commonwealth Government and the Northern Land Council (NLC) acting on behalf of the traditional Aboriginal land	1978

	owners	
14.	26 year Authority to mine at Ranger granted by the Commonwealth Government. Construction begun immediately	January 1979
15.	Release of the Agreed Working Arrangements on Procedures for Co-ordinating the Regulation of the Environmental Aspects of Uranium Mining in the Alligator Rivers Region	September 1979
16.	Ranger General Authorisation A82/3 issued. This consolidated other authorisations issued since the project began. The first of these was issued by the Mining Registrar in May 1974	3 June 1982
17.	Release of the Revised Working Arrangements for Co-ordinating the Regulation of the Environmental Aspects of Uranium Mining in the Alligator Rivers Region	September 1995
18.	Memorandum of Understanding (MOU) signed regarding the supervision and regulation of environmental aspects of uranium in the Alligator Rivers Region	September 1995
19.	Final approval to develop Ranger #3 granted.	May 1996
20.	Commonwealth Environmental Requirements re-issued for the operation of the Ranger mine	June 1999
21.	ERA's Authority (Section 41) to operate Ranger under the Atomic Energy Act was renewed for 21 years (plus 5 years rehabilitation period)	January 2000
22.	Ranger General Authorisation A82/3 re-issued	March 2000
23.	Agreement between the Commonwealth and the Northern Territory Governments in relation to principles to be observed in the regulation of uranium mining in the Alligator	November 2000

	Rivers Region	
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Jabiluka**Table A5.2: Overview of Jabiluka Uranium Project Approvals Process**

1.	Agreed Working Arrangements on Procedures for Co-ordinating the Regulation of the Environmental Aspects of Uranium Mining in the Alligator Rivers Region	September 1979
2	Pancontinental completed an EIS for an underground mine and milling facilities at Jabiluka	July 1979
3.	Jabiluka EIS approved	August 1979
4.	Pancontinental reached agreement with the Northern Land Council on mining at Jabiluka. Serious doubts have been raised about the means by which this agreement was reached	July 1982
5.	Northern Territory Government granted mining lease (ML N1) over the Jabiluka area for an initial period of 42 years following the signing of an agreement with the NLC. The agreement was approved by the Commonwealth Minister for Aboriginal Affairs	August 1982
6.	All necessary approvals provided for underground mining and ERA was able to seek sales	1982
7.	The newly elected Hawke Labor Government announced it's 'three mines policy', effectively halting the development of Jabiluka	1983
8.	The Commonwealth Social Impact Study into uranium mining in the Alligator Rivers Region criticises the administrative arrangements that leave Aboriginal people as 'problems, not participants', not assigned an active role	1984

9.	ERA purchased Jabiluka from Pancontinental for \$125 million	1991
10.	Northern Land Council assigns Aboriginal agreement to ERA, on condition that the milling of Jabiluka ore at Ranger would require further consent from the Traditional Owners	1991
11.	ERA undertook feasibility study of milling the ore at Jabiluka which demonstrated that only milling at Ranger would be viable	1993
12.	Release of Revised Working Arrangements for Co-ordinating the regulation of the environmental aspects of uranium mining in the Alligator Rivers Region	September 1995
13.	Memorandum of Understanding signed regarding the supervision and regulation of environmental aspects of the uranium in the Alligator Rivers Region	September 1995
14.	Environment Australia, in response to the Jabiluka EIS releases its Environmental Assessment Report, saying <i>there would appear to be evidence of marginalisation of the Traditional Owners and the broader Aboriginal Community as a result of past decisions concerning development and management of the region</i>	1996
15.	ERA develops a new proposal to mine uranium at Jabiluka with the preferred option of milling uranium from Jabiluka at Ranger – the Ranger Mill Alternative (RMA) and developed an Environmental Impact Statement under the EPIP Act Draft Jabiluka RMA EIS presented to Commonwealth and Territory Governments	October 1996
16.	EIS for RMA forwarded to Northern Territory and Commonwealth Environment Ministers	June 1997

17.	Commonwealth Minister for the Environment makes recommendations to the Minister for Resources and Energy on the RMA EIS	August 1997
18.	Minister for Resources and Energy approves RMA EIS subject to 77 environmental conditions – the Jabiluka Requirements	October 1997
19.	Consultations with the NLC (representing the traditional owners) completed with regard to change in Jabiluka development	May 1998
20.	Commonwealth directs ERA to prepare a Public Environment Report (PER) for mining and milling at Jabiluka (JMA)	1998
21.	JMA PER submitted to Commonwealth Minister for the Environment with a 50-50 option for disposal of tailings underground and in surface pits	June 1998
22.	Northern Territory Minister for Resource Development authorised construction of common elements of the RMA and JMA—the portal and decline and associated facilities—and construction commences	June 1998
23.	Minister for the Environment reported to Minister for Resources and Energy on JMA PER	August 1998
24.	JMA PER approved subject to additional 'Jabiluka Requirements' that all the tailings be returned to the underground mine voids	27 August 1998
25.	Blasting and excavation of the decline begins	September 1998
26.	The approvals process for the Jabiluka uranium mine including the JMA and the RMA referred to the Senate Environment, Communications, IT & the Arts References Committee (ECITA)	30 May 1999
27.	ECITA reports, making 24 recommendations and finding serious flaws in the EIA process relating to the quality of the environmental	June 1999

	impact statements prepared by ERA, their assessment by government agencies and the level of assessment applied to the consideration of continuing scientific project uncertainties	
28.	Construction of the mine suspended	September 1999
29.	NLC advises that it will not consider the trucking of ore from Jabiluka to the Ranger mill for processing until at least 1 January 2005	October 1999
30.	North Limited is absorbed by Rio Tinto which publicly concedes that Jabiluka cannot proceed without support of Traditional Owners	August 2000
31	Agreement between the Commonwealth and Northern Territory Governments in relation to principles to be applied in the regulation of uranium mining in the Alligator Rivers Region, making particular reference to the 'Jabiluka Requirements' in the 1997 EIS and 1998 PER and includes a statement of intent to amend the Jabiluka Mineral Lease	November 2000
32.	Jabiluka Authorisation A98/2 re-issued	February 2001
33.	Office of the Supervising Scientist reports on mismanagement of low-grade ore stockpile at Ranger and the delayed reporting of environmental monitoring data at Jabiluka and ERA commits to: <ul style="list-style-type: none"> • External specialists to review environmental tasks and duties with a restructure of the ERA Environment Department to meet these requirements to follow • Replacing the ERA Environment Manager • The commissioning of a new environmental data management system that automatically alerts ERA 	April 2002

	<p>managers when reportable levels are exceeded</p> <ul style="list-style-type: none"> • The ERA General Manager of Operations to attend all Minesite Technical meetings <p>Improvements to internal communications systems to deliver a cultural shift towards better environmental management</p>	
34.	Minister Kemp asks the Supervising Scientist to work with NT regulators to tighten enforceability of environment protection protocols and place monitoring information on the website ⁹	23 April 2002

9 Dr Kemp, Minister for Environment and Heritage, Media Release, 23 April 2002.

