



**ORIGINAL PAPER**

No. 2613

Laid on the Table

21 / 08 / 96

**LEGISLATIVE ASSEMBLY OF THE NORTHERN TERRITORY**

---

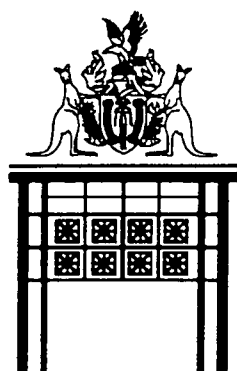
**SESSIONAL COMMITTEE ON THE ENVIRONMENT**

**REPORT**

**AUGUST 1996**

---

Presented and Ordered  
to be printed by the  
Legislative Assembly  
of the  
Northern Territory  
on 21 August 1996



LEGISLATIVE ASSEMBLY OF THE NORTHERN TERRITORY

---

**SESSIONAL COMMITTEE ON THE ENVIRONMENT**

**REPORT**

---

**AUGUST 1996**

## INTRODUCTION

The Sessional Committee on the Environment was appointed on the 27 June 1994 and now has the following membership:

Dr Lim, MLA (Chairman)  
Mr Adamson, MLA  
Mr Bailey, MLA  
Mr Mitchell, MLA  
Mr Rioli, MLA

## TERMS OF REFERENCE

Your Committee has been charged to -

"inquire into and from time to time report upon and make recommendations on:

- (a) all matters to uranium mining and processing activities and their effects on the environment within the Alligator Rivers region; and
- (b) any matter relating to mining and/or the environment within the Northern Territory which is referred to it by -
  - (i) the relevant Minister; or
  - (ii) resolution of the Legislative Assembly."

Your Committee has also been authorised during the course of its investigations -

- (a) "to send for persons, papers and records, to sit in public or in private session notwithstanding any adjournment of the Assembly, to adjourn from place to place and have leave to report from time to time its proceedings and the evidence taken and make such interim recommendations as it may deem fit, and to publish information pertaining to its activities from time to time;
- (b) to publish from day to day such papers and evidence as may be ordered by it and, unless otherwise ordered by the Committee, a daily *Hansard* be published of such proceedings as take place in public;
- (c) the Committee be empowered to consider, disclose and publish the Minutes of Proceedings, evidence taken and records of similar Committees appointed in previous Assemblies."

## **COMMITTEE'S ROLE**

During 1995-96 no specific references on mining were given to the Committee. Thus the Committee's role was one of monitoring and watching over the various government and non-government agencies participating in the mining and monitoring of uranium in the Alligator Rivers region with specific emphasis on any impact the mining has on the environment.

## **MEETINGS**

The Committee has held two meetings during the year and visited the uranium province twice.

## **ALLIGATOR RIVERS REGION**

While the committee received no specific references on mining or the environment, it continued to monitor activities in the uranium province of the Alligator Rivers Region. The Committee undertakes periodic inspection visits to the region. The Department of Mines and Energy provides the Committee with six-monthly reports on environmental monitoring and surveillance in the region, together with investigative reports on any breaches of environmental requirements and other incidents impacting on the environment. The Committee also receives annual reports from the Office of the Supervising Scientist and monitors information provided through the media and by interested groups and parties.

## **VISIT TO RANGER AND OFFICE OF THE SUPERVISING SCIENTIST, JABIRU 23 April 1996**

The Committee comprising, Dr Richard Lim, MLA, (Chairman), Members, Mr Peter Adamson, MLA, Mr John Bailey, MLA, Mr Phil Mitchell, MLA and Mr Maurice Rioli, MLA, assisted by Secretary to the Committee, Mr Graham Gadd and Mr Mal Wedd (Department of Mines and Energy).

## **Koongarra**

The Committee took the opportunity on its way to Ranger to fly over Koongarra and identified the mine site. Discussion ensued on access to the site and the concept of construction of a road to Ranger to enable possible processing of ore at Ranger, should the project proceed.

1. **RANGER**

Present from Ranger was: Mr Andrew Jackson (Environment Superintendent).

Mr Jackson proceeded to introduce the Ranger operations to the Committee and highlighted a number of current matters.

a. **Ranger Orebody #3**

An application had been lodged by Ranger to mine Orebody #3 which is adjacent to the mine site access road and opposite Retention Pond No. 2.

It is proposed to process ore from Orebody #3 at the existing Ranger mill. The Committee was informed that Orebody #3 was within the Ranger mining lease area and would likely be developed in accordance with the agreement of Aboriginal owners of the area.

b. **Proposed expansion of operations**

In order to meet expected demand, ERA is planning to upgrade the Ranger Mill to an output capacity of 5000 tonnes per year of uranium.

c. **Tailings Management**

Mr Jackson advised that Ranger's most recent research calculations and achieved practical results of tailings settlement procedures indicated that it was possible all tailings from Orebody #1 operations and those arising from Orebody #3 could be deposited in the Ranger #1 pit. Further, it is estimated that tailings resulting from the proposed Jabiluka mine could also be contained within the Ranger pits.

Environmental Requirement 29 requires that tailings be returned to the Ranger pits unless the Supervising Scientist agrees that the environment will be **no less well** protected by disposal of tailings by some other method. *In-situ* deposition and rehabilitation have been the focus of considerable research by Ranger and the staff of the Office of the Supervising Scientist regarding the long term environmental protection of the area. Environment Research and Development to the cost of approximately \$1.5 million has been set aside by Ranger during 1996-97 to allow a final decision on the fate of the tailings dam.

d. **Water Management**

A release of Retention Pond No. 2 water had been averted following the 1994-95 wet season by transferring water to the Ranger Pit #1 and subsequent disposal within the restricted release zone via the land

application. Long term management plans and strategies are now in place to obviate Retention Pond No. 2 water releases by:

- use of enhanced evaporation on retention ponds by aerial spraying;
- wetland filtration; and
- land application of water.

**e. Diesel fuel levy**

Implications of the removal of the diesel fuel levy on fuel consumed for power generation at Ranger was discussed although this field is outside the scope of Mr Jackson's work. There was some discussion relating to Ranger augmenting the town power grid.

**f. National Registration of Radiological exposure for workers**

The Committee was advised of a current proposal to put in place a National Register to record radiation doses received by all personnel exposed to radiation in the workplace and particularly those working in the uranium industry.

At present, all health records of radiation exposure of workers are forwarded to Territory Health Services for recording and health history assessment purposes. ERA was willing to cooperate in providing this information to a national registration body should one be established.

**g. Ranger Lease**

Mr Jackson advised that negotiations had commenced with the Northern Land Council to renew the Ranger Lease which is due to expire in 2000.

**h. Tailings Pipeline leak**

The Committee visited the site of recent leaks from the tailings pipeline which resulted from gate valve failure. On replacing the gate valve with its recommended replacement, the new valve also failed (not suitable for this application) and a further replacement was made using the type originally installed. Additional work was also carried out to secure the pipeline at this point to prevent vibration weakening the structure when pumps cut in and out.

Tailings which had escaped the bunded pipeline corridor were recovered and deposited in the tailings dam. The effected area had been cleaned up and seeded with grasses which had already germinated.

**i. Wetland filter**

The Committee was given a briefing and inspection of the short term wetland filter which is used to extract heavy metals from Retention Pond No. 2 water before being used on the flood irrigation area. Your committee was informed that this wetland filtration system successfully retained approximately ninety percent of uranium from the RP2 water passing through the system. On all available evidence there is no apparent remobilisation of uranium. Uranium locked up in the filters could be put into the tailings dam during the rehabilitation phase of the mine. This system is considered the best option for treating and managing water quality especially when compared with direct release.

**JABILUKA**

The Committee was given an overview of the proposal for the mining operation and milling of ore from Jabiluka. The proposal included an underground mining operation in which extracted ore is transported via a haulage road constructed within the current Jabiluka and Ranger mining leases for treatment at the upgraded mill at Ranger. A minor modification of the mill (a graphite removal stage) will be required due to the different mineral composition of the uranium.

A new EIS (Environmental Impact Statement) is being prepared to upgrade and refine data previously completed for Jabiluka. The new EIS must include factors relating to the reduced scope of the mining operations.

It was proposed that the new EIS would be conducted within guidelines set by both the Commonwealth (as advised by the Supervising Scientist) and Northern Territory Governments, which would be subject to public comment with a supplementary EIS made as a result of public comment received.

**NABARLEK**

The Committee was concerned to see for itself the progress of decommissioning and rehabilitation of the Nabarlek Mine site during its visit to the uranium province. Due to the accessibility constraints at that time of year, the Committee viewed the rehabilitated area from the air. This vantage point provided the Committee with a clear indication of the progress since rehabilitation and revegetation had been completed. It was obvious that the germination of grasses and tree plantings had taken place on the rehabilitated mine site and retention ponds; and that plant and equipment and building structures had been removed. The area had obviously been successfully seeded.

While the site was still in the early stages of regrowth it appeared to have been successfully revegetated. Continued monitoring of the rehabilitated site will be maintained by the company and the Department of Mines and Energy until further assessment of sustainable environmental rehabilitation is made by an independent person. Once agreement is reached on the sustainability of the revegetation by the Northern Land Council, Queensland Mines PL, Office of the Supervising Scientist, and the Northern Territory Department of Mines and Energy a rehabilitation certificate will be able to be signed by the Minister pursuant to the provisions of the *Uranium Mining (Environment Control) Act*.

#### **ENVIRONMENTAL INSTITUTE OF THE SUPERVISING SCIENTIST**

Dr Arthur Johnston	Director of ERISS,
Mr Peter Waggitt	Principal Environmental Scientist, OSS Darwin
Dr Max Finlayson	Wetlands Research, Senior Scientific Manager, ERISS
Dr David Klessa	Impact of Mining Research, A/Senior Scientific Manager, ERISS

The Committee visited the Environmental Research Institute of the Supervising Scientist at Jabiru, and were met by the above key personnel.

Mr Johnston discussed the restructure of the program of the Environmental Institute of the Supervising Scientist (ERISS) and the move towards a broader role for the Supervising Scientist. This has entailed the development of a new research program structure for ERISS which focussed on two main streams -

- impact of mining; and
- wetlands management,

with general environmental research being an adjunct to these streams of research. The Supervising Scientist now concentrates on assessing the impact of mining, conducts reviews and provides advice on matters to the responsible Commonwealth Government Minister as required.



Further, this role is being expanded to reflect the available expertise and to develop collaborative partnerships with the State and Territory Governments.

### **Impacts of Mining**

As part of ERISS' ongoing program in relation to the protection of the environment from the effects of mining in the region, it was continuing its research into developing and refining standards, practices and procedures.

It was stated that past research had concentrated on developing and documenting environmental benchmarks for radio-nuclide standards, ecotoxicological protocols, biological monitoring protocols, radiation exposure of workers and inhabitants of the mine and township site, as a result of mining and erosion of rehabilitated landforms.

Future and current research development projects issues for ERISS were:

- methods of treating water arising from mine operations;
- radiological exposure following rehabilitation of mined areas;
- alternatives for long term tailings disposal and management; and
- assessment of likely environmental impacts arising from Jabiluka and Koongarra projects.

### **Wetlands Protection**

ERISS' research is being directed towards tropical freshwater and estuarine ecosystems and their conservation, together with methods of providing environmentally responsible sustainable development in sensitive areas.

Past research programs had been directed towards producing regimes for biological monitoring and toxicological water quality guidelines for metals.

Other areas of research being conducted were the assessment of risks to the environment in the use of herbicides in coastal tropical freshwater and estuarine flood plain ecosystems. An additional research program, which has recently been commenced, was the identification and assessment of radium in bores in the Northern Territory.

The Committee was advised of a number of the projects being undertaken as part of the wetlands research program. These mainly related to rehabilitation studies on:

- the effect on vegetation on the hydrology and erosion of waste rock material at Ranger; and

- the effects of long term storage of topsoil on biological and chemical properties.

By devolving the research of the office to ERISS, the Supervising Scientist is able to direct resources towards the coordination and supervision of the implementation of environmental requirements in the Alligator Rivers Region.

The revision of the *Environment Protection (Alligator Rivers Region) Act*, which expanded the activities of the Supervising Scientist and his staff, also created two new committees to act as forums for the exchange of information and replace the old Co-Ordinating Committee. This has been ably conducted under the umbrella of the Alligator Rivers Region Advisory Committee (ARRAC) and the Alligator Rivers Region Technical Committee (ARRTC), both of which have an independent chairperson appointed by the Commonwealth Minister for the Environment. ARRAC comprises representatives from all major stakeholders in the region and ARRTC includes technical representatives from all organisations carrying out environmental and related research in the region. These committees are an example of the improved working relationships between the Commonwealth and Northern Territory Governments, as well as between major stakeholders.

### **Nabarlek**

The Committee was reassured that with the decommissioning and rehabilitation of the Nabarlek mine site an ongoing routine assessment program was in place to monitor ground water, the sustainability of rehabilitation undertaken and any continuing environmental effects on surrounding areas. Further detailed radiological studies are also planned.

### **Environmental Performance and Monitoring**

As part of the environmental performance and assessment carried out by ERISS, Dr Johnston provided a slide presentation which included the overhead projections of environmental monitoring data.

The attached schedules, Figures 1 - 6, give an indication of the environmental performance monitoring by comparing the chemical and biological measurements of the effects of mining on the surrounding areas compared with those predicted by the Fox Inquiry.

Figure 1 is a comparison of what was predicted during the Fox Inquiry in terms of the loads of, number of metals and radio-nuclides that would be discharged from the Ranger site. Copper which was found to have been released from the mine site into the Magela Creek system was down on expectations by approximately a factor of 100. Similar levels were evident for lead and zinc. Uranium levels are not quite a factor of 100 less, but still

significantly lower than expected. Similarly for radium, very low concentrations of loads released were measured together with those of manganese and sulphate.

In monitoring environmental performance of ecosystems from a chemical assessment point of view, Figure 2 illustrates the concentrations of sulphate in the Magela Creek system downstream from Ranger, as a function of time. An increase in sulphate concentration has occurred gradually over time.

The impact of these concentrations is minimal, despite the fact that there has been an increase over time. However, the mean sulphate concentrations are still a factor of 10 below the receiving water standard set by ERISS in 1984.

Similarly, with magnesium (Figure 3), a cation associated with sulphate, concentrations are all more than a factor of 10 below receiving water standards.

Uranium concentrations measured over time (Figure 4), indicates a decrease but the Committee was informed that this may be due to the inaccuracy of early measurements. Certainly, the maximum concentrations on some occasions have risen. However, this is still within a factor of 10 below receiving water standards recommended by ERISS in 1984.

Other measures used to monitor environmental performance and protection include the monitoring of effects on sensitive aquatic animals. Figure 5 indicates the results of trials carried out which exposed fish larvae to water of Magela Creek upstream and downstream from the Ranger mine. There is no discernible difference between the upstream and down stream fish larvae populations. Similarly, with the monitoring of snails (Figure 5), a zero mean result was achieved. On this type of monitoring (biological) ERISS is unable to detect any downstream effects from the Ranger mine.

As a further measure of environmental protection, monitoring of aquatic pathways and the atmosphere for human radiation exposure is carried out (Figure 6).

This exposure to radiation via the aquatic pathway occurs whereby radionuclides move from the mine site, by the uptake in animals and plants that are subsequently consumed by people. It was reported to the Committee that generally actual exposures are 100 times lower than the public dose limit.

Atmospheric exposure of people, Figure 6, occurs as a result of their exposure to radon gas and radon daughters and possible dust ingestion. ERISS had carried out a substantial research program to differentiate between the natural levels of radon presence in the atmosphere and that due to mining. From the measurements obtained, people in the vicinity of the mine have exposure to radon and radon daughters at a level substantially

below the international recommended limit. Dust reduction practices at Ranger ensure this is not a hazard.

### **Summary**

Your committee was reassured to learn that the monitoring regime program for Ranger and Nabarlek indicated that chemical levels in discharge from the mining operations in the Alligator Rivers Region varied between 10 - 100 times less than predicted at the Fox Inquiry. This was attributed to the diligence of all stakeholders in adhering to Environmental Requirements set and the development of and implementation of Best Practice methods for mining. To a degree, the fact that there has been no discharge of retention pond water into Magela Creek would have contributed to the overall low levels of measurable change in chemical concentrations of water downstream of Ranger.

Your Committee is satisfied that on the basis of the measurements achieved under the current monitoring programs, not only is the mining operation performing much better than expected by the Fox Inquiry, but in terms of standards derived later and in terms of sensitive biological monitoring methods being used, there is little doubt that the off-site environment downstream - Kakadu National Park and people living in it are being protected to accepted national and international standards.

Dr Richard Lim  
Chairman

## APPENDICES

---

- Figure 1** Annual loads of chemicals discharged from Ranger - comparison of RUEI Predictions with actual loads discharged.
- Figure 2** SO<sub>4</sub> concentrations downstream for Ranger.
- Figure 3** Magnesium concentrations downstream from Ranger with receiving water standards recommended by ERISS.
- Figure 4** Uranium concentrations downstream from Ranger with receiving water standards recommended by ERISS.
- Figure 5** (a) Biological monitoring: Fish larval survival.  
(b) Biological monitoring at Ranger: snail reproduction.
- Figure 6** (a) Radiation exposure: Aquatic pathway.  
(b) Radiation exposure: Atmospheric pathway.

FIGURE 1

### Annual Loads of Chemicals Discharged From Ranger Comparison of RUEI Predictions with Actual Loads Discharged

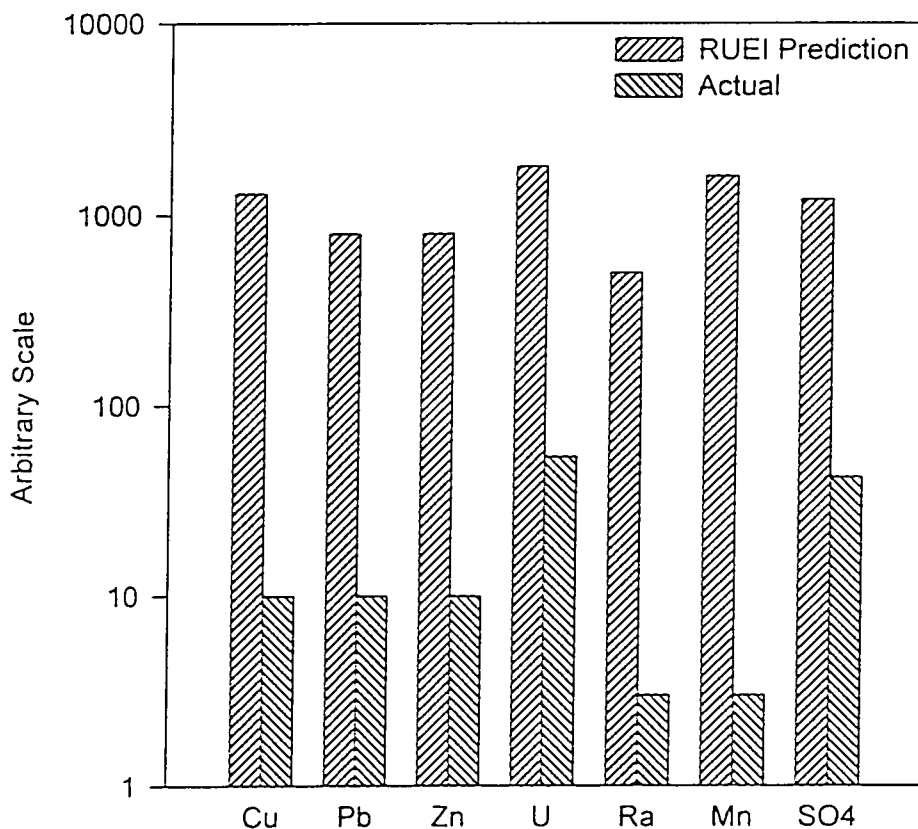


Figure 1. Comparison of actual loads of constituents discharged from the Ranger mine in year 10 of operation with the predictions of the Ranger Uranium Environmental Inquiry.

Copper which was found to have been released from the mine site into the Magela Creek system was down on expectations by approximately a factor of 100. Similar levels were evident for lead and zinc. Uranium levels are not quite a factor of 100 less, but still significantly lower than expected.

FIGURE 2

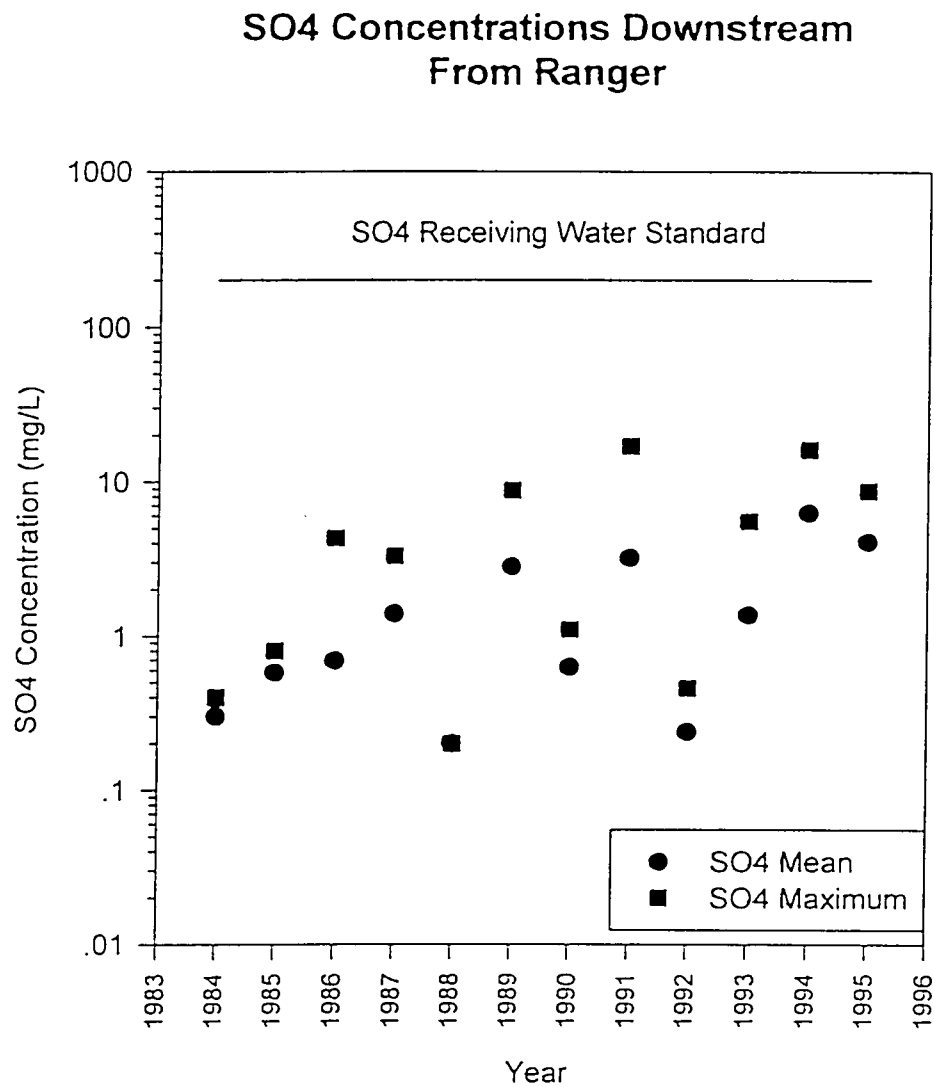


Figure 2. Comparison of sulphate concentrations at gauging station GS8210009 downstream from the Ranger mine with the receiving water standard recommended by *eriss*.

The impact of these concentrations is minimal, despite the fact that there has been an increase over time. However, the mean sulphate concentrations are still a factor of 10 below the receiving water standard set by ERISS in 1984.

FIGURE 3

### Mg Concentrations Downstream From Ranger

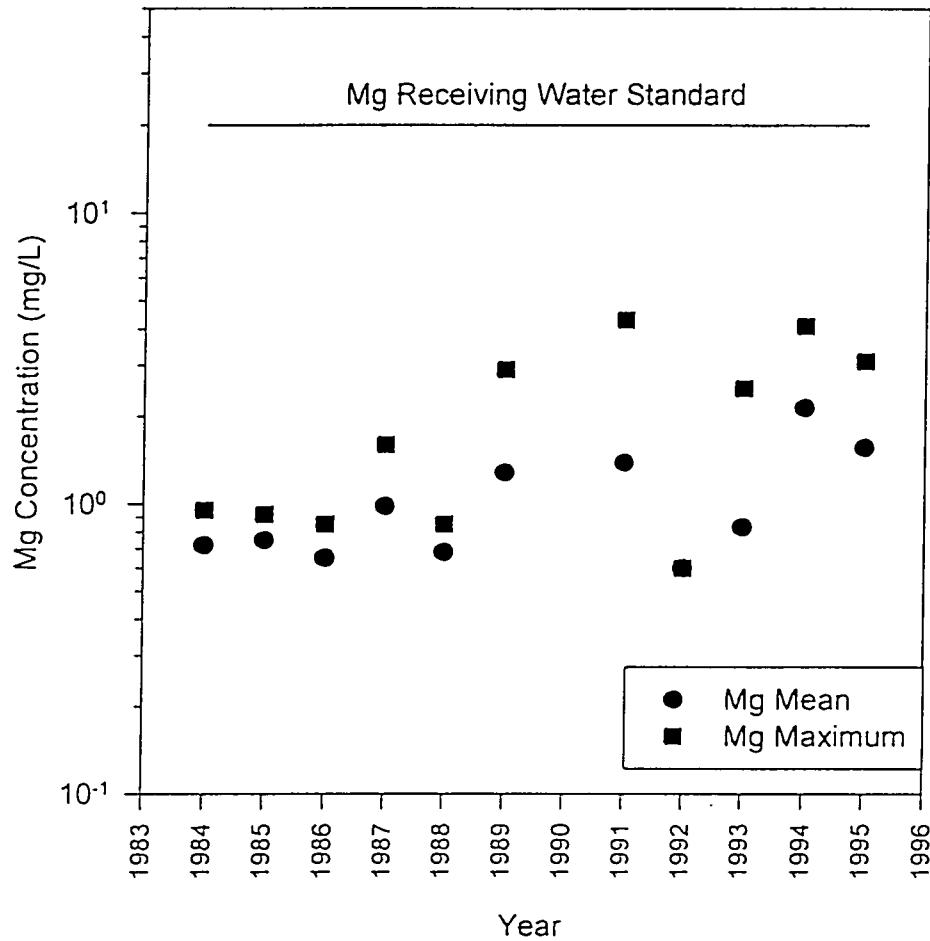


Figure 3. Comparison of magnesium concentrations at gauging station GS8210009 downstream from the Ranger mine with the receiving water standard recommended by *eriss*.

Magnesium concentrations are all more than a factor of 10 below receiving water standards.



FIGURE 4

### Uranium Concentrations Downstream From Ranger

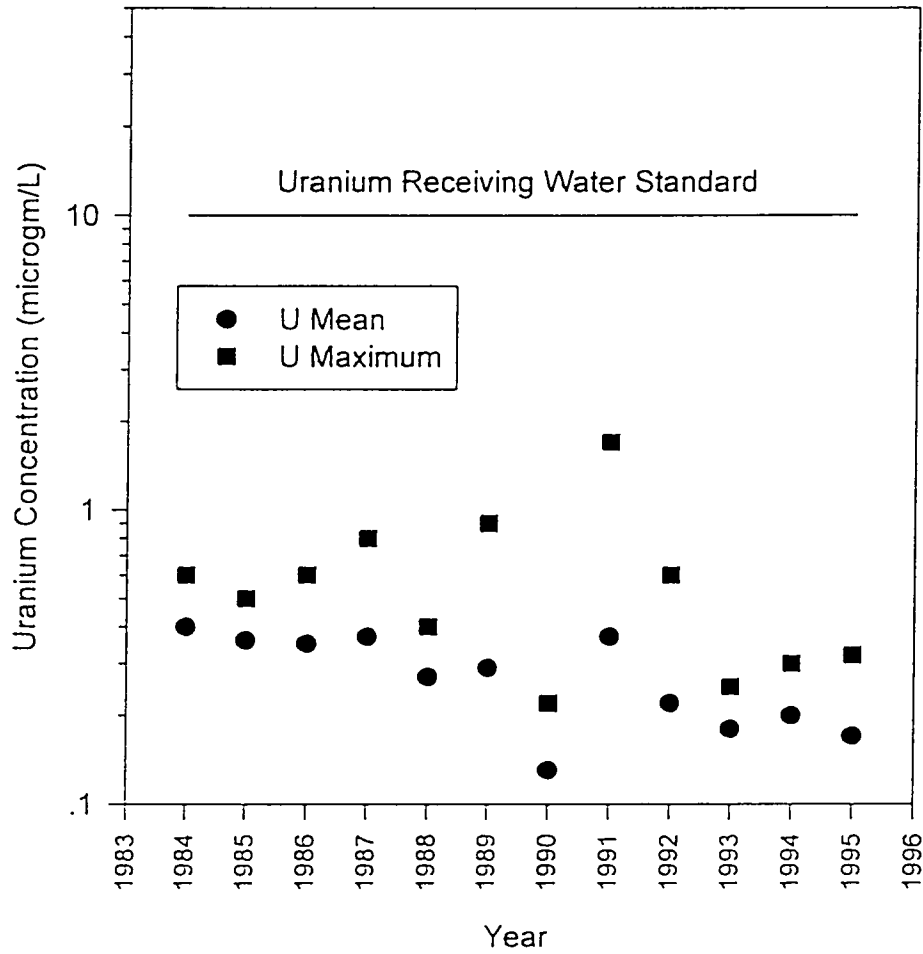


Figure 4. Comparison of uranium concentrations at gauging station GS8210009 downstream from the Ranger mine with the receiving water standard recommended by *eriss*.

Maximum Uranium concentrations on some occasions have risen. However, this is still within a factor of 10 below receiving water standards recommended by ERISS in 1984.

FIGURE 5

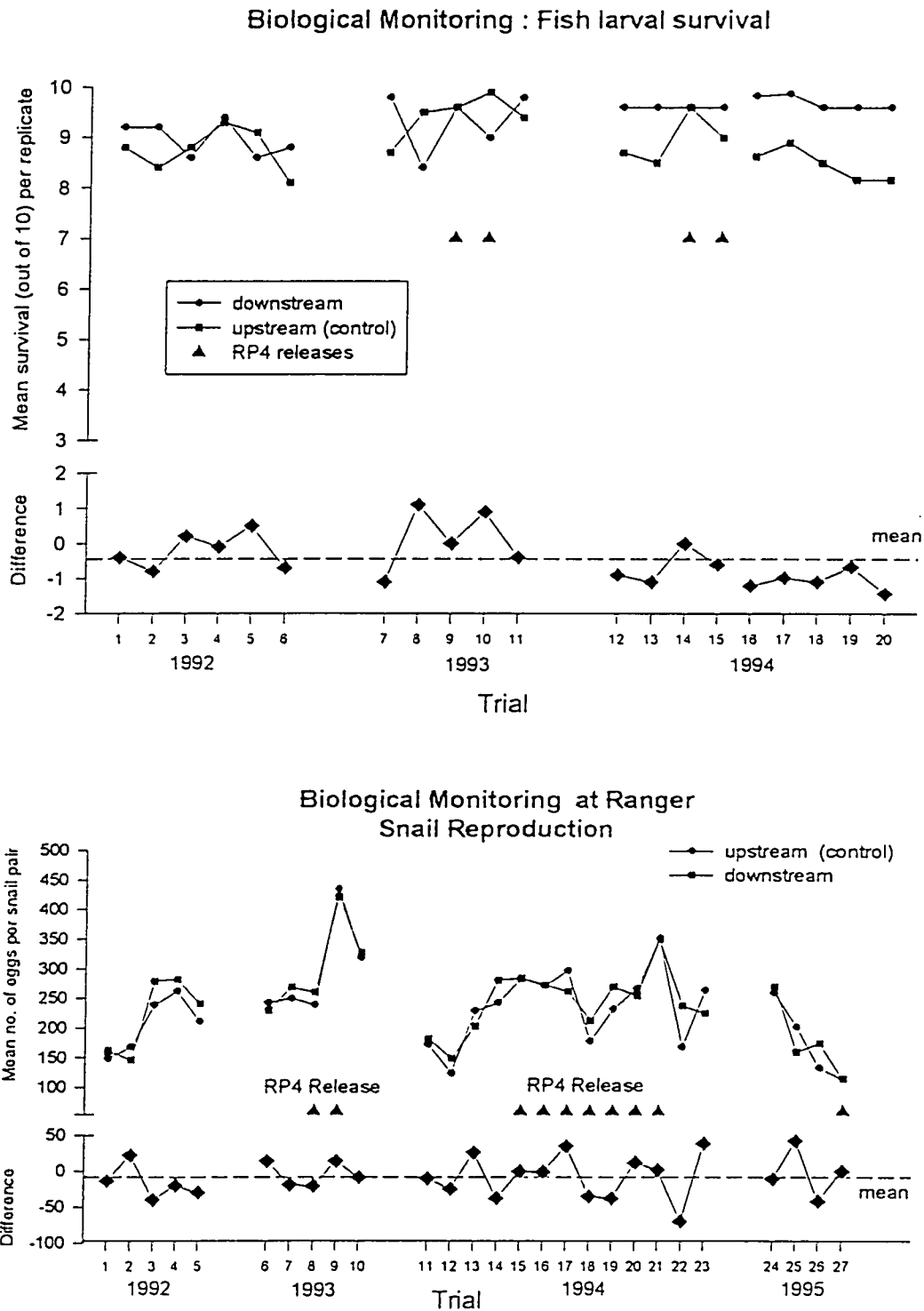


Figure 5. Biological monitoring of the impact of mining at Ranger using fish larval survival (upper graph) and freshwater snail reproduction (lower graph). Data are shown for animals exposed to water from sites upstream and downstream of the Ranger mine. Differences between upstream and downstream responses are also shown. Periods of release of RP4 water are indicated.

There is no discernible difference between the upstream and downstream fish larvae populations. Similarly, with the monitoring of snails (Figure 5), a zero mean result was achieved.

FIGURE 6

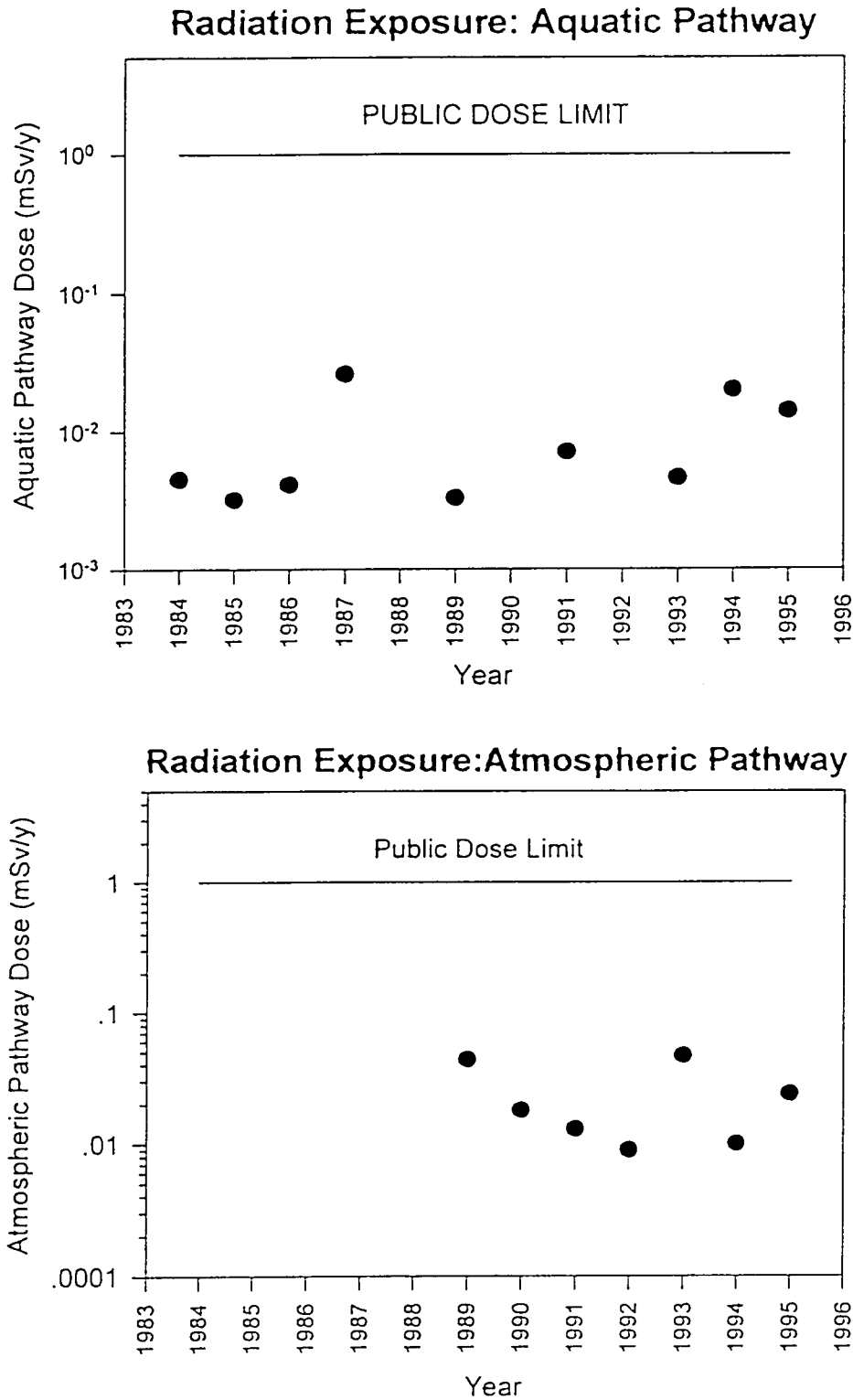


Figure 6. Radiation exposure of members of the public resulting from operation of the Ranger Mine via the aquatic pathway (upper graph) and the atmospheric pathway (lower graph).

Exposure to aquatic pathway radiation was generally 100 times lower than the public dose limit. People in the vicinity of the mine have exposure to radon and radon daughters at a level substantially below the international recommended limit