

*current system, are consistent with Environmental Requirement 16.1, reduce the need for the exercise of judgement by staff of ERA and will assist in minimising undue concern for Aboriginal people and the broader community.*

When considering reporting arrangements it is important not to overlook reporting between NTDME and OSS. The Working Arrangements state that there should be frequent and detailed communication between the Supervising Scientist and NTDME. They also state that NTDME is responsible for ensuring that the mining company directly and immediately notify NTDME, the Supervising Scientist, DISR and the NLC of any environmental event or incident which has the potential to cause concern to Traditional Owners or the broader public. The Working Arrangements do not, however, require NTDME or the Supervising Scientist to inform each other of any information they may acquire independently which could be of environmental significance. This is a deficiency in the Working Arrangements.

In this instance, NTDME officers observed black precipitate indicative of the presence of manganese in the VLGCR on 2 February 2000. The officers recognised this to be unusual prompting them to collect water samples from the VLGCR for analysis. This information was not passed by NTDME to the Supervising Scientist until investigations commenced after ERA notified OSS of the incident on 28 April 2000. Had the Working Arrangements required NTDME to report this observation to the OSS, OSS would have been in a position to commence its own inquiries and the leak may have been identified in a more timely manner.

#### **Recommendation 17**

*The Working Arrangements between the Commonwealth and the Northern Territory regarding the regulation of uranium mining activities in the Alligator Rivers Region should be reviewed and amended to require the Department of Mines and Energy and the Supervising Scientist to immediately inform each other of any information they may acquire independently which could be of environmental significance.*

## **6 Conclusions**

This report has been prepared in response to requests from the Minister for the Environment and Heritage and the Minister for Industry Science and Resources. Its purpose has been to investigate and report on the leak of water from the Tailings Water Return Pipe at the Ranger uranium mine during the 1999/2000 wet season with specific reference to:

- The origin of the leak and the adequacy of remediation measures taken to prevent similar occurrences in the future
- The extent to which the people and the environment of Kakadu National Park have been adversely affected by the leak
- The extent to which Energy Resources of Australia has complied with the reporting requirements specified in the Environmental Requirements that apply to the Ranger operation.

### **6.1 Origin of the leak and adequacy of remediation measures**

It has been established that the volume of water that leaked from the tailings water return pipeline was about 2000 cubic metres during the 1999/2000 wet season. Of this, only a small fraction, about 85 cubic metres, entered the culvert which flows to the Corridor Creek Wetlands. The remainder was collected in the tailings corridor sump and returned to the water management system.

The cause of the leak was corrosion and subsequent failure of three bolts that secure the jointing of two flanges in the pipeline. The principal cause of corrosion was the burial, under moist conditions for up to 6 months of the year, of the relevant section of the pipeline under silt derived from erosion in the vicinity of the tailings corridor roadway. A contributing factor to the failure may have been the use of undersized bolts.

The gradual burial of the pipeline and the absence of measures to remediate the situation are attributable to a reduction in the standard of maintenance carried out by ERA in the pipeline corridor in recent years. The failure of the mine inspection program carried out by the Northern Territory Department of Mines and Energy and, to a lesser extent, that of the Office of the Supervising Scientist, to observe and require remediation of the buried section has also been a contributing factor to the leak.

The failure of the pipeline to contain tailings water would not of itself normally have resulted in the discharge of this water to the external environment. That the leaked water did reach the external environment is due to a failure of the bunded corridor system to fully contain any spilled water. The cause of this failure was that the engineered structure between the roadway and a culvert that drains water from the nearby waste rock dump was not impermeable.

The statutory monitoring program has been found to be deficient in two ways. First, other than visual inspection, it has not been designed to include monitoring locations within secondary containment systems that would indicate the failure of primary containment systems. In the present case, no statutory reporting of the quality of water in the tailings corridor sump is required under the Ranger General Authorisation. If the routine analysis of ammonium ion and manganese in corridor sump water had been required, the existence of a leak in the pipeline may well have been detected several months before it was found and rectified. Second, there is no systematic monitoring program designed to check the integrity of the secondary containment systems. If these monitoring systems had been in place, the current incident could well have been avoided.

The original leak in the pipeline has been repaired and the complete pipeline has been tested to determine its integrity. The system is now operating satisfactorily. The silt that buried the pipeline has been removed and steps implemented to ensure that no build-up of silt will occur in the future. A concrete slab has been installed at the section of roadway that passes over the culvert to prevent infiltration in the future. A full review of the Tailings Dam Corridor has been recommended with particular emphasis on the efficacy with which it performs the task of providing secondary containment.

## **6.2 Impact on people and the environment**

Assessments of possible ecological impact arising from the leak have been carried out both using actual monitoring data and by modelling.

An examination of the chemical monitoring data at the gauging station on the Magela Creek upstream of the point at which the Creek enters Kakadu National Park shows that no change occurred during 1999/2000 in the concentrations of the principal constituents of concern compared to similar observations in previous years. The concentrations of all constituents were within the natural range observed previously. Similarly, biological monitoring at the gauging station and at a point upstream from the minesite shows no difference in the response of animals exposed to water at the downstream and the upstream sites. Even at the monitoring site at Georgetown Billabong, which is located on the mine project area downstream from the source of the leak but upstream of the confluence of Georgetown Creek and Magela Creek, no increase in the concentration of any of the principal solutes was detectable.

Modelling of the possible ecological impact was carried out by calculating the likely increase in concentrations at the gauging station using information derived in this study on; the maximum possible volume of leaked tailings water, the most probable value for this volume, the measured concentrations of solutes in tailings water, measured rates of attenuation of solutes in the constructed wetland filter systems and the flow rates in Magela Creek. Even if one ignores the losses in the wetland filters and uses the maximum possible volume of leaked tailings water, the calculated increase in the concentration of all constituents is much lower than the naturally observed concentrations at this point.

We have concluded that the leak of tailings water had no adverse ecological impact on Kakadu National Park.

The radiological impact was assessed using the information derived in this study on the quantity of water released and the concentrations of radionuclides in tailings water together with the results of the past research program of the Supervising Scientist on the dispersion of radionuclides in the surface water system and the uptake of radionuclides in animals and plants. The maximum conceivable dose received by members of the public as a result of the leak is lower than the public dose limit by more than a factor of 1000. The best estimate of the dose received is lower by a further factor of 30. Even these estimates ignore the reduction in dose resulting from absorption of radionuclides in the wetland filter system.

The overall conclusion reached is that the leak of tailings water into the external environment has had a negligible impact on people and the environment.

### **6.3 Compliance with reporting requirements**

Under the Environmental Requirements, ERA must directly and immediately report any breach of the Environmental Requirements and any mine-related event which:

- (a) results in significant risk to ecosystem health; or
- (b) which has the potential to cause harm to people living or working in the area; or
- (c) which is of or could cause concern to Aboriginals or the broader public.

It has been concluded that ERA did not comply with this requirement on two grounds: (i) the leak of tailings water to the external environment is a breach of Environmental Requirement 3.4 and (ii) there should have been no doubt that such a leak would have been of concern to the local Aboriginal people and the broader public.

The reasons for the lack of reporting have been the subject of an internal ERA investigation and the Supervising Scientist has received correspondence from, and has discussed with, the Chief Executive of ERA the outcomes of the review. ERA believes that there was no deliberate intent to deceive or dissemble. Rather, two principal factors are believed to have contributed to the omission. First, recent changes in staffing at Ranger have resulted in the absence of a senior scientist with the ability to effectively identify, interpret and rectify environmental incidents. The lack of interpretive ability was a key factor in the lack of recognition that the data which were available to ERA staff implied that tailings water had reached the external environment. Second, there is a lack of recognition by the Ranger Management Team of the needs and expectations of stakeholders that resulted in emphasis being placed on the absence of environmental impact rather than the issue of whether or not the incident would be of concern to Aboriginal people.

From his discussions with senior ERA personnel, the Supervising Scientist is satisfied that there was no deliberate attempt to deceive the authorities. He accepts the conclusions of ERA and has made recommendations to address the deficiencies identified.

#### **6.4 Other issues**

In the course of this investigation into the leak of tailings water during the 1999/2000 Wet season, evidence has been obtained that water with the characteristics of tailings water was probably discharged into the same culvert during the 1998/1999 Wet season. Due to time constraints, the cause of this discharge has not been fully established. A possible explanation that is being investigated is that tailings water associated with a leak in the tailings pipeline on 13 December 1998 seeped in to the VLGCRS during the 1998/99 Wet season. While the Supervising Scientist is concerned that the probable presence of tailings water in the VLGCRS went undetected until now and that a full explanation for its origin is not yet available, he is satisfied that the 1998/99 leak caused no harm to people or the environment of Kakadu National Park. ERA should complete a comprehensive investigation of additional sources of contaminants in the VLGCRS, including previous tailings spills in the Tailings Dam Corridor, and provide a report to the Minesite Technical Committee.

During the past few years, there has been an increase in public expressions of concern about the ability of the Supervising Scientist to provide reliable assurances to the public when he has to rely heavily on information and monitoring data provided by ERA and/or by the Department of Mines and Energy which is seen primarily as a proponent of mining. These concerns have heightened following the reporting of the tailings water leak. In particular, the Mirrar, traditional owners of the land containing both the Ranger and the Jabiluka projects, expressed their concerns on this issue at a recent meeting with the Supervising Scientist. We have concluded that, in order to keep pace with these changing expectations on the independent nature of the assessments carried out by the Supervising Scientist, the Supervising Scientist should ensure that there is an adequate and independent on-site audit program, and develop and implement an environmental monitoring program. These programs should focus on the potential off-site environmental consequences arising from operation of the Ranger mine and mill.

There are difficulties with the current requirements for the reporting of incidents at Ranger. First, they often require a judgement by ERA staff on whether or not the incident would give rise to concern by Aboriginal people or the general public. Such judgements may be difficult to make. Second, the demand for a completely open and transparent system of reporting often results in an unjustified but very genuine concern, even fear, on the part of traditional owners. Guidelines need to be developed to clarify the reporting requirements in a way that will, while retaining the transparency of the current system, reduce the element of judgement needed and assist in minimising undue concern for Aboriginal people and the broader community.

A full set of recommendations has been made to address the issues identified above.

#### **References**

- ANZECC & ARMCANZ In review, National Water Quality Management Strategy (NWQMS), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- Akber RA, Johnston A & Hancock G 1992. Absorption of radionuclides and other solutes in a natural wetland. *Radiation Protection Dosimetry* 45, 293–297.

From his discussions with senior ERA personnel, the Supervising Scientist is satisfied that there was no deliberate attempt to deceive the authorities. He accepts the conclusions of ERA and has made recommendations to address the deficiencies identified.

#### **6.4 Other issues**

In the course of this investigation into the leak of tailings water during the 1999/2000 Wet season, evidence has been obtained that water with the characteristics of tailings water was probably discharged into the same culvert during the 1998/1999 Wet season. Due to time constraints, the cause of this discharge has not been fully established. A possible explanation that is being investigated is that tailings water associated with a leak in the tailings pipeline on 13 December 1998 seeped in to the VLGCRS during the 1998/99 Wet season. While the Supervising Scientist is concerned that the probable presence of tailings water in the VLGCRS went undetected until now and that a full explanation for its origin is not yet available, he is satisfied that the 1998/99 leak caused no harm to people or the environment of Kakadu National Park. ERA should complete a comprehensive investigation of additional sources of contaminants in the VLGCRS, including previous tailings spills in the Tailings Dam Corridor, and provide a report to the Minesite Technical Committee.

During the past few years, there has been an increase in public expressions of concern about the ability of the Supervising Scientist to provide reliable assurances to the public when he has to rely heavily on information and monitoring data provided by ERA and/or by the Department of Mines and Energy which is seen primarily as a proponent of mining. These concerns have heightened following the reporting of the tailings water leak. In particular, the Mirrar, traditional owners of the land containing both the Ranger and the Jabiluka projects, expressed their concerns on this issue at a recent meeting with the Supervising Scientist. We have concluded that, in order to keep pace with these changing expectations on the independent nature of the assessments carried out by the Supervising Scientist, the Supervising Scientist should ensure that there is an adequate and independent on-site audit program, and develop and implement an environmental monitoring program. These programs should focus on the potential off-site environmental consequences arising from operation of the Ranger mine and mill.

There are difficulties with the current requirements for the reporting of incidents at Ranger. First, they often require a judgement by ERA staff on whether or not the incident would give rise to concern by Aboriginal people or the general public. Such judgements may be difficult to make. Second, the demand for a completely open and transparent system of reporting often results in an unjustified but very genuine concern, even fear, on the part of traditional owners. Guidelines need to be developed to clarify the reporting requirements in a way that will, while retaining the transparency of the current system, reduce the element of judgement needed and assist in minimising undue concern for Aboriginal people and the broader community.

A full set of recommendations has been made to address the issues identified above.

#### **References**

- ANZECC & ARMCANZ In review, National Water Quality Management Strategy (NWQMS), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- Akber RA, Johnston A & Hancock G 1992. Absorption of radionuclides and other solutes in a natural wetland. *Radiation Protection Dosimetry* 45, 293–297.

- Bywater JF, Banaczowski R & Bailey M 1991. Sensitivity to uranium of six species of tropical freshwater fishes and four species of cladocerans from northern Australia. *Environmental Toxicology & Chemistry* 10, 1449–1458.
- Goetsch P-A & Palmer CG 1997. Salinity tolerances of selected macroinvertebrates of the Sabie river, Kruger National Park, South Africa. *Arch. Environ. Contam. Toxicol.* 32, 32–41.
- Humphrey CL, Faith DP & Dostine PL 1995, 'Baseline requirements for assessment of mining impact using biological monitoring', *Australian Journal of Ecology* 20: 150–166.
- Klessa DA 2000. *The chemistry of Magela Creek: A baseline for assessing change downstream of Ranger*. Supervising Scientist Report 151, Supervising Scientist, Darwin.
- Klessa D, Hunt C & leGras C 1998. Sediment characteristics and concentration gradients in the RP1 constructed wetland filter. July 1998, Internal report 293, Supervising Scientist, Canberra. Unpublished paper.
- Johnston A & Needham RS 1999. Protection of the Environment near the Ranger uranium mine. Supervising Scientist Report 139, Supervising Scientist, Canberra.
- leGras C & Klessa D 1997. An assessment of the performance of the Ranger RP1 constructed wetland filter during releases in 1995 and 1996. Internal report 255, Supervising Scientist, Canberra. Unpublished paper.
- Lewis B 1992. The assessment of seven Northern Territory gastropod species for use as biological monitors of Ranger uranium mine retention pond waters. Open file record 100, Supervising Scientist for the Alligator Rivers Region, Canberra. Unpublished paper.
- Martin P 2000. Radiological impact assessment of uranium mining and milling. PhD thesis, Queensland University of Technology, February 2000. Section 3.1.
- Rippon G, Hunt S, Camilleri C & Summerton J 1998. 340502: Toxicity of waters with artificially enhanced concentrations of constituents (seepage). In *Environmental Research Institute of the Supervising Scientist Annual Research Summary 1992–1994, Incomplete draft report*. Internal Report 291, Supervising Scientist, Canberra, 147–148.