

Appendix 6

Environmental Incidents at Ranger – update August 2002

Compiled from:

- Annual Reports by the Office of the Supervising Scientist.
- OSS Six-Monthly Reports to the Alligator Rivers Region Advisory Committee (ARRAC).
- Appendix 2.9, Senate Select Committee on Uranium Mining & Milling (1997).
- OSS, 2000, *Investigation of Tailings Water Leak at the Ranger Uranium Mine*. Office of the Supervising Scientist, Supervising Scientist Report 153, June 2000, 168 p.
- SKM, 2000, *ERA Ranger Tailings Corridor Review*. Report to the Office of the Supervising Scientist, Supervising Scientist Report 154, June 2000, 27 p.
- *ERA Ranger Mine - Annual Environmental Management Reports*.
- Kinhill, 1996, *Appendix E : Draft Environmental Impact Statement - The Jabiluka Project*. Prepared by Kinhill Engineers Pty Ltd, in association with ERA Environmental Services Ltd, for Energy Resources of Australia Ltd (ERA), October 1996, 775 p.
- Borton, R, 1989, *A History of Ranger Uranium Mine 1979-83*. Unpublished manuscript.

Compiled by Friends of the Earth, Australian Conservation Foundation and the Sustainable Energy & Anti-Uranium Service Inc.

2002

- **April** - It was discovered that further runoff from the Low Grade Ore stockpile - which was supposed to have been redirected - had uranium at 13,785 µg/L and was entering the headwaters of Corridor Creek. Despite being a considerably higher and more significant concentration, ERA (and regulators) do not investigate to find the source.
- **Feb. 26** - It was discovered that Low Grade Ore had been dumped in the wrong area, with contaminated runoff containing uranium in excess of 2,000 µg/L entering the headwaters of Corridor Creek. Subsequent investigations revealed that the incorrect dumping had been occurring for some six weeks from January 14. The total quantity involved 80,900 t of 'Grade 2' material (0.02-0.08% U₃O₈) plus 3,600 t of 'Grade 3' material (0.08-0.12% U₃O₈). It was also discovered that runoff from an adjacent medium grade stockpile ('Grade 4') was failing to report to RP2 as intended and was mixing with the contaminated runoff from the incorrect stockpiling and entering Corridor Creek. Remedial works were undertaken immediately.
- **Feb. (early)** - *Fourth year in a row* of high uranium concentrations in water discharging uncontrolled from RP1 to Coonjimba and Magela Creeks. This year the concentrations have increased back to as high as the first episode in 1998/99 (about 70 µg/L). In response, ERA promise to 'completely re-engineer' the RP1 catchment (though this is four wet seasons too late).

2000

- **Sep. 9** - About 20,000 litres of tailings leaked following the failure of a pressure gauge tapping point adjacent to one of the tailings pumps in the mill area. The failure resulted in tailings spraying over the bunds surrounding the pipe and associated infrastructure into an area which drains to RP2. No tailings left the mill area.
- **May 15** - Weeping was detected between two pipe joints in the Tailings Water Return Pipeline. The line was shut down and joints disassembled, checked, reassembled and the complete line was pressure tested. Estimated volume loss was 5 litres.
- **May 12** - A leak was discovered in the 'B' tails line between the processing plant and Pit #1. The contents of the spill were retained by secondary containment systems.
- **April 28** - A major leak of about 2,000,000 litres was announced from the tailings water return pipeline, between Pit #1 and Georgetown Creek. ERA first detected the problem on April 4, but failed to notify the authorities until April 28. The leak, from late December 1999 to April 5, 2000, originated from 2 flanges on the tailings water return pipeline (which pumps water from the tailings dam in Pit #1 to the mill for process use). The burial of the flange joints in silt and moist conditions for up to 6 months of the year allowed three bolts to rust and allow the joint to develop a slow leak. After breaching the bund surrounding the pipeline, about 85,000 litres of tailings water was estimated to have reached the adjacent wetlands in Corridor Creek, from where water discharges through Georgetown and into Magela Creek. The exact way the leak was discovered remains unclear, but appears to be by visual inspection. Follow-up investigation by OSS discovered evidence of a similar leak during the 1998/99 wet season. Tailings water has concentrations of Mn around 1,000,000 µg/L and NH₄ at 530 mg/L. ERA's monitoring was not required to analyse for these species in sampling in the Corridor Creek area.

- **Feb. 2** - Re-occurrence of high uranium in water discharging uncontrolled from RP1 to Coonjimba and Magela Creeks. Although concentrations were not as high as the previous wet season, the source of the uranium remained uncertain and questions the remedial works undertaken by ERA in the 1999 dry season to prevent this problem again.

1999

- **General** - The uranium contamination of RP1 during the 1998/99 Wet Season is the closest ERA has yet come to exceeding their operating requirements. Although the total mass of uranium discharged is below (high) legal limits, the low flows in Magela Creek during the early discharges from RP1 almost led to ERA increasing the U concentration in the Magela greater than the 3.8 µg/L allowed. The U and SO₄ levels in the Magela at the Kakadu National Park border are higher than background. ERA state that : *"Analysis of water quality and sediments in surrounding billabongs and creeks indicate the presence of the mine is apparent, as was expected by the Ranger Uranium Environmental Inquiry. Whilst the levels are detectable chemically, they are not ecologically significant and no deleterious effects on downstream flora and fauna or downstream users of the creek and its resources have been detected."* This is in contrast to the evidence and earlier OSS comments on such increases.
- **Oct. 7** - 4 new, unused drums used to transport uranium were lost whilst in transit from Perth to Darwin.
- **Aug. 5** - About 5,000 litres of RP2 water was used outside the RRZ for fire fighting. The fire damaged a small joint in the tailings pipeline, leading to a small spill of tailings into the tailings pipeline corridor.
- **June 24** - A pump and back-up system failed at the Brockman borefield, which led to the exhaustion of the potable water supply on site. As a consequence, 7 employees were unable to shower at the end of their shift as part of the decontamination routine.
- **Feb. 17** - ERA attempt to minimise the discharge from RP1 by sandbagging the spillway - in order to avoid the Magela exceeding its allowable uranium concentration.
- **Feb. 4** - Discharge and runoff from the low grade stockpiles on the northern wall of the (old) tailings dam was pumped to RP2.
- **Jan. 30** - Daily monitoring commenced of RP1 discharge - 3 days after high uranium concentrations were first observed.
- **Jan. 27** - The concentration of uranium in water discharging uncontrolled from RP1 to Coonjimba Creek and on to the Magela Creek was found to be approximately 70 µg/L - up to 100 times higher than normal. The RP1 sediment control bund, with uranium at 600 µg/L, was identified as the likely source.

1998

- **Dec. 13 (1998/99 Wet)** - Possible leak of tailings water discovered during investigation of the tailings water return pipeline discovered on April 28, 2000.
- **Dec. 10** - The sulphur dioxide (SO₂) monitor located in the newly expanded acid plant was found to be malfunctioning.

- **Nov. 16** - An estimated 16,000 to 27,000 litres of water between Sump 98 and RP2 escaped through a bypassing valve into a borrow pit adjacent to the RP2 Wetland Filter.
- **Nov. 13** - A small quantity of tailings was reported at the tailings corridor drain. This occurred at the top of the tailings dam ramp when a syphon-break valve on the dredge tailings line allowed the tailings to drain. Neither tailings nor process water left the drain.
- **Oct. (late) to Nov. (early)** - The RP2 Wetland filter had been allowed to dry out during the Dry Season. The first rains of the Wet led to acidification of the wetland waters, with pH around 2.6 and uranium as high as 4 to 6 mg/L.
- **Oct. 31** - A small quantity of tailings was reported at the tailings corridor drain in two locations during the clearing of the tailings lines, which had become bogged.
- **Sep. 24** - About 200 litres of tailings material escaped from a small truck involved in carting some tailings-contaminated earth from the mill to Pit #3 for disposal ¹.
- **Sep.** - The stack sampler failed and so stack emissions could not be monitored or reported.
- **July 27-28** - The B-centrifuge conveyor was decontaminated for return to Alfa Laval in Sydney for repair. The conveyor was dispatched from ERA on July 28, and upon inspection by Alfa Laval, they "flaky yellow material" coated the inside of the bearings being replaced. It was estimated to be approximately 10 grams of ammonia diuronate.
- **June (mid)** - Difficulties experienced in analysing water samples at the external analytical laboratories for ²¹⁰Pb, ²¹⁰Po and ²³⁰Th meant that they were not included in the Non-RRZ Water Release Report for 1997/98.
- **March 16** - To remove rainwater which had collected on the haul road, an ERA employee broke a bund which resulted in about 100,000 litres of water escaping from the RRZ.

1997

- **General** - Powerhouse stack emissions had not been reported since 1981, contravening the Authorisation which requires data summary reports to be submitted quarterly.
- **General** - Gross alpha activity in freshwater mussels has not been monitored and reported since 1990.
- **Dec. 19** - About 2,000 litres of tailings slurry escaped from the RRZ due to a leak in the tailings pipeline.
- **June 30** - During the Environment Performance Review (EPR) held in June 1997, two other infringements were identified.
- **June 29** - A monitor installed in the power station stack to continuously record the level of SO₂ and CO₂ emissions failed on 29 June 1997.
- **Feb. 24** - 50,000 litres of Very Low Grade/Low Grade (VLG/LG) ore spilled outside the RRZ zone into the RP1 catchment.

¹ It is unsure why tailings-contaminated soil would be disposed of in the operational Pit #3, presumably Pit #1 was intended and Pit #3 is an error (pp 245, OSS-AR, 1999; in EA, 1999a).

1996

- **Dec. 10** - ERA reported another minor failure of the stockpile drainage bund resulting in a small quantity of RRZ runoff entering the RP1 catchment during a severe rainfall event. Further, a drain blocked by sediment at a VLG dump also caused RRZ rainfall runoff to enter a non-RRZ drain discharging to RP1 at that time.
- **Dec. 10** - ERA reported another failure of the stockpile drainage bund resulting in a small quantity of RRZ runoff entering the RP1 catchment during a severe rainfall event. Further, a drain blocked by sediment at a VLG dump also caused RRZ rainfall runoff to enter a non-RRZ drain discharging to RP1 at that time.
- **Nov. 19** - A segment of the perimeter drain around new extensions to the VLG/LG stockpile washed out during a heavy storm. About 100,00 litres of RRZ water and some sediment was released into RP1 catchment.
- **Nov. 6** - Fatal work accident involving a contractor. The worker died when the excavator he was operating collapsed into the excavation.
- **Sep. 27** - Preliminary works on the mill expansion commenced before ministerial approval was granted.
- **Sep. 21** - A bush fire on the mine site placed significant demand on accessible non-RRZ water for fire fighting. To speed up the turnaround times for water tankers, a decision was made to use RRZ water to create a wet perimeter and to dampen facilities under threat. Approximately 585,000,000 litres was applied to areas outside the RRZ.
- **Feb. 18** - 2,000 litres of tailings sprayed from a leak in the pipeline running along the top of the tailings dam embankment. Approximately 250 litres fell outside the RRZ on the outer wall of the dam. This area was scraped up and returned to the tailings dam.
- **Jan. 23** - 2,000 to 3,000 litres of tailings spilled from the tailings line and went outside the RRZ, the result of a valve failure. The area affected extended over about 60 to 80 m².

1995

- **General** - Biological monitoring along the Magela Creek following the releases was limited due to other ERA commitments.
- **Dec. 13** - An administrative error resulted in a repeat of the incident of 6 Dec. when 8,000 litres of the residual diesel/water mixture was spilled back to RP2. There were no further bird deaths associated with this incident.
- **Dec. 6** - 12,000 litres of diesel spilled from tanks at the power station and ran into RP2. Although the spill was cleared up the spill was responsible for the **death of forty water birds**
- (36 Little Black Cormorants, 3 Australasian Grebe and 1 Australian Darter). **The OSS regarded this incident as the first example of an unacceptable environmental impact at Ranger since operations began.**
- **Aug. to Dec.** - Wetland filtration option commenced for disposal of excess water from RP2. Previous trials indicated that the filters would have a capacity to absorb 98% of uranium and that it appears that there is no remobilisation of the uranium later. The

actual performance indicated that uranium removal from the RP2 filter decreased from 95% to 45%.

- **Aug. 1** - About 120,000 litres of RP2 water was accidentally discharged outside the RRZ due to a failure in a pipeline carrying water to the constructed wetland filter adjacent to RP1.
- **July 31** - An asbestos cement pipe failed and about 120,000 litres of water from RP2 was released. The water was pumped over the spillway into Djalkmara Creek.
- **July 20** - About 10,000 litres of RP2 water was used in pre-production drilling at ore body #3 outside the RRZ.
- **Feb. 21** - ERA sought approval to release water with elevated levels of uranium, sulfates and heavy metals from RP2 demonstrating again the difficulties of operating a mine in monsoon tropical climates. Aboriginal Land Owners took legal action to halt the release.
- **Jan. 19 to April 13** - 500,000,000 litres of water from RP4 was released through wetland filter into Djalkmara Billabong and then into Magela Creek. Uranium concentrations in RP4 are increasing.

1994

- **General** - The OSS questioned the capacity of the Land Application Area to receive water without deleterious environmental impacts in the longer term - due to the appearance of salt efflorescence. OSS-AR (1994) expresses concern at the appearance of salts in the Land Application Area, stating that the "... appearance this year of salt efflorescence on soil surfaces in the LAA raises the question of the capacity of the area to receive water without deleterious environmental impacts in the long term" (pp 36).
- **May 10** - About 50,000 litres of RP2 water was accidentally discharged outside the RRZ during the installation of a new section of pipe at the RP2 pumping station. The pipe was part of the network that serves the Magela irrigation area.
- **April 13** - About 60,000 litres of combined rainfall-runoff and seepage from the high-grade ore stockpile discharged outside the RRZ following a pipe joint failure. The pipe ran alongside the drain downstream of the RRZ boundary at the bund in the high-grade ore stockpile drain. Samples taken along the flow path showed an increase in U concentration in Georgetown Creek but no change in U concentration could be detected in Georgetown Billabong. The pipe has since been relocated wholly inside the RRZ.
- **Feb.** - Ranger applied to change the monitoring program such that during a water release from RP4 or RP1 monitoring of Magela Creek water quality is required weekly rather than daily.

1993

- **Oct. 21** - Failure of a component in the tailings dam sprinkler system, used to minimise dust generation resulted in wind blown spray drifting over the dab embankment outside the RRZ boundary. This resulted from coincidental high winds from the NNW at the time of the failure. The quantity of water was small and the area was cleaned up within two days.

- **Feb. 21 to March** - 43,000,000 litres of water containing U, Mg and SO₄ was released from RP4 during this time. The OSS reported that ERA and the NTDME altered authorisations and were tardy in providing full information in regard to the toxicity and monitoring of these releases. Mg, Mn and SO₄ concentrations in Magela Creek are higher than background levels.
- **Jan. 25** - During heavy rainfall a blocked drain caused a small volume (less than 100,000 litres) of water to escape from the RRZ. The OSS assessed this event as being an infringement of the Ranger Authorisation and a breach of ER27.

1992

- **Sep. 27** - About 430,000 litres of RP2 water was transported by mine trucks to locations outside the RRZ for use by the Ranger emergency fire crew in containing and controlling a bushfire burning in and near the Magela LAA. The fire, fanned by strong winds and burning on a number of fronts, threatened infrastructure including monitoring installations and powerlines close to RP2 and also threatened to move towards the light industrial area and the Jabiru East site. There were no alternative sources of water in sufficient quantity available to fight the fire. The OSS assessed the transfer of water from the RRZ as constituting an infringement of the Ranger Authorisation and a breach of the ERs.
- **Feb. 26 to 27** - During a high rainfall event, water from the high grade ore stockpile, which contained significant U concentrations, escaped from its containment sump and flowed into Georgetown Creek, then into Magela Creek. As a result increased concentrations of U were detected in Georgetown Creek and in Magela Creek. The available information did not enable an accurate assessment to be made of the effect of this uncontrolled release. The OSS estimated that about 25 kg of U was released.

1991

- **General** - "At Ranger, the expected environmental effects of a large operating uranium mine are beginning to be discernible outside the immediate environs of the mine site ... The water quality of Magela Creek close to the boundary of the Project area and Kakadu National Park deteriorated in the 1991 Wet season to the extent that uranium and sulphate reached concentrations higher than background values ... this is the first recorded instance since Ranger commenced mining that the water quality in Magela Creek has deteriorated to the point where it has the potential to cause observable effects on aquatic organisms. Ranger is now a mature mine; losses of contaminants to the environment are increasing and their presence is measurable in local waterbodies and streams. The company has introduced a number of practices which result in the deliberate release of water whose quality will modify the chemistry of nearby natural waterbodies. While each of these sources contributes only minor quantities of contaminants, the resultant effect on water quality is readily measurable and more importantly, the evidence shows it to be increasing. The environmental implications of this trend should be assessed and water management practices re-evaluated to ensure that all sources contributing to losses to the environment have been minimised as required under the definition of Best Practicable Technology (ER 44)." (pp 14-15, OSS-AR, 1991).

- **General** - The OSS predicted that water management at Ranger was inadequate to cope with 'below average rain' let alone that approaching the 1 in 10 rainfall.
- **General** - High U concentrations were found in the Magela Creek. "Following the observation of intermittent increases in uranium concentrations in Magela Creek during the 1990-91 Wet season, the Committee requested Ranger, NTDME and OSS to collaborate in a sampling program during the 1991-92 Wet season to monitor and investigate the origin of any anomalously high concentrations." The escape of uranium bearing water from the crusher feed ore stockpile was identified as the major contributor to higher uranium levels.
- **Aug. 24 to 25** - Approximately 1,300,000 litres of RRZ water (from RP2) was inadvertently used on the perimeter road of the tailings dam to suppress dust.
- **March 27** - About 320,000 litres of additional water were applied to the land application area following equipment malfunction, leading to a 9% increase in irrigation rate. The water fully infiltrated and there was no runoff.
- **Feb. 26 to 27** - Uranium enriched water draining from the Ranger high grade ore stockpile was accidentally released to Georgetown Creek and subsequently Magela Creek. The event was not classified as an infringement by NTDME. The OSS estimated that about 25 kg of U was discharged to Magela Creek during this event and, based upon the flow conditions at the time, assessed that the concentration of uranium could have been comparable to the receiving water limit for a short period.
- **Feb. 19 to April 8** - 75,000,000 litres from RP4 containing 40 µg/L U.

1990

- **General** - "The Supervising Scientist has advised that the 1989 Wet season environmental toxicity tests have shown that waters from RP4 when mixed with Magela Creek water can produce toxic responses in certain aquatic organisms". The toxicity of RP4 is of concern because it is not in the RRZ and the relatively large catchment and the limited capacity of the pond requires the release of water in most Wet seasons.
- **June 22** - Approximately 2,500 to 3,000 litres of tailings leaked from a split pipe; all material was contained with the RRZ.
- **April 25** - A small quantity of tailings sprayed from a pump when the casing failed. No material left the RRZ and a thorough clean up was completed.

1989

- **Aug. 13 to 14** - About 315,000 litres of RP2 water was used for fire fighting when a bush fire threatened both the Ranger and Alligator Rivers Region Research Institute laboratories.
- **April 9** - The daily approved application rate of water to the land application area was exceeded. There may have been a small amount of runoff.
- **March** - Approval was given by the NT supervising authority to shut down temporarily (for up to two years) the seepage collector system in the Ranger tailings dam in contravention of ER10. The purpose was to obtain information on the migration of

seepage away from the tailings dam so as to calibrate a theoretical model of groundwater contamination.

- **March** - Approval was given by the NT supervising authority for release of water from RP4 via the spillway. This provided less assured control of the environmental impact of the released water than direct discharge to Magela Creek via the installed pipeline.
- **March 20** - RP2 water level was allowed to reach a level almost 1 m above the agreed wet season limit desirable to prevent overtopping as a result of a 1-in-100 year storm event.
- **Jan.** - The NTDME gave permission to release water into Kakadu National Park from RP4 next to a pile of radioactive rock that was dumped in error and even though higher than normal U levels had been detected in the pond on two occasions. ERA released 10,000,000 litres of contaminated water over a spillway to Djalkmara billabong, which flows into the Magela Creek system, despite ongoing advice from the OSS that any release should be via the pipeline rather than the spillway. The OSS criticised this method of release saying water release at Ranger was 'out of control'.

1988

- **General** - Following an abnormally low rainfall wet season more than a third of the tailings in the dam were exposed to the atmosphere. Attempts by Ranger to dampen the tailings left a dry portion in the centre of the dam not within the range of the water spray system, causing potential hazards to workers, tourists and the nearby town of Jabiru from the release of wind-carried radioactive dust particles.
- **Nov.** - Following a malfunction of ore discriminators material containing low grades of uranium was being dumped incorrectly on the waste rock dump; up to 500,000 tonnes of material may have been involved, possibly for as long as six months. The area of the waste rock dump was redesignated as RRZ. Criticising Ranger's attitude to the incident, Dr Glen Riley, OSS Director at Jabiru wrote "I regard this situation as the most serious deficiency shown by Ranger in a long series of malfunctions and operational shortcomings since the mine opened ... rather than achieve better (or more sure) environmental control as they gain more experience, Ranger are moving the operation into a more hazardous situation".
- **Oct. 22** - A small quantity of tailings sprayed, mostly into the tailings dam itself, from a burst gasket in the tailings dam.
- **Oct.** - OSS samples showed that unusually high levels of U and Ra in RP4.
- **Aug. 31** - Minor RRZ infringement when a contractor inadvertently used a small quantity of RRZ water for dust suppression outside the RRZ.
- **Feb. 1 to 2** - An overflow occurred of mill process froth from a tailings neutralisation tank; about 13,000 litres of liquid ran into RP2 but no liquid left the RRZ.

1987

- **March** - 500,000 litres of RP4 water was inadvertently released via the pipeline to Magela Creek following a valve malfunction and when the creek's flow rate was below the minimum approved rate.

- **March** - NTDME determined that RUM were 6 months overdue in submitting a report on revegetation of waste rock as required by ER 26. Also water from RP3 had been used for dust suppression outside the RRZ on a waste rock dump haul road.
- **Feb. 3 to 27** - 175,000,000 litres of RP4 water released into Magela Creek.
- **Feb. 2** - Between 20,000 and 100,000 litres of treatment water in the Ranger mill with elevated levels of uranium and calcium carbonates overflowed into the RRZ.

1986

- **General** - The trial dry tailings plot was observed to be unfenced and with animal footprints in the tailings.
- **Dec. 5** - RUM reported the unlawful removal from site of an empty but radiologically contaminated water tank (truck mounted; after negotiating with the owner the tank was returned to site and RUM control).
- **July 31** - A tailings pipeline failure led to ? kg of tailings being sprayed outside the RRZ.
- **June 3** - About 5,000 litres of water from a tailings pipeline was spilled outside the RRZ.
- **March 21** - Small quantity of tailings dam water sprayed and ran off the tailings dam wall; water mostly returned through the seepage collector system in all probability. The OSS expressed concern over delays in taking positive action to stop the leakage.
- **March 6 to 7** - An island of tailings developed in the tailings dam.
- **March 4** - The sulphuric acid plant was started up at the wrong rate leading to an increase in emissions of sulphur dioxide. Exact monitoring did not take place because Ranger's monitoring equipment had been out of order since Nov. 1985.
- **Jan. to March** - Approval granted to Ranger to release 84,500,000 litres of water from RP4 via a pipeline to Magela Creek. An expected program of biological monitoring was not undertaken even though biological tests undertaken the year before indicated adverse effects on some aquatic species after release of water from RP4.

1985

- **Nov. 26** - 200 litres of water leaked from a pipeline between the central seepage collector sump and the north wall of the tailings dam.
- **Oct. 3-7** - Valve failure in the tailings line resulted in 500,000 litres of tailings and process water being inadvertently applied to land application plots within the RRZ.
- **Oct.** - Ranger was requested by the NT Supervising Authorities and the Co-ordinating Committee for the Alligators River Region to carry out a comparative evaluation of options for water management at the mine.
- **Sep. 24** - 25,000 litres of tailings was sprayed over a 1,250 m² area outside the RRZ after a tailings line failure, covering the area 2 cm thick in tailings.
- **Sep. 18** - Another tailings pipeline failure resulted in about 25,000 litres of tailings water being released from the RRZ.

-
- **Sep. 17** - Tailings pipeline failure resulted in about 25,000 litres of tailings water being released from the RRZ.
 - **Sep. 3** - A small island was detected in the tailings dam, about 25 m² and 5 cm high.
 - **Sep. 2** - Accidental release of about 50,000 litres of water from RP2 adjacent to the trial land application area.
 - **Sep.** - Scaffolding stained with ammonium diuranate was shipped off site to Darwin for re-use.
 - **Aug. 9** - Yet another failure in the tailings pipeline - again resulted in about 2 kg of tailings being sprayed outside the RRZ.
 - **Aug. 1** - A further failure in the tailings pipeline resulted in about 2 kg of tailings being Sprayed outside the RRZ.
 - **July 31** - A failure in the tailings pipeline resulted in about 2 kg of tailings being sprayed outside the RRZ.
 - **June 28** - RUM detected a level of acid mist above the authorised limit; remedial work alleviated the problem and prevented recurrence.
 - **March** - A pipeline failure resulted in tailings dam water leaving the RRZ. The OSS expressed concern to Ranger over the delays in taking action to stop the leakage.
 - **March** - Ranger discharged about 160,000,000 litres of water from RP4 to the Magela Creek. Water held in RP4 is regularly released and is only supposed to hold rainfall runoff. The OSS reported some mussels in the creek aborted their larvae. It also appeared that the migration routes of some fish were altered during the release.
 - **Feb. 28** - Monthly sampling at product packing stack showed uranium levels close to the allowable limit; remedial work undertaken by RUM to repair scrubber system.
 - **Feb. 14 to 16** - Fish kill in RP2 was reported after water was pumped from RP4.
 - **Feb.** - Pipeline from RP2 to Magela Creek installed. ERA sought permission to release contaminated water into the Magela Creek. Approval for release not granted.

1984

- **Oct. 30** - 600 litres of water leaked outside the RRZ from the tailings dam seepage collector line.
- **July 11** - 200,000 litres of water from within the RRZ leaked outside the RRZ from a joint in a pipe carrying tailings dam seepage back to the dam.
- **April 9** - Estimated 200 litres spilled from a tank at bore 77/13 when it was tipped over.
- **Jan. 25** - 100,000 litres of RP2 water escaped from a pipeline within the RRZ; all water contained.

1983

- **Nov. 16** - 100 litres of diesel fuel spilled from split fuel line at borehole 77/2 over an area of 25 m².

- **Oct. 20** - Non-routine maintenance operations were undertaken in the product packing area with radioactive dust above levels required those required to be reported.
- **Sep. 20** - 40 tonnes of low grade dumped outside the RRZ. Clean up was carried and material returned to RRZ.
- **Sep.** - Workers at Ranger went out on strike for 7 days over health and safety standards. The strike was described as the final straw in a series of incidents at the mine that have endangered the health of workers and have repercussions on the Kakadu National Park.
- **Aug. 15** - Minor tailings leak; contained within RRZ.
- **Aug.** - Planned maintenance operations were undertaken in the calciner and product packing areas with radioactive dust above levels required those required to be reported.
- **July 13** - A contractor, without authorisation, pumped a small amount of RP2 water outside the RRZ to use in tailings dam construction.
- **July** - Drinking water at the mine was contaminated by radioactive water used in the processing of the plant. The processing water and drinking water were connected accidentally. It is uncertain how long this situation went undetected. When the contamination was eventually discovered the system was flushed out and workers were examined for radioactive contamination. Tests on the workers and in the contaminated area indicated 'no danger'; however subsequently a plumber found residue in the pipes which was revealed to have been the radioactive substance ammonium diuranate.
- **May** - High groundwater pressures and seepage discovered at RP2.
- **April 22** - Less than 50 litres of diesel escaped to Gulungul Creek from a spill at a borehole site 74/1.
- **March 9** - Labourer exposed to radioactive dust concentration above derived limits.
- **March** - Small volume of sewage escaped from Jabiru East following entry of stormwater into system; leading to pump failure.
- **Feb. 23** - 7 personnel exposed to above permitted levels of airborne radioactive contamination during modifications to yellowcake scrubbers.
- **Feb. 9** - 200 litres of diesel spilt at a borefield 800 m south of pit #1.
- **Feb. 1** - 1 tonne of low grade ore (0.02-0.05% U_3O_8) washed outside RRZ with 150,000 litres of RRZ water following drain blockage in heavy rainfall.

1982-83 Wet Season

- **1982-83** - Ranger imported 1,000,000,000 litres of water during a drought. The mine had recruited management personnel from arid climates who were unfamiliar with the variations of tropical monsoonal climates.

1982

- **Dec. 9** - Tailings spillage within the mill at No. 2 pachuca.
- **Nov. 5** - Blockage in the tailings pipeline with spillage covering 40 m² of the bund on the dam wall.

-
- **Sep.** - The first reports appear on the problems with leakage of the dam. The tailings dam continues to leak with greater seepage than design assumptions.
 - **Aug. 13** - Release of tailings from an air release valve. Apparently not discovered until 7 am on August 14. Cleanup effected on August 16.
 - **July 5** - Significant incident following a major spill of product, 1 tonne of yellowcake, with two workers ingesting yellowcake, radiation safety measures were investigated.
 - **June/July** - SO₂ emissions from acid plant stack over allowable limits (2 kg per tonne of acid produced). Plant shut down and modified to prevent further problems.
 - **June 22** - Filter cake from sulphur meter self ignited and was not fully extinguished before dumping in tailings dam; subsequently re-ignited and had to be dowsed with earth.
 - **June 16** - Discovered that emissions from scrubber in the product packing area exceeded the allowable rate on May 24; unit was shut down and overhauled; system modified to prevent blockage in water filter. Revised calculations also showed a breach on March 12.
 - **June 7** - Minor leakage from a perforation in the tailings pipeline.
 - **May** - High groundwater pressures noted at the tailings dam.
 - **April 20** - 30,000 litres pregnant organic liquor solution overflowed from an overflow sump into stormwater system thence to RP2. Operation was stopped; sump modified.
 - **March 25** - Bleeder valve on tailings pipeline leaked about 30,000 litres of tailings onto inside top of embankment; tailings were hosed into dam.
 - **March 16** - SO₂ analyser on acid plant damaged by acid.
 - **March 4** - 1 m² island of tailings appeared above water in tailings dam overnight when pipe was not shifted on time.
 - **Feb. 25** - Acid mist eliminators in acid plant flooded due to blocked drain and mist level exceeded permitted limits; plant shut down and fault rectified (by March 3).
 - **Feb. 18** - According to OSS-AR (1982), a small leak from the tailings pipeline was detected. The line was shut down and a repair effected within 1 hour including clean up, all tailings stayed in the 'supervised area'. Based on the Mine Inspectors' entry in the Mill Record Book, however, the spill was actually discovered by a Mines Inspector (and *NOT* OSS or ERA) and was apparently 2 m deep and 0.5 km long.
 - **Jan. 22 to Feb. 2** - Acid plant stack emissions measured to be in excess of allowable limit of 2 kg/tonne of acid produced; problem due to incorrect fitting in plant since commissioning (July 17, 1981); part replaced and level fell to about 1.3 kg/tonne.
 - **Jan. 22 to 23** - About 40 dead fish were found in Coonjimba Billabong, considered part of natural processes (no abnormal water quality indicators were found).
 - **Jan. 5** - Small quantity of yellowcake spilt from two drums in transport outside packing area.
 - **Jan. 2** - Break in tailings line inside tailings dam wall; some erosion, wall repaired with waste rock.
 - **Jan.** - At least 3 additional failures in the tailings pipelines not reported by OSS-AR (1982). One was at the dam wall while another was along the pipeline corridor.

1981

- **General** - At the official opening ceremony in 1981 there were exposed tailings in the dam. The Ranger Uranium Environmental Inquiry recommended that tailings at Ranger be covered by 2 m of water to reduce the release of radon gas and to prevent dry season winds from carrying radioactive dust particles over the region. Regulations were quickly changed to enable tailings to be kept damp instead (ie. no minimum water depth).
- **Dec. 28** - Operator sprayed with ammonium diuranate.
- **Dec. 22** - #3 sewage retention pond overflowed, Contractor failed to be on site as required.
- **Dec. 14** - Small tailings spill from breather valve in tailings pipeline on inside perimeter on tailings dam embankment. Breather valves declared redundant and removed.
- **Dec. 11** - Small amount of tailings leaked from a pipeline to the tailings dam floor above the water level, material was covered in soil.
- **Nov. 26** - Operator found in bare feet whilst working in the tailings dam; operator and supervisor advised of the importance of following safety procedures.
- **Nov. 25** - Two observed emissions of concentrate dust from the scrubber stack, estimated at 2 to 4 kg U. This exceeded the daily discharge limit of 1.5 kg U.
- **Nov. 23** - Spillage of concentrate from a drum outside the store during unloading.
- **Nov. 3 to 23** - Two islands of tailings appeared in the tailings dam, area about 20 m²; mine closed for 4 days while authorisation and requirement for 2 m water cover were reviewed. Authorisation amended to show water cover rather than specific depth.
- **Aug. 13** - Sewage manhole at Coonjimba Camp discharged at 3-4 litres/minute and effluent was flowing on the track to the billabong; leak was due to a faulty automatic pump control which prevented pump starting.
- **Aug. 5** - Clarified pregnant liquor tank and associated clarifier tank overflowed into an adjacent bund due to operator error. Liquor was pumped back; further overflow stopped by adjustment of process flow rate; slight increase in radioactivity in bund during incident.
- **Aug.** - During commissioning of the mill process stream waste rock was used. The ground waste accumulated at one point in the tailings dam and some was exposed to air.
- **July 31** - Fugitive slaked lime dust from a lime transfer operation blew into the surface of Djalkmara Billabong and was noted through a pH reading of 9.3 during routine monitoring.
- **July 29** - Recycle tank overflowed spilling process water from RP3 into the neutral thickener area. Some of the water and a minor amount of tailings solids were pumped into the stormwater collection pond which discharges to RP2 during the wet season. The estimated volume pumped was 40,000 litres.
- **April 9** - Small volume of water and silt flowed from RUM's organic dump tank to Georgetown Creek. (Ranger reported the incident to the OSS on April 29).

1980-81 Wet Season

- **General** - Sewer at old mess site became surcharged at times and sewage entered Coonjimba Billabong; necessitating remedial works.

1980

- **Nov. 9** - One antilopine kangaroo found shot at Gulungul Creek borefield.
- **Aug. 11** - One sea eagle found shot near junction of Magela and Georgetown Creeks.
- **July** - Large-scale sand mining was found to be occurring at Mudginberri Billabong by Pioneer Concrete for cement and construction works at Ranger and the township of Jabiru. Mining ordered to be stopped by the OSS.
- **June 27** - Dry drilling in Borrow Pit A; wet drilling was to be used under Occupational Health and Safety requirements.
- **June 6** - Release of 1,000,000 litres of silty water discharged from Borrow D to Georgetown Creek.
- **March 29** - Ranger Uranium Mine (RUM) pumped water from Borrow areas A and B to RP2 and RP3 before the ponds were declared officially to be the RRZ.
- **Feb. 23** - Eucalypt tree knocked over by a contractor.
- **Feb.** - The tailings dam floor and walls were identified by the Ranger Uranium Environmental Inquiry as major pathways by which contaminants could enter the Magela Creek. 245 mm of rain fell on the Ranger mine site in five hours. A rapid rise in water level occurred in both RP1 and the partially complete tailings dam. The company was forced to make a four metre breach in the tailings dam wall and about 9,000,000 litres was discharged into Djalkmara Creek. [Note - calculations in Section 4.3.3 suggest that a total of up to 64,000,000 litres was actually discharged, including the outlet pipe.]
- **General (Feb. ?)** - Concrete used in the construction of the tailings dam was faulty.

1979

- **Dec. 7** - Small amount of oil-tar spilled at a sediment control pond at Jabiru Police Station.
- **Nov. 22** - 20 litres of diesel spilled into a drain in Jabiru.
- **Nov. 9** - Contractor's plant encroached on fenced off vegetation; area was re-fenced and vegetation restored.
- **Feb. 28** - Spillage of diesel into Coonjimba Billabong.

