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**SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT:  
PROPOSED EXPANSION PROJECT FOR RÖSSING URANIUM  
MINE IN NAMIBIA:**

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**PHASE 2 ASSESSMENT:**

**Extension of current SJ open pit mining activity**

**New mining activity in SK area**

**Increased waste rock disposal capacity**

**Increased tailings disposal capacity**

**Establishment of acid heap leaching facility**

**Sulphur handling in the Port of Walvis Bay**

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***FINAL SCOPING REPORT***

**MAY 2008**



**LEAD CONSULTANT**

Ninham Shand (Pty) Ltd.  
P.O. Box 509  
George 6530  
South Africa

Tel: +27 (44) 874 2165  
Fax: +27 (44) 873 5843  
Email: [brett.lawson@shands.co.za](mailto:brett.lawson@shands.co.za)

**PROPONENT**

Rössing Uranium  
Private Bag 5005  
Swakopmund  
Namibia

Tel: +264 (64) 520 2300  
Fax: +264 (64) 520 2286  
Website: [www.rossing.com](http://www.rossing.com)

## PROJECT DETAILS

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<b>TITLE</b>	Social and Environmental Impact Assessment: Proposed Expansion Project for Rössing Uranium Mine in Namibia: Phase 2: Extension of current SJ open pit mining activity, new mining activity in SK area, increased waste rock disposal capacity, increased tailings disposal capacity, establishment of acid heap leaching facility and sulphur handling in the Port of Walvis Bay.
<b>AUTHORS</b>	Brett Lawson: Ninham Shand Consulting Services Andries van der Merwe: Ninham Shand Consulting Services Patrick Killick: Ninham Shand Consulting Services Genie de Waal: Ninham Shand Consulting Services Marie Hoadley: Independent Consultant
<b>SUB CONSULTANTS</b>	Council for Scientific & Industrial Research Airshed Planning Professionals RisCom Visual Resource Management Africa Nuclear Energy Council of South Africa Environmental Evaluation Associates of Namibia Quaternary Research Services Environmental Science Associates Metago Environmental Engineers Namibian Vibration Consultants Aquaterra Consulting Infotox
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**BRETT LAWSON** PrSciNat; EAPSA [Cert]  
Associate: Environmental Group  
Ninham Shand

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## ACRONYMS

<b>μSv/a</b>	μ = a metric prefix meaning 10 <sup>-6</sup> (one millionth); Sv = Sievert (an SI unit used for measuring the effective (or "equivalent") dose of radiation received by a human or some other living organism.) per a = an international symbol for year
<b>ARD</b>	Acid Rock Drainage
<b>As</b>	Arsenic
<b>cm</b>	Centimetre
<b>CSIR</b>	South African Council for Scientific & Industrial Research
<b>CIX</b>	Continuous Ion Exchange Plant
<b>DEA</b>	Directorate of Environmental Affairs (MET)
<b>DRFN</b>	Desert Research Foundation of Namibia
<b>EAP</b>	Environment Assessment Policy of 1994
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plan
<b>F</b>	Fluorine
<b>FPR</b>	Final Product Recovery
<b>GDP</b>	Gross Domestic Product
<b>Grindrod Limited</b>	Lessee to Namport for the Bulk Terminal facility in the Port of Walvis Bay
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide
<b>H<sub>2</sub>SO<sub>4</sub></b>	Sulphuric Acid
<b>ha</b>	Hectares
<b>HCl</b>	Hydrochloric Acid
<b>Hg</b>	Mercury
<b>HIA</b>	Heritage Impact Assessment
<b>HIV/AIDS</b>	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
<b>I&amp;APs</b>	Interested and Affected Parties
<b>IAEA</b>	International Atomic Energy Agency
<b>ICRP</b>	International Council for Radiological Protection
<b>ISO 14 001 EMS</b>	International Standards Organisation 14001 Environmental Management System
<b>IUCN</b>	The World Conservation Union
<b>kg.t<sup>-1</sup></b>	Kilogramme per tonne
<b>kg/t</b>	Kilogramme per tonne
<b>km</b>	Kilometre
<b>km/h</b>	Kilometre per hour
<b>kt/a</b>	Kilotonne per annum
<b>kV</b>	Kilovolt



<b>kWh</b>	Kilowatt hour
<b>m</b>	Metre
<b>m<sup>3</sup></b>	Cubic metre
<b>m<sup>3</sup>/day</b>	Cubic metre per day
<b>m<sup>3</sup>/h</b>	Cubic metre per hour
<b>mamsl</b>	Metres above mean sea level
<b>MET</b>	Ministry of Environment and Tourism (national environmental authority)
<b>MET:DEA</b>	Ministry of Environment and Tourism's Directorate of Environmental Affairs
<b>mg</b>	Milligramme
<b>mg.Nm<sup>-3</sup></b>	Milligram per normal cubic meter
<b>mm</b>	Millimetres
<b>Mm<sup>3</sup></b>	Million cubic metres
<b>MME</b>	Ministry of Mines and Energy
<b>mSv/a</b>	Millisievert per annum
<b>Mt</b>	Megatonne (a metric unit of mass or weight equal to one million metric tonnes)
<b>MW</b>	Megawatt
<b>N\$</b>	Namibian Dollar
<b>Namport</b>	Namibian Ports Authority
<b>NamPower</b>	Namibian Power Utility (electricity generation and supply)
<b>Nm<sup>3</sup></b>	Normal Cubic Metre (a unit of mass for gases equal to the mass of 1 cubic metre at a pressure of 1 atmosphere and at a standard temperature, often 0 °C or 20 °C)
<b>NOx</b>	Nitrogen Oxides
<b>O<sub>2</sub></b>	Oxygen
<b>RAMSAR</b>	The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands, especially as waterfowl habitat. The convention was developed and adopted by participating nations at a meeting in Ramsar, Iran, in 1971 and came into force in 1975.
<b>RDS</b>	Return Dam Solution
<b>PID</b>	Public Information Document
<b>ppm</b>	Parts per million
<b>PPP</b>	Public Participation Process
<b>PRU</b>	Physiographic Rating Units
<b>RU</b>	Rössing Uranium
<b>SAIEA</b>	Southern African Institute for Environmental Assessment
<b>SAPP</b>	Southern African Power Pool
<b>Se</b>	Selenium
<b>SEIA</b>	Social and Environmental Impact Assessment
<b>SEIR</b>	Social and Environmental Impact Report
<b>SEMP</b>	Social and Environmental Management Plan
<b>SX</b>	Solvent Extraction Plant
<b>SO<sub>2</sub></b>	Sulphur Dioxide
<b>SO<sub>3</sub></b>	Sulphur Trioxide



<b>t</b>	Tonne
<b>ToR</b>	Terms of Reference
<b>tpd</b>	Tonnes per day
<b>U<sub>3</sub>O<sub>8</sub></b>	Uranium Oxide
<b>US\$</b>	American Dollar
<b>V<sub>2</sub>O<sub>5</sub></b>	Vanadium Pentoxide

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## UPDATE SUMMARY

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This Update Summary describes the process followed since the Draft Scoping Report for the Phase 2 Social and Environmental Impact Assessment (SEIA) process for Rössing Uranium's proposed expansion project was made available to interested and affected parties (I&APs), stakeholders, authorities and review consultants for their comment. It also indicates how the finalisation of the Phase 2 Scoping Report has responded to public and review input and outlines the way forward in the environmental decision-making process. The proposed developments in question are the extension of the current mining activities in the existing SJ open pit, new mining activity in the larger SK area, increased waste rock and tailings disposal capacities, an acid heap leaching facility, and the handling of sulphur in the Port of Walvis Bay.

### PROCESS DURING THE PHASE 2 SCOPING STAGE

The public participation actions undertaken during the Phase 2 Scoping Stage of the process comprised the following:

- Engagement with I&APs who had expressed an interest in the Phase 1 SEIA participation process;
- Presentation of the findings of the Draft Phase 2 Scoping Report;
- Registration of any additional I&APs; and
- Notification and response to questions and/ or issues of concern.

All registered I&APs were informed of the availability of the Draft Phase 2 Scoping Report, the period for review, the public meetings being held and the venues where the report would be available. Three public participation meetings were held, during which the findings of the Draft Phase 2 Scoping Report were presented.

The comments received in response to the release of the Draft Phase 2 Scoping Report, as well as the related stakeholder feedback records, are presented as annexures to this finalised Phase 2 Scoping Report.

This report is now to be submitted to the environmental authorities for their acceptance, which will enable the Phase 2 SEIA Stage to be embarked upon. All registered I&APs and stakeholders will be kept informed of progress.

### UPDATING OF THE DRAFT PHASE 2 SCOPING REPORT

Updating of the Draft Phase 2 Scoping Report to this finalised version has entailed the following:

- Amending typographical and other insignificant errors that appeared in the Draft Phase 2 Scoping Report and indicating these and other changes in the main body of this finalised report by underlining;
- Updating the public participation process to reflect the latest round of public engagement (also underlined);

- Commissioning an independent internal review of the Draft Phase 2 Scoping Report and reflecting its findings in this finalised Phase 2 Scoping Report; and
- Appending the following additional annexure:
  - Annexure J: Internal reviewer's report.

The Draft Phase 2 Scoping Report has been updated to this Final Phase 2 Scoping Report by means of the inclusion of this Update Summary, the incorporation of the above changes in the text of the report, as well as the additional annexure as indicated. Significant amendments to the body of the report are indicated by means of underlining in this final version, to enable readers to track the changes easily.

## THE WAY FORWARD

This finalised Phase 2 Scoping Report is to be submitted to the Ministry of Environment and Tourism's Directorate of Environmental Affairs (MET:DEA) for their acceptance. This will allow the Phase 2 SEIA process for Rössing Uranium's proposed developments to continue into the actual assessment stage.

Once the Draft Phase 2 SEIA Report is available, all registered I&APs and stakeholders will be notified and further opportunities for participation will be provided. We would like to thank all those who have participated to date in Rössing Uranium's Phase 2 SEIA and look forward to continued public involvement.

**9 May 2008**

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## EXECUTIVE SUMMARY

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### BACKGROUND AND INTRODUCTION

Rössing Uranium (RU) has operated an open pit uranium mine in the Erongo Region of Namibia since 1976. As a result of an increase in uranium prices on the international market in recent years, RU is able to consider the possible financial benefit from an expansion of its operations. The anticipated closure date of the Rössing uranium mine is consequently being re-evaluated in terms of overall feasibility, i.e. including social and environmental criteria.

The maximum extent of the envisaged expansion would entail, in summary, an increase in size of the current mining pit known as SJ, the opening of new mining areas, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities. In terms of the Namibian Constitution and related environmental legislation, in particular the Environmental Management Act, the Environmental Assessment Policy and the Minerals Act, the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. A Social and Environmental Impact Assessment (SEIA) has thus been commissioned by RU for their proposed expansion project.

The present Scoping stage will be followed by the assessment stage, which will culminate in a comprehensive document, the Social and Environmental Impact Assessment (SEIA) Report.

This Scoping Report comprises the following:

- A contextualisation of the policy, legislative and methodological frameworks within which the SEIA needs to be undertaken;
- A description of the proposed activities that form the subject of the SEIA process;
- A detailed description of the affected environment;
- A description of the possible social and environmental impacts that have been identified to date;
- A detailed description of the public participation process that underpins the current SEIA; and
- An identification of alternatives, a description of aspects recommended for further study during the subsequent SEIA Report stage, and a recommended way forward to the next stage of the process.

### PROJECT DESCRIPTION

The entire extent of the envisaged expansion of the Rössing mine would comprise, in summary, nine individual components. These are being dealt with in two phases of the SEIA process, as follows:

- A sulphuric acid manufacturing plant with associated sulphur storage on the mine, and the transport of sulphur from the Port of Walvis Bay;
  - A radiometric ore sorter plant;
  - Mining of an ore body known as SK4;
  - Extension of the current mining activities in the existing SJ open pit;
  - New mining activity in the larger SK area;
  - Increased waste rock disposal capacity;
  - Increased tailings disposal capacity;
  - Establishing an acid heap leaching facility; and
  - Sulphur handling in the Port of Walvis Bay.
- } Phase 1

} Phase 2

The **Phase 1** assessment has been completed and the Final SEIA Report (Ninham Shand Report No. 4492/402239) was submitted to the Ministry of Environment & Tourism: Directorate of Environmental Affairs (MET:DEA) for a decision. Their approval of the Phase 1 SEIA was issued on 7 April 2008, by means of an Environmental Clearance.

The **Phase 2** expansion project components are being dealt with as a separate SEIA process and forms the subject of this report.

Interested and Affected Parties (I&APs) registered for Phase 1 of the SEIA will be kept informed as the present Phase 2 process continues.

## THE PUBLIC PARTICIPATION PROCESS

Engagement with I&APs forms an integral component of the SEIA process. I&APs have had, and will continue to have, opportunities at various stages throughout the SEIA process to gain more knowledge about the proposed project and to provide input into the process.

Stakeholders and I&APs have already participated in the SEIA process and the useful inputs received are acknowledged. The following are the most noteworthy of the issues raised by I&APs to date that are applicable to Phase 2 of RU's expansion project, as derived from records of stakeholders' inputs:

- Employment opportunities;
- Workplace health and safety concerns, including air and water pollution and noise;
- Housing implications;
- Services such as schools, medical care and water availability;
- Effects on the regional and local economy, including tourism;
- Negative social impacts from newcomers seeking work;

- Possible social and biophysical threats from the handling of sulphur in the Port of Walvis Bay (such as food contamination, proximity to RAMSAR<sup>1</sup> site, polluted effluent, noise and dust, and contingency planning);
- Possible dust and noise threats to humans and the environment from the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility;
- Biodiversity implications, particularly in the SK mining area and the Dome area;
- Supply, storage, application, runoff and reuse of water from the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility;
- Regional implications of bulk water supply;
- Visual impacts of the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility; and
- Energy use.

The objectives of public participation will be maintained throughout this SEIA process. These are to provide information to the public, identify key issues and concerns at an early stage, respond to the issues and concerns raised, provide a review opportunity, and document the process properly.

The proposed expansion project was initially advertised between 14 and 20 August 2007 in national, regional and local newspapers and on RU's website, in order to make as many people as possible aware of the project and associated SEIA process. This was done to elicit comment and register I&APs from as broad a spectrum of the public as possible. Once an I&AP has been registered, he or she will be kept informed of progress throughout the SEIA process.

A Public Information Document (PID) was widely distributed during the initial public participation process and was also available on the website. In addition to the advertising and PID, public and key stakeholder meetings were held with a wide array of interest groups and organisations during August 2007. All the issues and comments from these meetings have been noted and responded to.

Public meetings were again held between 22 and 24 January 2008 and were advertised in national, regional and local newspapers between 16 and 22 January 2008. The purpose of the meetings was the release of the Phase 1 Draft SEIA Report, as well as for the introduction of the present Phase 2 of the SEIA process. Comments and concerns received from these meetings have been noted in this report. Public input during the comment period after release of the Draft Phase 2 Scoping Report has been taken into account when finalising this report and before submission to MET:DEA. This finalised Phase 2 Scoping Report will be made available to the public and all registered I&APs will be notified of such availability.

During the assessment stage that will follow the present Phase 2 Scoping stage, public participation and engagement will comprise the following:

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<sup>1</sup> Walvis Bay was declared a Ramsar Wetland of International Importance by Namibia in 1995. The approximate 9,000 ha Ramsar wetland area includes the coastal zone, salt pans and mud flats to the south of the Walvis Bay Port and excludes the deep waters of the bay and the Pelican Point peninsula.

- engagement with I&APs who did not register during the Scoping stage process;
- presenting the findings of the draft Phase 2 SEIA Report;
- registering any additional I&APs;
- noting and responding to questions and/ or issues of concern; and
- investigating issues at greater depth where the need for this has been indicated.

The proposed handling of sulphur in the Port of Walvis Bay as a component of the Phase 2 assessment will be presented in a separate SEIA Report, whilst the balance of the Phase 2 assessment components at the mine itself will be presented in a combined SEIA Report. All registered I&APs will be informed of the availability of draft versions of the SEIA Reports and of the period for review, as well as the venues where the reports will be available.

## **STRATEGIC ALTERNATIVES**

The Chamber of Mines of Namibia has recently initiated a Strategic Environmental Assessment aimed specifically at the uranium mining interests in the Erongo Region. RU has indicated a commitment to sustainable development in their recognising the need for an holistic approach to planning future mining activities, by means of a Strategic Planning Process. Sustainability criteria will be included in this ongoing process and, as such, life of mine planning will not only be based on financial considerations.

As a further move towards filling the gap between the strategic and project levels of assessment, the cumulative impacts of both Phase 1 and Phase 2 will be evaluated and assessed in the SEIA documentation to follow in the next stage of this process.

## **PROJECT LEVEL ALTERNATIVES**

The following elements of the Phase 2 assessment project components have been identified as areas where alternatives are available that need to be taken forward to the next stage for detailed assessment:

- Extension of current SJ pit:
  - Tailings management
  - Waste rock disposal strategy
- New mining activity in SK area:
  - Tailings management
  - Waste rock disposal strategy
- Increased waste rock disposal capacity:
  - Disposal site selection
- Increased tailings disposal capacity:
  - Tailings disposal methods
  - Disposal site selection



- Establishment of heap leaching facility:
  - “On-off” or matrix design
  - Site selection
  
- Sulphur handling facility in the Port of Walvis Bay:
  - Site selection

These aspects of the listed Phase 2 SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.

## IDENTIFIED IMPACTS

Apart from the screening of alternatives, the present Scoping stage has identified several potential impacts that are proposed to be assessed in the next stage. Each of these impacts or issues will be the subject of a specialist study. The following areas of specialisation have been identified for detailed assessment in the next stage:

- Socio-economic impact assessment;
- Air quality impact assessment;
- Quantitative risk assessment;
- Visual impact assessment;
- General waste handling and disposal;
- Hazardous waste handling and disposal;
- Radioactivity and public dose assessment;
- Biodiversity assessment;
- Archaeology/heritage assessment;
- Water resources assessment;
- Seepage and groundwater management assessment;
- Noise and vibration assessment;
- Waste rock and tailings management;
- Energy consumption and greenhouse gas emissions assessment; and
- Toxicology assessment.

## CONCLUSION AND WAY FORWARD

This Scoping Report for the Phase 2 SEIA process has been informed by the public participation process to date, as well as the issues and concerns raised by the authorities, the proponent (RU) and by the project team. It presents the context and rationale for the project, describes the project components and screens the suite of possible alternatives and environmental implications. We submit that the report provides sufficiently comprehensive documentation of the initial Scoping stage of an assessment process. It should be acceptable as such to MET:DEA, thus allowing us to progress into the SEIA stage of the process.

# 1 INTRODUCTION AND BACKGROUND

## 1.1 INTRODUCTION

Rössing Uranium (RU) has operated an open pit uranium mine in the Erongo Region of Namibia since 1976. Figure 1 provides a locality map for the mine. Although of considerable extent, the Rössing ore body is of a low uranium grade and consequently large volumes of rock have to be mined to extract the uranium ore and to produce the processed uranium concentrate that is the final product.

As a result of an increase in uranium prices on the international market in recent years, RU is able to consider the possible financial benefit from an expansion of its operations. The previous mine plan predicted an operational period ending in the year 2016. According to this plan, a sustainability assessment was undertaken and approved in 2005. RU is now looking at a 2026 mine plan and consequently, the associated environmental and social issues are being reviewed.

The maximum extent of the envisaged expansion would entail, in summary, an increase in size of the current mining pit known as SJ, the opening of new mining areas, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities.

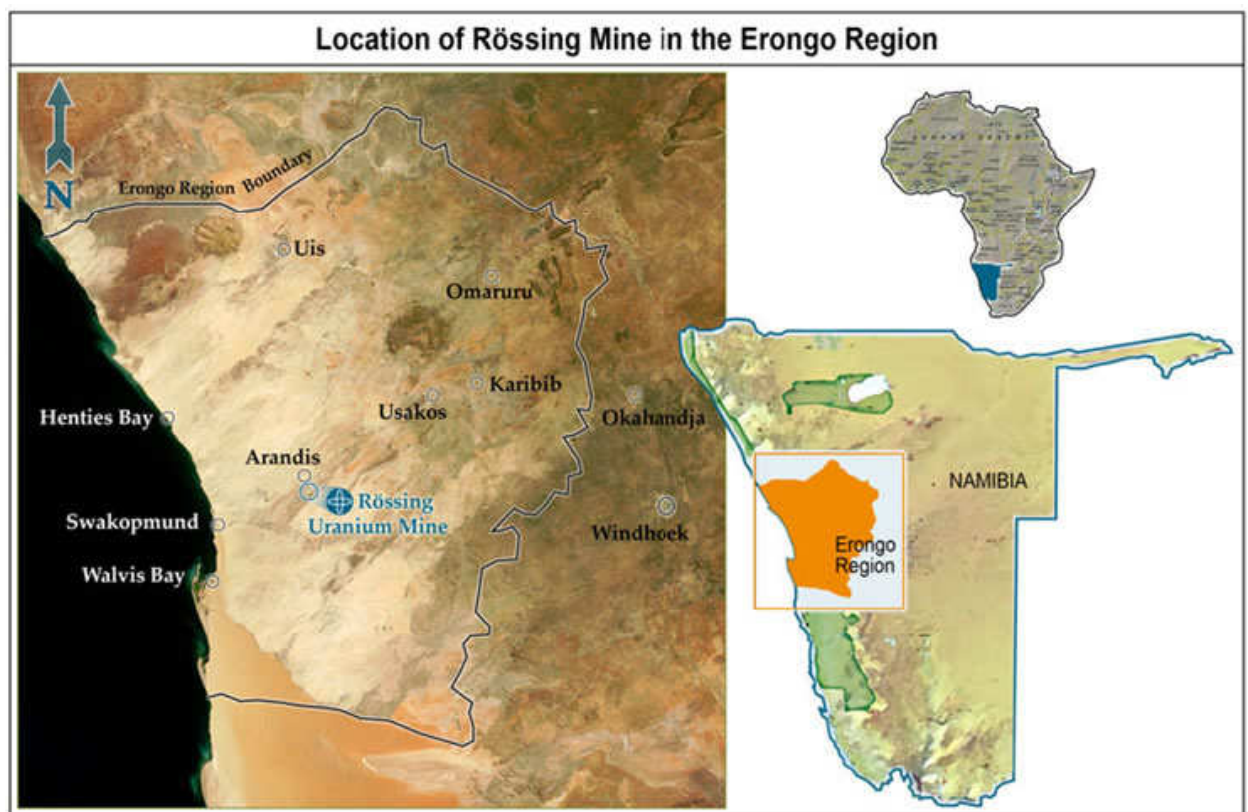


Figure 1: Locality map (source: RU)

In terms of the Namibian Constitution (GRN 1990) and related environmental legislation, in particular the Environmental Management Act (No. 7 of 2007) and the Minerals Act (No. 33 of 1992), the proposed expansion activity would require authorisation from the responsible authorities before it can be undertaken. Insofar the environmental acceptability of RU's proposed expansion project is concerned, the Ministry of Environment and Tourism's Directorate of Environmental Affairs (MET:DEA) would need to issue a clearance for such expansion.

A Social and Environmental Impact Assessment (SEIA)<sup>2</sup> has thus been commissioned by RU for their proposed expansion project, as required by the Environmental Assessment Policy (MET 1995) but also informed by the principles of Namibia's Environmental Management Act<sup>3</sup>, as well as the internal standards and guidelines prescribed by Rio Tinto, RU's parent company. MET:DEA's clearance would be based on the outcomes of the SEIA and this report serves to document the Scoping stage of the SEIA process. Should MET:DEA issue a clearance for the project, the responsible sector ministry, i.e. the Ministry of Mines and Energy (MME), will be able to consider extending RU's current mining licence that is valid until 2019, to allow for the expansion of their current operations to 2026.

It is important to note that six specific components of RU's expansion project are the subject of this Scoping Report, namely the **expansion of the current SJ pit** to enable mining operations to continue feasibly until at least 2026, the development of a **new mining area known as SK**, **increased waste rock disposal** capacity, **increased tailings disposal** capacity, the **establishment of a new acid heap leaching facility** on the mine, and the **handling of sulphur in the Port of Walvis Bay**. These components are referred to as the Phase 2 assessment components of RU's expansion project. The Phase 1 assessment components, as described in Section 1.5, have been dealt with in another assessment process that was launched during 2007. Interested and affected parties (I&APs) registered for Phase 1 of the SEIA will be kept informed as this Phase 2 process continues.

The entire extent of the envisaged expansion of the Rössing mine would thus comprise, in summary, nine individual components. These are being dealt with in two phases of the SEIA process, as follows:

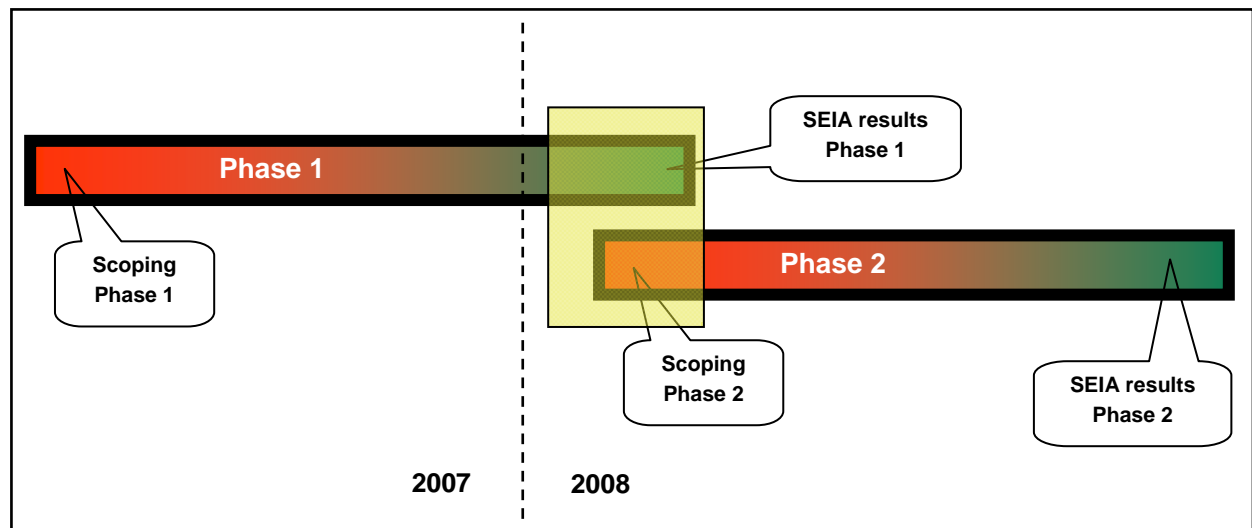
- A sulphuric acid manufacturing plant with associated sulphur storage on the mine, and the transport of sulphur from the Port of Walvis Bay;
  - A radiometric ore sorter plant;
  - Mining of an ore body known as SK4;
- } Phase 1

<sup>2</sup> It is recognised that the term "environment" when applied in the context of an environmental impact assessment refers to the total environment, i.e. encompassing both the socio-economic and biophysical environments. Notwithstanding this recognition, however, RU prefers to retain the term "social" in the title of the present environmental impact assessment, as a clear indication of their commitment to the human element in the affected environment and in keeping with their Sustainable Development Frameworks.

<sup>3</sup> Approved by the Namibian Parliament during October 2007 and gazetted on 27 December 2007 as the Environmental Management Act (No 7 of 2007).

- Extension of the current mining activities in the existing SJ pit;
  - New mining activity in the larger SK area;
  - Increased waste rock disposal capacity;
  - Increased tailings disposal capacity;
  - Establishing an acid heap leaching facility; and
  - Sulphur handling in the Port of Walvis Bay.
- } Phase 2

The reason for separating these components into the two phases is that the engineering design and detailed feasibility studies for each of the nine components are not occurring simultaneously. This is due to the complex and highly technical nature of the various expansion project components necessitating a sequential approach to the execution of the proposed developments. It is understandable that economic and engineering criteria may influence the feasibility of RU's entire expansion project during the formulation and approval stages of the project cycle.



**Figure 2: SEIA assessment and implementation phases** (source: RU public participation information)

The SEIA process and its sequence of supportive documentation, as envisaged for the specified components of RU's expansion project, are illustrated in Figure 2.

This Scoping Report comprises the following:

- A contextualisation of the policy, legislative and methodological frameworks within which the SEIA needs to be undertaken, i.e. an overview of the legal requirements which have necessitated the assessment, as well as a review of other current or pending legal requirements that have a bearing on the activity, as well as the obligations associated with the various protocols and conventions to which RU subscribes;
- A description of the proposed activities that form the subject of the SEIA process, i.e. details of the processes envisaged, which also considers alternative project actions;
- A detailed description of the affected environment and an overview of the findings of previous and current pre-feasibility and planning studies, assessments that have been undertaken in the past and other specialist studies;

- A description of the possible social and environmental impacts that have been identified to date, i.e. during the present Scoping stage, and the means whereby such impacts will be subjected to methodological evaluation during the subsequent SEIA Report stage, insofar their significance, mitigation potential and possible acceptance are concerned;
- A detailed description of the public participation process that underpins the current SEIA; and
- An identification of alternatives, a description of aspects recommended for further study during the subsequent SEIA Report stage, and a recommended way forward to the next stage of the process.

The proposed handling of sulphur in the Port of Walvis Bay as a component of the Phase 2 assessment will be presented in a separate SEIA Report, whilst the balance of the Phase 2 assessment components at the mine itself will be presented in a combined SEIA Report. All registered I&APs will be informed of the availability of draft versions of the SEIA Reports and of the period for review, as well as the venues where the reports will be available.

As illustrated in Figure 3, the present Scoping stage will be followed by the SEIA stage, which will culminate in comprehensive documents being the Social and Environmental Impact Assessment Reports (SEIA Reports). A Social and Environmental Management Plan (SEMP), as described in Sections 6.1 and 6.2 below, will be included in each of the SEIA Reports, to provide a comprehensive amount of information for MET:DEA and MME to base their consideration of the proposed developments on.

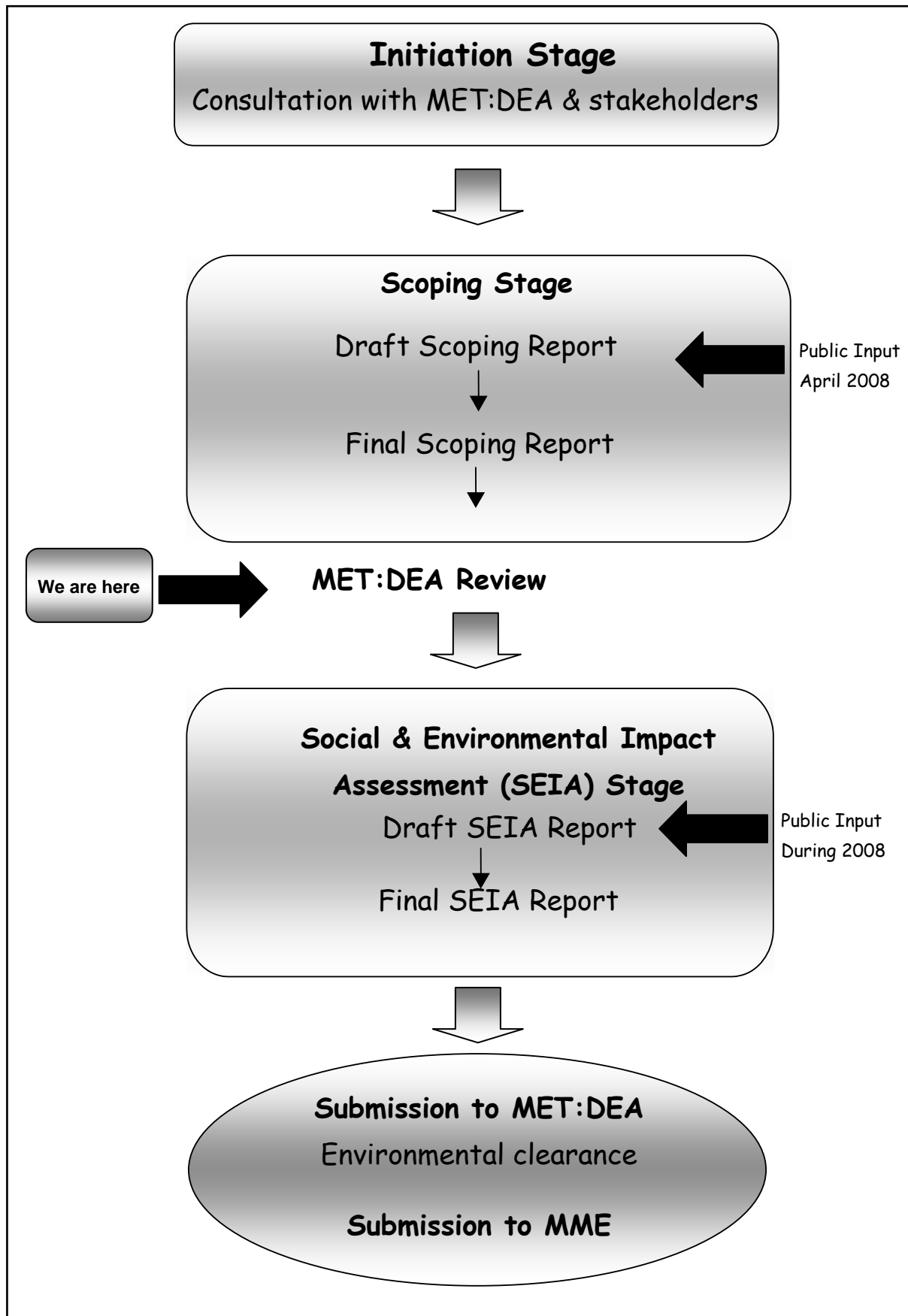
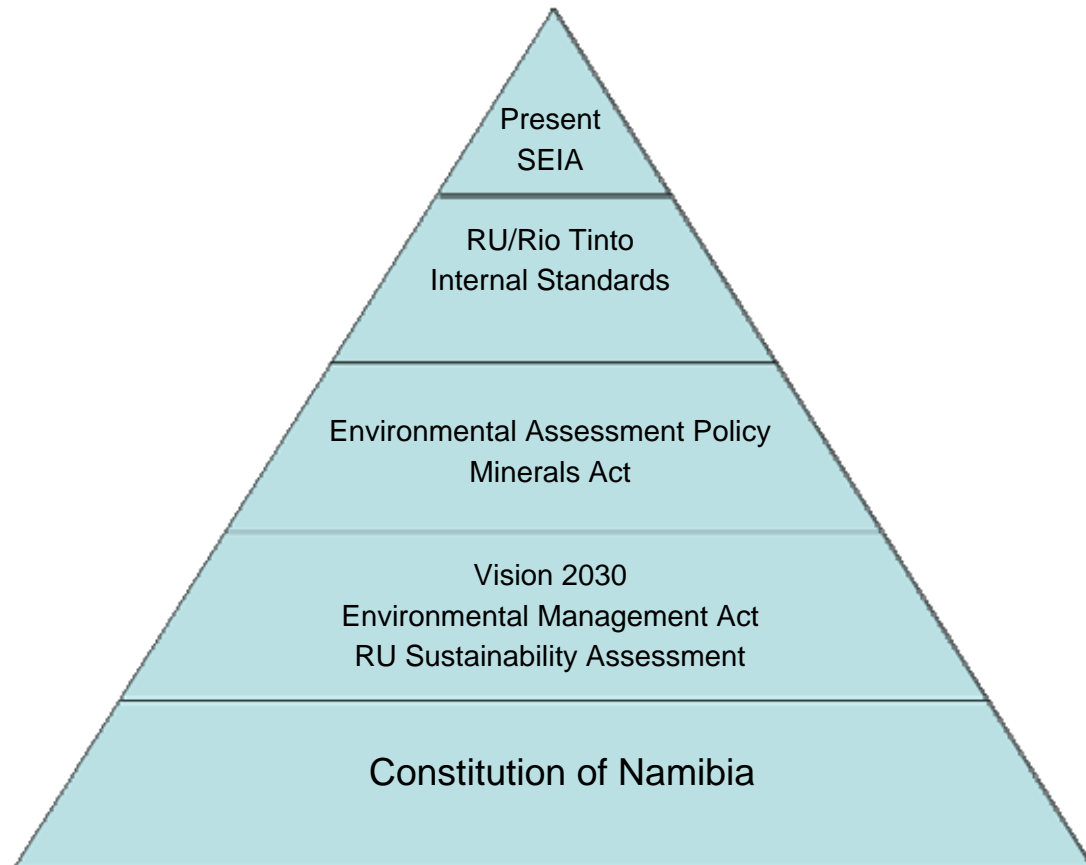


Figure 3: The SEIA process



## 1.2 POLICY FRAMEWORK

As a significant contributor to the Namibian economy<sup>4</sup>, RU's role in local and regional economic development necessitates demonstrable adherence to sound environmental practices. The decision to pursue possible expansion of their operations thus needed to be underpinned by informed strategic planning. To this end, the following hierarchy of policy, planning and procedural documentation (Figure 4) reflects the point of departure for the proposed expansion project:



**Figure 4: Hierarchy of policy and planning documents**

The strategic policy and planning documents reflected in Figure 4 are now briefly described. Regulated procedural requirements are dealt with in more detail in Section 1.3 below, together with other standards, conventions and pending legislation.

### 1.2.1 The Constitution of the Republic of Namibia

There are two clauses contained in the Namibian Constitution that are of particular relevance to sound environmental management practice, viz. articles 91(c) and 95(l). In summary, these refer to:

- guarding against over-utilisation of biological natural resources;
- limiting over-exploitation of non-renewable resources;
- ensuring ecosystem functionality;

<sup>4</sup> In 2001 RUL contributed 2.5% of Namibia's Gross Domestic Product (GDP) and 10% of the country's export earnings (Sustainability Assessment 2004).



- protecting Namibia's sense of place and character;
- maintaining biological diversity; and
- pursuing sustainable natural resource use.

The State is thus committed to actively promoting and maintaining the environmental welfare of Namibians by formulating and institutionalising policies that can realise the above-mentioned sustainable development objectives. As an important role-player in the beneficiation of Namibia's non-renewable mineral resources, RU has demonstrated its alignment with these constitutional principles.

### 1.2.2 Vision 2030

The principles that underpin Vision 2030<sup>5</sup>, a policy framework for Namibia's long-term national development, comprise the following:

- good governance;
- partnership;
- capacity enhancement;
- comparative advantage;
- sustainable development;
- economic growth;
- national sovereignty and human integrity;
- environment; and
- peace and security.

In pursuing the further development of the uranium resources available to it, RU is in a position to contribute significantly to the realisation of the Vision 2030 principles.

### 1.2.3 Environmental Management Act

In giving effect to articles 91(c) and 95(l) of the Constitution of Namibia, general principles for sound management of the environment and natural resources in an integrated manner have been formulated. This has resulted in an Environmental Assessment and Management Act being approved by the Namibian Parliament in October 2007. It was gazetted on 27 December 2007 as the Environmental Management Act (Act No. 7 of 2007), Government Gazette No. 3966. Part 1 of the Environmental Management Act describes the various rights and obligations that pertain to citizens and the Government alike, including an environment that does not pose threats to human health, proper protection of the environment, broadened *locus standi* on the part of individuals and communities, and reasonable access to information regarding the state of the environment.

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<sup>5</sup> Derived from Namibia's Green Plan drafted by MET in 1992 and followed by the sequence of National Development Plans.

Part 2 of the Act sets out 13 principles of environmental management, as follows:

- Renewable resources shall be utilised on a sustainable basis for the benefit of current and future generations of Namibians.
- Community involvement in natural resource management and sharing in the resulting benefits shall be promoted and facilitated.
- Public participation in decision-making affecting the environment shall be promoted.
- Fair and equitable access to natural resources shall be promoted.
- Equitable access to sufficient water of acceptable quality and adequate sanitation shall be promoted and the water needs of ecological systems shall be fulfilled to ensure the sustainability of such systems.
- The precautionary principle and the principle of preventative action shall be applied.
- There shall be prior environmental assessment of projects and proposals which may significantly affect the environment or use of natural resources.
- Sustainable development shall be promoted in land-use planning.
- Namibia's movable and immovable cultural and natural heritage, including its biodiversity, shall be protected and respected for the benefit of current and future generations.
- Generators of waste and polluting substances shall adopt the best practicable environmental option to reduce such generation at source.
- The polluter pays principle shall be applied.
- Reduction, reuse and recycling of waste shall be promoted.
- There shall be no importation of waste into Namibia.

As reflected in the policy statement described in Section 1.3.3, there is a clear commitment to pursuing these principles of environmental management on the part of RU as the proponent of the expansion project.

#### 1.2.4 RU Sustainability Assessment

In determining the viability of extending the life of the Rössing uranium mine, RU has undertaken a detailed sustainability assessment (RU, 2004). This sustainability assessment is in support of the engineering and financial feasibility studies that were the primary informants in considering such an extension of the life of the mine.

It is important to note that a sustainability assessment considers impacts that may result from a proposed development at a broader level than the site-specific impacts. The aims of the 2004 sustainability assessment were thus to:

- Identify any aspects of the proposed expansion project that could present fatal flaws that could be contrary to any development at all;
- Identify the opinions of all stakeholders and interested and affected parties, insofar any real concerns that emerged could influence the future of the mine;
- Evaluate the risks and benefits of extending the life of the mine to either 2016 or 2026, compared to early closure in 2007; and

- Suggest possible mitigatory measures to minimise potentially negative impacts, as well as means of enhancing the positive impacts that may result from extending the life of the mine.

Developing a measure of sustainability, in terms of quantifying the net social and biophysical benefit or decrement of the proposed expansion project, thus allowed RU to consider the next step in the development process, *viz.* whether the project could be implemented within acceptable environmental parameters. The sustainability assessment is consequently a vital strategic informant in the pursuance of the present SEIA.

### 1.3 LEGAL REQUIREMENTS, STANDARDS AND CONVENTIONS

In order to protect the environment and ensure that RU's proposed expansion project is undertaken in an environmentally responsible manner, there are two significant pieces of environmental legislation that focus this assessment, *viz.* Namibia's Environmental Assessment Policy and the Minerals Act. These are reflected below, followed by reference to other legislation, standards and conventions that may prove to be relevant. Note that although the Environmental Management Act (refer to 1.2.3 above) has been promulgated, the enabling regulations have yet to follow. Consequently, the requirements of the Environmental Assessment Policy are deemed to remain in force.

#### 1.3.1 Namibia's Environmental Assessment Policy of 1994

Appendix B of Namibia's Environmental Assessment Policy contains a schedule of activities that may have significant detrimental effects on the environment and which require authorisation from MET:DEA. The nature of RU's proposed expansion project includes activities listed in this schedule. The primary triggers<sup>6</sup> are, *inter alia*:

- “10~ Transportation of hazardous substances and radioactive waste
- 11~ Mining, mineral extraction and mineral beneficiation
- 12~ Power generation facilities with an output of 1MW or more
- 14~ Storage facilities for chemical products
- 15~ Industrial installation for bulk storage of fuels
- 36~ Water intensive industries
- 39~ Effluent plants
- 46~ Chemical production industries
- 50~ Waste disposal sites”

Accordingly, the proposed expansion project requires authorisation from MET:DEA, and will be based on the findings of the present SEIA process. The envisaged SEIA process will accord with the requirements of such processes as described in Appendix A of the Environmental Assessment Policy.

<sup>6</sup> Given the complex nature of the proposed expansion project, other activities may also serve as triggers. However, the comprehensive SEIA as envisaged will address all of the identified impacts.

### 1.3.2 Namibia's Minerals Act of 1992

A provision of the Minerals Act (Act No. 33 of 1992), specifically Section 48 (2) (b) (i) of the Act, is that “*environmental impact studies*” may be called for by the Minister of Mines and Energy when mineral licences - or their renewal or transfer - are applied for.

RU are presently operating under a mining licence issued by MME and this will remain unaffected for the current mining operation until it expires in 2019. However, as the responsible sector ministry, MME will consider extending the current mining licence until 2026, as well as to consider awarding the necessary mining license for RU's expanded mining activities, once MET:DEA has issued environmental clearances. Copies of this Scoping Report, as well as the subsequent SEIA Report, will thus be submitted to the Ministry for their decision-making regarding mining licences for the extended and expanded mining operation.

### 1.3.3 RU/Rio Tinto's Internal Standards

Rio Tinto, RU's parent company, operates a comprehensive Health, Safety, Environment and Quality (HSEQ) management system that accords with international standards of best practice and is certified to comply with the ISO:9001, ISO:14001 and ISO:18001 management systems. The objective is to measure, record and demonstrate ongoing compliance with relevant legislation and RU company policies regarding Occupational Health, Safety, Environment and Community (OHSEC) management through implementation of specified actions. Certification per the ISO 14 001 EMS standard was obtained by RU in 2000. Recertification was obtained in 2004 and 2007. Certification services and independent third party auditing will continue through a Rio Tinto nominated international auditing organisation, to ensure continued compliance with the standard throughout the group.

An array of environmental standards are thus in place and all Rio Tinto businesses, such as RU, are committed to maintaining such international standards. Rio Tinto's policy statement titled *The Way We Work* provides the overarching governance touchstone, while matters of planning, implementation and operation, checking and corrective action, and management review, are embodied in HSEQ management system that each business is obliged to maintain.

Specifically as it relates to the proposed comprehensive expansion project, the planning component of RU's EMS requires that the project is treated as a new activity and is thus subjected to “...*previous identification of (its) environmental aspects and impact assessment...*” and that the assessment of the project is measured against related environmental performance indicators. This may be interpreted as an explicit intention to undertake the present SEIA in accordance with international best practice.

### 1.3.4 Other legislation and conventions

In addition to the Environmental Assessment Policy, the Minerals Act and RU's internal standards described above, the following additional pieces of existing or pending legislation and conventions may have some bearing on the proposed expansion project:

- The socio-economic environment~
  - Atomic Energy and Radiation Protection Act (2005)
  - Combating of Rape Act (2002)
  - Communal Land Act (2002)
  - Decentralisation Policy (1998)
  - International Atomic Energy Agency Non-proliferation Treaty (1970)
  - Labour Act (1992)
  - Marriage Equality Act (2002)
  - National Code on HIV/AIDS and Employment (1996)
  - National Employment Policy (1997)
  - National Heritage Act (2004)
  - Pending Minerals Safety Bill
  - Primary Health Care Policy (1990)
  - Regional Councils Act (1992) as amended
  - Traditional Authorities Act (1995)
  - War Graves and National Monuments Amendment Act (1986)
  
- The biophysical environment~
  - Air Quality Act (2004)
  - Atmospheric Pollution Prevention Act (1965)
  - Atmospheric Pollution Prevention Ordinance (1976)
  - Convention on Biological Diversity (2000)
  - Convention to Combat Desertification (1997)
  - Forestry Act (2001)
  - Minerals Policy of Namibia (2003)
  - Namibian Water Corporation Act (1997)
  - Nature Conservation Ordinance (1975) and Nature Conservation Amendment Act (1996)
  - Pollution and Waste Management Bill (draft)
  - Ramsar Convention (1975)
  - Soil Conservation Act (1969)
  - United Nations Framework Convention on Climate Change (1992)
  - Water Act (1956) and yet to be enabled Water Act (2004)
  - Water Resources Management Act (2004)

The extent to which these pieces of legislation and conventions may be relevant to the undertaking of the present SEIA will become clear as the process unfolds. Other government departments that may need to provide comment on the SEIA, such as the Department of Water Affairs of the Ministry of Agriculture, Water and Forestry, will be provided with copies of this Scoping Report and the subsequent SEIA Report.

## 1.4 THE BRIEF

Rössing Uranium has appointed Ninham Shand Consulting Services as the independent lead consultant to assess the environmental impacts of their proposed expansion project. Importantly, the appointment is also to ensure that RU as the proponent complies with the legislated requirements of environmental assessment processes as mentioned in Section 1.3.1. As per the legislated Environmental Assessment Policy and international best practice, the lead environmental consultant would be responsible for ensuring that the following are undertaken:

- Consultation with the responsible authorities and stakeholders early in the process, to confirm that the envisaged approach and methodology are appropriate and that the proposed development has been correctly screened to determine the acceptable level of assessment to be undertaken.
- Compilation of a Scoping Report that contextualises policy and legislation relative to the proposed development, describes the proposed activities, describes the affected environment, describes the possible environmental impacts, reports on the public participation process, and identifies aspects that require further or specialist study during the subsequent assessment stage.
- Submission of the Scoping Report to MET:DEA for their review and acceptance prior to embarking on the SEIA Report stage.
- Compilation of a SEIA Report that provides, in addition to the information contained in the Scoping Report, a detailed description of the potential impacts associated with the proposed development, the findings of the specialist studies, an evaluation of the significance of the potential impacts, and recommendations regarding mitigation and a way forward.
- Submission of the SEIA Report to MET:DEA for their clearance before MME consider issuing a new, and/or extending the current, mining licence.

A public participation process is being undertaken throughout this study, to ensure that I&APs are given an opportunity to participate and to allow them to be certain that issues of importance to them are addressed. This is discussed in more detail in Chapter 6 of this report.

## 1.5 STUDY APPROACH AND METHODOLOGY

To initiate the SEIA process for RU's proposed expansion project, early consultation with the Head of the Environmental Impact Assessment Unit at MET:DEA, Dr F Sikabongo, took place in a meeting held on 17 August 2007. A letter of confirmation of the proceedings of the meeting serves as the necessary initial registration and screening of the SEIA in question, and confirms MET:DEA's acceptance of the envisaged approach. Included in Annexure B is a copy of a letter of 29 January 2008 to Dr Sikabongo which, *inter alia*, confirmed the initiation of the Phase 2 SEIA process.

As mentioned in Section 1.1, six specific components comprise Phase 2 assessment of RU's expansion project and are the subject of this Scoping Report, namely:



- Expansion of the current SJ pit to enable mining operations to continue feasibly until 2026;
- Development of a new mining area known as SK<sup>7</sup>;
- Increased waste rock disposal capacity;
- Increased tailings disposal capacity;
- Establishment of a new acid heap leaching facility; and
- Handling of sulphur in the Port of Walvis Bay.

These are described in detail in Section 2 below, but it should be borne in mind that the remainder of the expansion project components were dealt with as Phase 1 of the SEIA process (SEIA Report completed and approved by MET:DEA on 7 April 2008, by means of an Environmental Clearance), and were subjected to a separate but identical assessment process. The reason for separating these components is that the engineering design and detailed feasibility assessment of the Phase 2 components had not progressed far enough to allow for the current Scoping stage to be undertaken concurrently with the now completed Phase 1 programme. However, sufficient preliminary information is now available to allow for this Phase 2 Scoping Report to be compiled and the subsequent detailed assessment stage to follow later in 2008, culminating in the SEIA Report for Phase 2. This will ensure that social and environmental issues are identified early enough in the SEIA process to meaningfully influence the engineering design.

To optimise future ore exploitation as mentioned above, RU is presently engaged in a Strategic Planning Process that addresses life of mine planning. Sustainability criteria will be included in this ongoing process and, as such, life of mine planning will not only be based on financial considerations. As a further move towards filling the gap between the strategic and project levels of assessment, the cumulative impacts of both Phase 1 and Phase 2 will be evaluated and assessed in the SEIA documentation to follow in the next stage of this process.

The same standardised and internationally recognised methodology<sup>8</sup> applied to the Phase 1 assessment will be applied to assess the significance of the potential environmental impacts in the Phase 2 assessment. The methodology is outlined as follows:

For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) will be described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the SEIA Report will represent the full range of plausible and pragmatic measures but does not necessarily imply that they should or will all be implemented. The decision as to which combination of alternatives and mitigation measures to apply for will lie with RU as the proponent, and their acceptance and approval ultimately with MET:DEA and MME. The SEIA Report will explicitly describe RU's commitments in this regard. The tables on the following pages show the scales used to assess these variables and define each of the rating categories.

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<sup>7</sup> Note that an additional area of known uranium ore deposit referred to as SH has also been identified for possible exploitation. The present SEIA process does not address the SH deposit but attention to this resource may occur in the future.

<sup>8</sup> As described, *inter alia*, in the South African Department of Environmental Affairs and Tourism's Integrated Environmental Management Information Series (CSIR, 2002).



**Table 1: Assessment criteria for the evaluation of impacts**

CRITERIA	CATEGORY	DESCRIPTION
<b>Extent or spatial influence of impact</b>	<b>National</b>	Within Namibia
	<b>Regional</b>	Within the Erongo Region
	<b>Local</b>	On site or within 100 m of the impact site
<b>Magnitude of impact (at the indicated spatial scale)</b>	<b>High</b>	Social and/or natural functions and/ or processes are <i>severely</i> altered
	<b>Medium</b>	Social and/or natural functions and/ or processes are <i>notably</i> altered
	<b>Low</b>	Social and/or natural functions and/ or processes are <i>slightly</i> altered
	<b>Very Low</b>	Social and/or natural functions and/ or processes are <i>negligibly</i> altered
	<b>Zero</b>	Social and/or natural functions and/ or processes remain <i>unaltered</i>
<b>Duration of impact</b>	<b>Short term</b> (construction period)	Up to 7 years
	<b>Medium Term</b>	Up to 10 years after construction
	<b>Long Term</b>	More than 10 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in the following table, developed by Ninham Shand in 1995 as a means of minimising subjectivity in such evaluations, i.e. to allow for standardisation in the determination of significance.

**Table 2: Definition of significance ratings**

SIGNIFICANCE RATINGS	LEVEL OF CRITERIA REQUIRED
<b>High</b>	<ul style="list-style-type: none"> <li>High magnitude with a regional extent and long term duration</li> <li>High magnitude with either a regional extent and medium term duration or a local extent and long term duration</li> <li>Medium magnitude with a regional extent and long term duration</li> </ul>
<b>Medium</b>	<ul style="list-style-type: none"> <li>High magnitude with a local extent and medium term duration</li> <li>High magnitude with a regional extent and construction period or a site specific extent and long term duration</li> <li>High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration</li> <li>Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term</li> <li>Low magnitude with a regional extent and long term duration</li> </ul>
<b>Low</b>	<ul style="list-style-type: none"> <li>High magnitude with a site specific extent and construction period duration</li> <li>Medium magnitude with a site specific extent and construction period duration</li> <li>Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term</li> <li>Very low magnitude with a regional extent and long term duration</li> </ul>
<b>Very low</b>	<ul style="list-style-type: none"> <li>Low magnitude with a site specific extent and construction period duration</li> <li>Very low magnitude with any combination of extent and duration except regional and long term</li> </ul>
<b>Neutral</b>	<ul style="list-style-type: none"> <li>Zero magnitude with any combination of extent and duration</li> </ul>

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in the following two tables. It is important to note that the

significance of an impact should always be considered in concert with the probability of that impact occurring.

**Table 3: Definition of probability ratings**

PROBABILITY RATINGS	CRITERIA
<b>Definite</b>	Estimated greater than 95% chance of the impact occurring.
<b>Probable</b>	Estimated 5 to 95% chance of the impact occurring.
<b>Unlikely</b>	Estimated less than 5% chance of the impact occurring.

**Table 4: Definition of confidence ratings**

CONFIDENCE RATINGS	CRITERIA
<b>Certain</b>	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
<b>Sure</b>	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
<b>Unsure</b>	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in the following table.

**Table 5: Definition of reversibility ratings**

REVERSIBILITY RATINGS	CRITERIA
<b>Irreversible</b>	The activity will lead to an impact that is permanent.
<b>Reversible</b>	The impact is reversible, within a period of 10 years.

## 1.6 ASSUMPTIONS AND LIMITATIONS

The SEIA process that this Scoping Report is in support of is limited to the specific elements of the Phase 2 expansion project detailed in Section 2 and will be undertaken in terms of the Environmental Assessment Policy (with due cognisance of the requirements of the new Environmental Management Act) and internationally recognised best practice in environmental assessment. In developing the approach to this project, Ninham Shand took cognisance of RU's deliberations regarding their Life of Mine Expansion Options Analysis and the earlier Sustainability Assessment.

Specific assumptions that have been made are:

- Regarding the assessment of relevant project-level alternatives, it is assumed that, where appropriate, two or three discrete, detailed and well-defined alternatives for particular project components will be attended to. Section 4 deals with alternatives in more detail.

- Regarding the technical and specialist information required during the SEIA Report stage, it is assumed that such information will be based on the latest available data, is as accurate as possible and is made available timeously.
- Due to the complexity of the present SEIA in terms of the variety of different components being addressed and the sequencing of related engineering design, there may be cases where the available information is incomplete or not available timeously. Where such information gaps are a shortcoming in the assessment, they will be clearly identified. However, where the subject matter is well understood and not critical to the assessment, provision will be made for their inclusion in the decision-making process in the Social and Environmental Management Plan (SEMP) that will accompany the SEIA Report.
- While external review throughout the process will be carried out by the Southern African Institute for Environmental Assessment, Ninham Shand has also commissioned an internal review. This was carried out by a recognised expert with particular knowledge of the Rössing site and operations (see Section 1.7 and Annexure J). In this way, assurance of a world-quality product can be given.

## 1.7 THE PROJECT TEAM

Ninham Shand has assembled a team of professionals to undertake the SEIA for RU's expansion project. The composition of the team is indicated below and it is likely that the same team will be tasked with specialist and other support for the current Phase 2 SEIA process. The respective areas of responsibility are as follows:

**Table 6: The SEIA Project Team**

Organisation	Area of responsibility Field of expertise	Team member(s)
Ninham Shand (Lead Consultant)	: Project Management : SEIA co-ordination : SEIA process	<p><u>Brett Lawson</u> (Project Manager) is a certified Environmental Assessment Practitioner, bound by a code of conduct, with considerable environmental management experience. Mr Lawson is also registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions.</p> <p><u>Andries van der Merwe</u> is a registered professional engineer and has been involved in a wide spectrum of infrastructure development projects throughout Africa. He is a trained SABS/ISO 14001 Environmental Management Systems (EMS) auditor and he has compiled numerous Environmental Management Systems (EMSs) and Environmental Management Plans (EMPs) for all life-cycle phases of typical infrastructure development projects.</p> <p><u>Patrick Killick</u> (Environmental Practitioner) has an MPhil degree in environmental management and specific experience in the supervision, management and monitoring of construction-related environmental impacts associated with large engineering works, as well as recent experience in environmental assessment practice.</p> <p><u>Genie De Waal</u> (Technical Assistant) has a National Diploma in Business Computing and 13 years experience in office and project management in engineering and environmental consulting.</p>

Organisation	Area of responsibility Field of expertise	Team member(s)
The Council for Scientific & Industrial Research (CSIR)	: Internal Review	<u>Dr Peter Ashton</u> will undertake an internal review of the SEIA process to ensure that it accords with local and international best practice. He holds a PhD degree and has considerable experience in a wide range of fields, including the assessment of impacts of mining and development projects on aquatic ecosystems. Dr Ashton has undertaken several environmental assessment and water quality studies for RU since the early nineties.
Airshed Planning Professionals	: Air quality impact assessment	<u>Reneé Thomas</u> is currently completing her Masters degree and has six years experience in the field of air pollution impact assessment and air quality management. She has undertaken numerous air pollution impact studies and has provided extensive guidance to both industry and government on air quality management practices.
RisCom	: Quantitative Risk Assessment	<u>Michael Oberholzer</u> is a registered Professional Engineer and holds a BSc (Chemical Engineering) degree. He has over 20 years experience with Dow Chemicals and Sentrachem in all aspects of project implementation. Since leaving Dow, he has completed a number of Risk Assessments studies and Process Hazard Analysis in various industries including offshore assignments in the oil and gas industries, as well as in the chemical, petrochemical, agrochemicals and mining industries.
Visual Resource Management Africa (VRMA)	: Visual impact assessment	<u>Stephen Stead</u> has a BA (Hons) in Human Geography and Geographic Information and has 12 years of experience in the field of GIS mapping and Modelling. Over the last 5 years he has completed approximately 40 Visual Impact Studies throughout South Africa using the well-documented visual impact analysis methodology developed by the Bureau of Land Management in the USA. He has also undertaken numerous studies to identify land use, vegetation and vegetation sensitivity from aerial and satellite imagery.
Marie Hoadley (Independent Consultant)	: Public consultation and facilitation : Socio-Economic impact assessment	<u>Marie Hoadley</u> has a BA degree and is an experienced social impact assessor, having worked on mining projects across Southern Africa. She specialises in working with marginalised mining communities in rural and peri-urban settings and has worked with both artisanal miners and multi-national mining companies. Prior to starting her consulting practice, she worked as a research associate at the School of Mining Engineering, University of the Witwatersrand.
The Southern African Institute for Environmental Assessment (SAIEA)	: Independent external review	<u>Dr Peter Tarr</u> holds a PhD in Environmental Management and has been involved in conservation and environmental management in southern Africa for the past 20 years. He was primarily responsible for developing Namibia's Environmental Assessment Policy. In 2001, he established the SADC regions' first non-profit organisation dedicated to the use of Environmental Assessment (EA) as a front-line tool for promoting sustainable development, SAIEA, and became its founder and Director. SAIEA has overseen over 50 EA processes and studies covering a wide variety of sectors.
The Nuclear Energy Corporation of South Africa (NECSA)	: Radioactivity and public dose assessment	<u>Dr Gert de Beer</u> of NECSA will assist with the radioactivity and public dose study. Apart from several ancillary functions, the main functions of NECSA are to undertake and promote research and development in the field of nuclear energy and radiation sciences and technology; to process source material, special nuclear material and restricted material; and to co-ordinate with other organisations in matters falling within these spheres.

Organisation	Area of responsibility Field of expertise	Team member(s)
Environmental Evaluation Associates of Namibia (EEAN) Pty Ltd (consulting arm of the Desert Research Foundation of Namibia (DRFN))	: Biodiversity study	<p><u>John Pallett</u> has biodiversity experience from his work as mammal curator at the State Museum and more general experience in EIAs conducted through EEAN since 1992. He will be project managing the study.</p> <p><u>Dr John Irish</u> was involved in the mid 1980s RU EIA work. He now heads Namibia's Biodiversity Database project, and is well familiarised with biodiversity distributional information and computerised spatial recording of endemics. He will provide specialist input into identification of collected species.</p> <p><u>Dr Joh Henschel</u> is Executive Director of Gobabeb Training and Research Centre, a centre for ecological expertise in the Namib. His research record includes specialisation on arachnids in the Namib. He is also involved in the training programmes of Namibian students who undertake practical work at Gobabeb and its field sites. He will provide specialist input into identification of collected species.</p> <p><u>Dr Mary Seely</u> is an internationally recognised expert on the Namib Desert and environmental issues in Namibia and arid regions. She brings an understanding of the bigger picture behind specialised studies such as this project, to assist in review and quality assurance of the project deliverables.</p> <p><u>Veronica Siteteka</u> is based at Gobabeb as a Junior Research Assistant and has recently undertaken GIS training in The Netherlands with particular focus on EIAs. She will compile all the GIS-based information.</p>
Quarternary Research Services	: Archaeology (i.e. heritage)	<p><u>Dr John Kinahan</u> has more than 25 years of professional experience as an archaeologist, with special emphasis on palaeo-environmental research. He has collaborated with numerous international research programmes. Dr Kinahan, in partnership with Jill Kinahan, has carried out more than 75 contract surveys and excavations in Namibia, Botswana, Tanzania, Mozambique, Angola and Ethiopia. Recently, they compiled the application by Namibia for the listing of Twyfelfontein rock art site under the World Heritage Convention.</p>
Rössing Uranium	: Water resource management	<p><u>Sandra Müller</u> is a highly experienced geohydrologist on the staff of RU whose professional experience and abilities are well recognized amongst peers. She has been responsible for the monitoring of water management on the mine for many years.</p>
Namibian Vibration Consultants (NVC)	: Noise and vibration study	<p><u>Mr Erwin Smith</u> has specialist vibration experience, particularly in the human vibration area. He will be project managing the study.</p> <p><u>Mr John Hassall</u> has over thirty years experience in the acoustic and vibration field. His areas of expertise include EIAs, environmental and industrial noise surveys, noise control measures, building services noise and vibration control, hearing damage protection measures, and machine condition monitoring and diagnosis using vibration analysis.</p> <p><u>Mr Demos Dracoulides</u> has experience in noise and air pollution dispersion survey and modelling, in particular in the aviation and solid waste management areas. He will assist in the noise monitoring and develop the modelling programme to predict the extent of noise and vibrations generated by the proposed development.</p>
Rio Tinto Technology and Innovation	: Waste rock and tailing management	<p>The Rio Tinto Excellence in Mineral Waste Management Program has been developed to help operations and projects reduce the environmental, health, financial and reputational risks posed by mineral wastes such as tailings, waste rock and open pits. The program is intended to provide expert technical analysis and guidance outside of the formal corporate assurance framework.</p>

Organisation	Area of responsibility Field of expertise	Team member(s)
Metago Environmental Engineers (Australia) Pty Ltd	: Waste rock and tailing management	<u>Dr Gordon McPhail</u> is the director of an Australian company (part of the larger Metago group of companies) established specifically for the provision of geotechnical and environmental engineering and science services to the Mining Industry. Dr McPhail holds a PhD in Civil Engineering and has more than 30 years experience as a consulting engineer specialising in tailings and waste engineering, water management and dam engineering, geotechnical engineering, closure planning, and risk assessment.
Aquaterra Consulting	: Update of groundwater model	<u>Jon Hall</u> is a principal hydrogeologist and will act as reviewer and team leader on the upgrade of the groundwater model. <u>Kathryn Rozlapa</u> is a senior modeller and will assume responsibility for the upgrade of the model.
Environmental Science Associates	: Legal review for SEIA	<u>Theo Fischer</u> , a senior environmental chemist and consultant at Environmental Science Associates will lead this legal review for the SEIA. <u>Dr Ernst Basson</u> holds a LL.D in law and has associated with Environmental Science Associates for this specialist legal review as an environmental law specialist. In addition, the legal review team will include an environmental engineer, a geophysicist and radiation specialist, and an occupational health & safety law specialist.
Infotox Pty Ltd	: Toxicology	<u>Dr Marlene Fourie</u> has a PhD in Reproductive Biology and is proficient in statistical methods and analysis, health measurement, epidemiological study design, analytical epidemiology, exposure assessment and health risk assessment.

## 1.8 REPORT STRUCTURE

This report is structured as follows:

Chapter One	<i>Provides the introduction, policy and legislative requirements, and approach and methodology for the study</i>
Chapter Two	<i>Describes the project components</i>
Chapter Three	<i>Describes the public participation process</i>
Chapter Four	<i>Describes the selection and screening of alternatives</i>
Chapter Five	<i>Describes the study area</i>
Chapter Six	<i>Discusses the identified impacts</i>
Chapter Seven	<i>Concludes the report and describes the way forward</i>



## 2 PROJECT DESCRIPTION

### 2.1 PROPOSED ACTIVITIES

The entire extent of the expansion project proposed by RU comprises, in summary, an increase in size of the current mining pit known as SJ, the opening of new mining areas, with concomitant new disposal areas for waste rock, new or expanded processing plants, additional tailings dam capacity, and an increase in staff numbers and facilities. Clearly, such a wide-ranging project comprises numerous components.

As mentioned in Sections 1.1 and 1.5, six specific components of RU's expansion project are the subject of the Phase 2 SEIA process, viz. the **expansion of the current SJ pit** to enable mining operations to continue feasibly until at least 2026, the development of a **new mining area known as SK**, **increased waste rock disposal capacity**, **increased tailings disposal capacity**, the **establishment of a new acid heap leaching facility**, and the **handling of sulphur in the Port of Walvis Bay**.

Each of the six components of Phase 2 of RU's expansion project, i.e. the subject of this Scoping Report, is now dealt with in more detail.

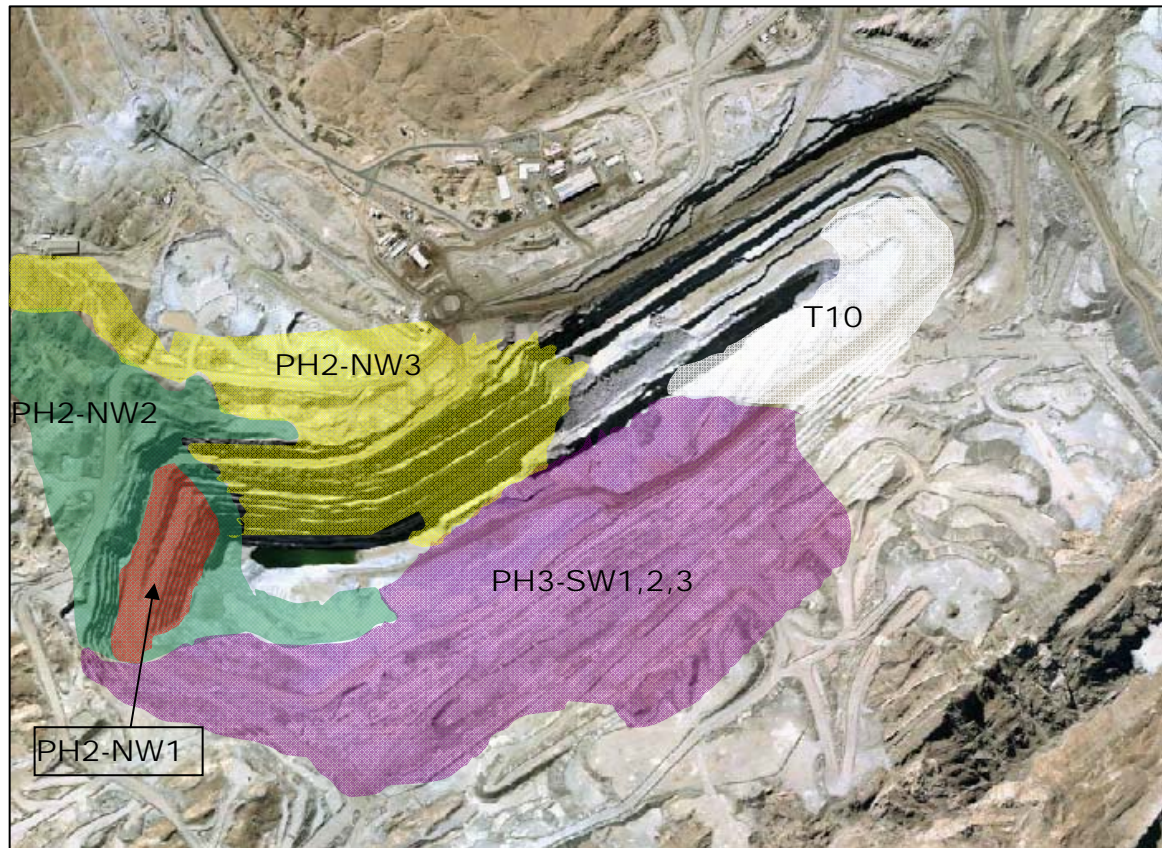
### 2.2 EXTENSION OF THE CURRENT SJ MINING ACTIVITY

#### 2.2.1 Context

As discussed in Section 1.2.4, RU undertook a detailed sustainability assessment in 2004 to determine the viability of extending the life of the Rössing uranium mine. The outcome was in support of the engineering and feasibility studies which were in favour of extending mining operations to beyond the current expected life of mine plan ending in 2016. The sustainability assessment thus supplied the impetus for undertaking the present SEIA, allowing RU to consider the next step in the process, namely to determine whether the expansion project could be undertaken within acceptable socio-economic and biophysical parameters.

RU's proposed expansion of the current SJ mining activity includes the horizontal expansion or push-back of the current pit into four possible adjacent areas. These are referred to as NW1 (Northwest Stage 1), NW2 (Northwest Stage 2), NW3 (Northwest Stage 3), SW (Southwest) and T10 (Trolley 10), as illustrated in Figure 5. The mining of the NW areas will ensure economically feasible mining of the SJ pit until the year 2016 and the addition of the remaining two areas, SW and T10, will supply a sufficient quantity of additional ore to extend the feasibility until 2026. The nature of the current mining activity will not change, but will ensure that the current economic feasibility is maintained into the future.





**Figure 5: SJ pit indicating new expansion areas (not to scale)**

### 2.2.2 The four push-back areas surrounding the current SJ pit

Figure 4 provides a diagrammatic illustration of the current active SJ pit and the four potential areas into which the pit is intended to expand.

The SJ pit in its current state is one of the largest open pit uranium mines in the world with dimensions of approximately 2 800 m in length by 800 m at its widest and 330 m in depth. The type of mining activity is a conventional truck and shovel operation with haul trucks running on a trolley-assist system installed in the pit in the late 1980s. The envisaged enlarged SJ pit will continue to be mined using the same method.

Approximately 19 new 180 tonne haul trucks will need to be acquired over the remaining life of mine, together with five PC5500s rope shovels and one Marion hydraulic shovel. One additional blast hole diesel drill and three GD120 blast hole drills are foreseen to be required.

As per the current mining operation, water will be required for drilling activities and dust suppression in the expanded areas. The current rate of water usage for these purposes for the entire mine operation is  $\pm 700 \text{ m}^3/\text{day}$  of which  $600 \text{ m}^3/\text{day}$  is drawn from the Khan River and the balance of the  $100 \text{ m}^3/\text{day}$  collected from the pit bottom sump. Without the inclusion of the additional new SK mining area, this figure is likely to double with the exploitation of the SK4 ore body (Phase 1 component) and the expansion of the mining activities in the active SJ pit. Groundwater is presently abstracted from the Khan River for use in dust suppression and, as

stated above, this source provides in the order of 600 m<sup>3</sup>/day. Water reuse is a priority on the mine and RU strives to minimize the use of groundwater by recycling as much of it in the processing system as possible. Together with water being provided for the expanded SJ areas, electricity will also be required, as per current operations. Additional infrastructure will be required for the supply of water and electricity, but management and conservation of both will be addressed in detail in the next phase of assessment.

Exploration drilling has indicated uranium mineralisation up to 600 m below the current pit. However, due to financial constraints of mining at such increased depths, it is economically more attractive to expand the pit horizontally rather than vertically. Due to the fact that the exact extent of the ore source is unknown, a scenario wherein mining could continue beyond 2026 is a possibility. As such, whilst there are still other suitable areas and methods available for the handling of waste rock, the infilling of the pit once depleted as a means of disposal of waste rock is not currently considered as a viable option.

The management of waste rock derived from the extension of the SJ mining activity is dealt with in Section 2.5.

## **2.3 NEW MINING ACTIVITY IN SK AREA**

### **2.3.1 Context**

During earlier geological exploration undertaken in RU's mining license area, two other areas of potentially viable ore, besides the active SJ pit, were identified. These are referred to as the SH and SK anomalies and are located within three kilometres to the west and east of the SJ pit respectively, as indicated in Figure 6. Further in-depth feasibility investigations are underway at present. For the purpose of the present Scoping stage of the Phase 2 SEIA process, it is assumed that the SK area will indeed be a feasible option for RU and that a single open cast pit may be developed in the area. The SH area is not being attended to during this SEIA process. However, the possibility remains that it will be considered for exploitation in the future and this will become evident as RU's investigations continue.

The SK anomaly is of particular importance since it contains an area, known as SK4, with ore grades that are verified as being significantly higher than the active SJ pit. Notwithstanding the economic motivation presented by the increase in uranium prices on the international market, exploitation of this SK4 pit (assessed in Phase 1) within the SK anomaly would supplement the lower uranium grade ore currently processed by RU. The present Phase 2 Scoping Report deals with the mining of the remainder of the larger SK ore body.





**Figure 6: Location of SH and SK anomalies** (source: RU)

### 2.3.2 Method and extent of mining

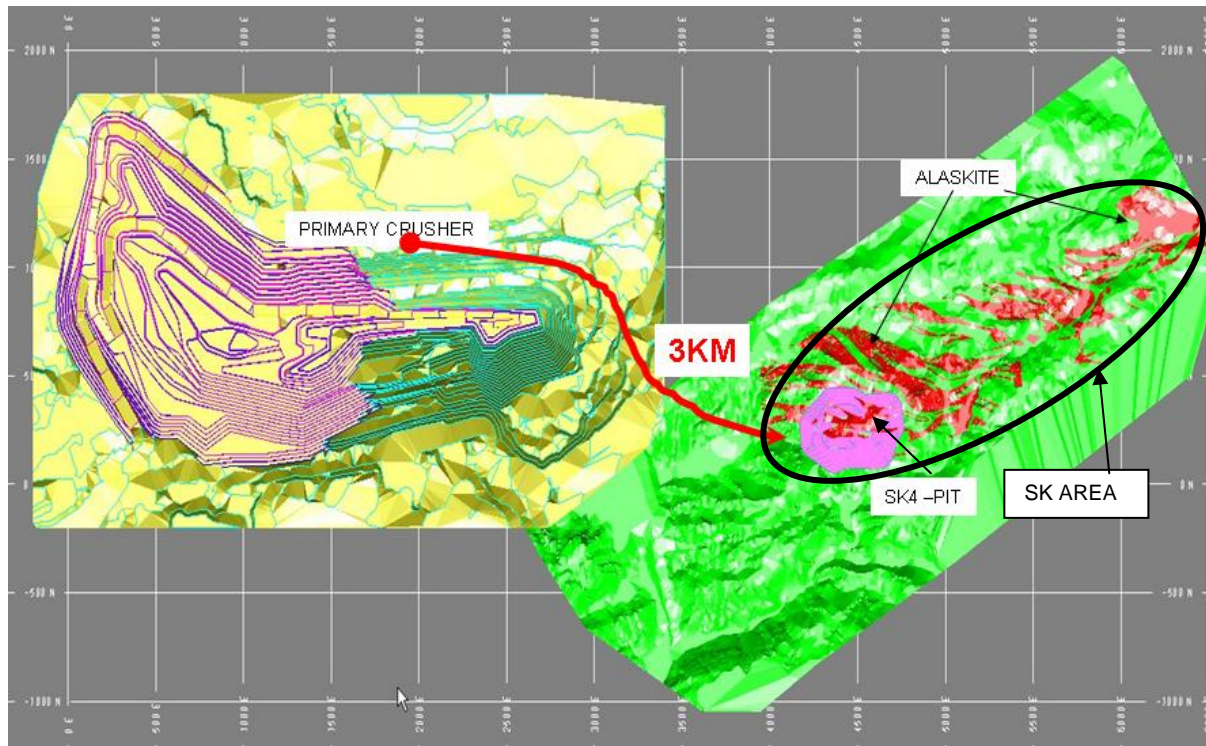
The pioneering work required to allow access to the SK ore body would comprise drilling, blasting and the use of heavy earth moving equipment. Once suitable road access has been created, excavation will be undertaken to provide a drilling platform for the pit, although the area will probably already have access as a result of the planned, smaller SK4 pit within the larger area, as illustrated in Figure 7 below.

The drilling platform will then allow for the opening of the benches needed for exploitation of the resource and for access by loading equipment. The typical open pit mining sequence as currently undertaken at the SJ pit of drilling, blasting, loading and haulage will be applied. Various heavy-equipment will be put to use on the site, including excavators and dump trucks, supported by bulldozers and front-end loaders. Water carts for dust suppression and diesel bowsers for refuelling will also be made available.

At this stage, as one of the options, RU is assessing the development of the SK area into a single open pit, eventually reaching a size of approximately 3 000 m in length, 800 m in width and 300 m in depth. The total quantity of rock including ore-bearing material expected to be mined from the SK pit is estimated at about 700 Mt. This equates to approximately the same tonnage as has been extracted to date from the SJ pit.

### 2.3.3 Haulage and processing

For the SK area at present, i.e. to serve the smaller SK4 area, a single haulage road of some 35 m in width is envisaged, accessing the pit in the south-western corner and linking to the existing primary crusher situated 3 km to the northwest of the pit. This dedicated haulage road will continue to serve the larger SK pit and Figure 7 provides a nominal indication of the route of the road. It should be noted that a ring road on the perimeter of the SK pit will also be required for enhanced access.



**Figure 7: Nominal alignment of the SK haul road (source: RU)**

The material from the SK pit will then continue in the ore stream from the primary crusher, to be processed in the current fashion through the existing conventional metallurgical plant or through a new or modified metallurgical processing system.

The management of waste rock derived from the new mining activity in the SK area is dealt with in Section 2.5.

### 2.3.4 Water and energy

Water will be required for drilling activities and dust suppression in the proposed SK pit. The current rate of water usage for these purposes for the entire mine operation is  $\pm 700 \text{ m}^3/\text{day}$ . This figure is likely to increase significantly with the exploitation of the SK ore body. Although industrial-quality water is used for dust suppression purposes on the mine, a major proportion of which is derived from groundwater abstracted from the Khan River, no additional quantity can be abstracted from this source, since the sustainable yield would be exceeded. Other sources of industrial-quality water are from sewage effluent and seepage water collection.

The supply of water to the proposed SK open pit would become an integral part of the management of water for the entire mining, processing and mineral waste disposal operation<sup>9</sup>. It is a key area of concern in the range of mining impacts managed by RU, especially when considering the limited water resources available in the generally arid environment of the Erongo Region of Namibia.

Water and electricity will also need to be provided for the SK mining activity. However, further planning is being undertaken in this regard. Where possible, the principle of optimising linear infrastructure within existing or planned utility corridors will be applied, meaning that the dedicated haulage roads would in all likelihood also provide the route for electricity and water supply.

## **2.4 INCREASED WASTE ROCK DISPOSAL CAPACITY**

### **2.4.1 Disposal of waste rock from the extended SJ mining activity**

The expansion of the SJ pit would lead to approximately 250 Mt of waste rock needing to be disposed of. It will be possible, and it is RU's intention, to accommodate this material at current waste sites, as illustrated in Figure 8. Waste 7 is presently at an elevation of 520 metres above mean sea level (mamsl) and has sufficient capacity to accommodate waste rock from the small, high grade ore body within the new SK mining area referred to as SK4, currently being assessed in the Phase 1 SEIA process. Although there is sufficient capacity on the current waste rock dump sites to accommodate the additional waste rock from the extended SJ pit, waste rock disposal as such must be addressed in an overarching approach and additional suitable areas must be identified to accommodate all waste rock resulting from RU's larger mining expansion project. Waste rock as a common issue is addressed again in more detail in Section 4.3.4 and longer term implications, such as seepage control, slope stability, wind and water erosion, rehabilitation of biodiversity, visual intrusion on elevated horizontal lines in the landscape, and emission of dust and radon, will be considered.

### **2.4.2 Disposal of waste rock from the SK mining activity**

In 2007 the footprint of waste rock disposal on Rössing mine amounted to 665 ha. This is comprised of a number of waste rock disposal areas and a number of low and high-grade-high-carbonate content (high calc) ore stockpiles in close proximity to the open pit. The low grade and high calc ore stockpiles are situated on top of inactive waste rock dumps, where they remain accessible for potential future uranium extraction, possibly using proposed new metallurgical processes such as heap leaching.

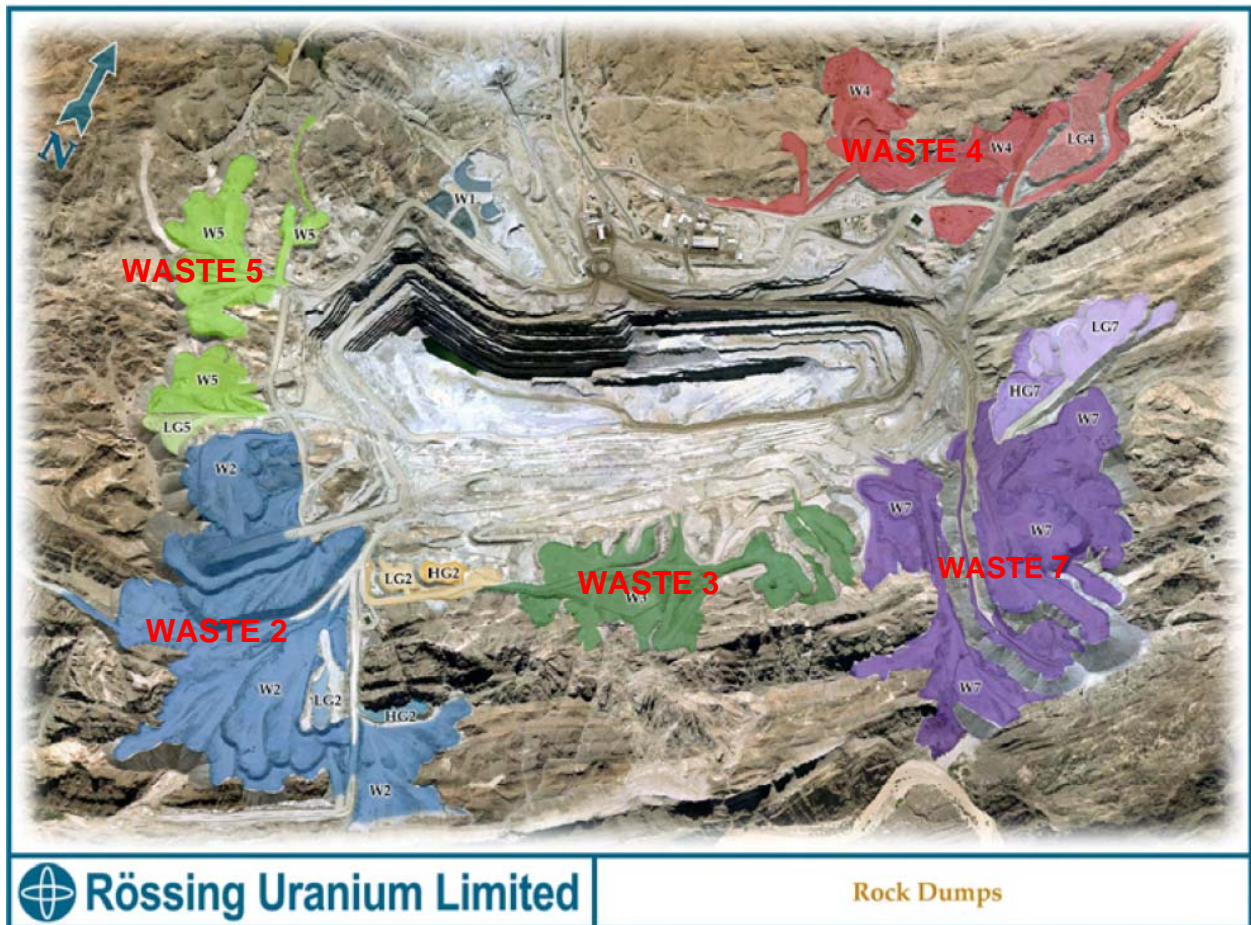
All of this material is transported from the pit by haul truck and disposed of at one of the designated waste rock disposal sites surrounding the open pit. The rock dumps are predominantly situated in the valleys and dry river gorges that drain towards the Khan River.

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<sup>9</sup> With reference to groundwater quality, the intention is to include the SK area in the existing groundwater flow model that is applied by RU (Aquaterra Consulting, 2005). This will require an extension of the application, insofar the physical area that is covered by the model is concerned.



Waste 2, Waste 5 and Waste 6 overlie Pinnacle Gorge, while Waste 4 and Waste 7 fill various tributaries of the Dome Gorge system. Rock dumps extend up to 2 km away from the open pit.



**Figure 8: Existing SJ pit indicating current rock disposal areas**

A volume of approximately 350 Mt of waste rock is expected to be generated by the proposed SK open pit and two current areas on the eastern rock dumps (Waste 7 or Waste 4) have been earmarked for this purpose (refer to Figure 8). Alternatively, the feasibility of using the valleys adjacent and parallel to the SK ore body for this purpose is also being investigated.

Waste rock from the proposed SK open pit, together with that from the proposed extension of the existing SJ pit, could be accommodated on the current rock dumps. However, this would be at the cost of significant visual impact, since the waste rock dumps would become considerably elevated. New rock disposal areas must therefore be identified as alternatives for waste rock from the proposed SK ore body.

The assessment of suitable alternative space for the various elements comprising RU's expansion project has presented itself as one of the core issues to be addressed in this SEIA process and RU is considering different methodologies and techniques to optimise this decision-making.

## 2.5 INCREASED TAILINGS DISPOSAL CAPACITY

### 2.5.1 Context

The current tailings dam applies a simple spigot deposition system. Coarse ground tailings for dam building are discharged through spigots, or open pipe ends, onto the sand wall which is built above the original starter dam.

Safe disposal of tailings at Rössing is a significant management issue because of the high tonnage and the fragile ecology of this arid region, where water is at a premium. The original tailings dam was designed to encircle an evaporation pond as a single entity, by means of a steeply angled ring berm constructed to the west of the Berning Range and mine processing area, as illustrated in Figure 9. However, the imperative of recycling water from the tailings pond resulted in the tailings dam being redesigned as a paddy system and considerable reductions in capital, operating and projected close-out costs to be made.

The paddy deposition method as illustrated in Figure 10 was commenced in 1988, reducing the wet beach area and, together with the decrease of pump speed to a minimum, produced a considerable reduction of water loss through evaporation. Tailings deposition planning is aided by the use of a model that allows the most cost-effective dam development in the short- and long-term.

Seepage from the tailings dam is collected in a seepage dam with a plastic-lined wall core. Downstream from this, and in other river beds that underlie the tailings dam, trenches have been cut into the alluvium and dewatering wells have been sunk into the fracture zones to collect any water flow, enabling it to be pumped back to the seepage dam.

Analysis of water drawn from these wells and trenches, as well as water drawn from wells in the Khan River lying within the mining grant, is monitored routinely to ensure that groundwater systems beyond the mining grant are unaffected by RU's mining activities.





**Figure 9: Original tailings dam design of 1982, viewed from the east (source: RU)**



**Figure 10: Current tailings dam design showing paddy system, viewed from the west (source: RU)**



Techniques for short-term dust control include windrowing and dust suppression spraying are applied on a continual basis. As a long-term dust control measure, the tailings facility would be fully covered with rock. A decommissioning plan (Rössing Uranium, 2005) has been compiled and is revised frequently in accordance with the findings from long- and short-term development work.

Due to the proposed expansion of mining operations at RU, the existing tailings dam may not offer sufficient capacity for the disposal of tailings emanating from the processing plant. Metago Environmental Engineers (Australia) (Pty) Ltd is currently undertaking a detailed investigation of tailings options, the findings of which will inform the assessment that will be a part of the detailed Phase 2 SEIA Report.

### 2.5.2 Process options

There are three alternative methods of tailings disposal under investigation by Metago Environmental Engineers, namely:

- Current conventional paddy system;
- Dry disposal method; and
- High density tailings placement.

Dry disposal will require the installation of a belt filter plant. This is being considered by RU as an effective dewatering technology enabling more water and process chemicals to be retained in the water management system and recycled for use within the plant. The less water disposed of on the tailings dam results in less water being vulnerable to loss due to evaporation.

These process options are discussed in further detail in Section 4.3.3.

### 2.5.3 Site options

The current tailings dam site in its present form would offer sufficient capacity until 2026 for disposal of tailings resulting from the dry disposal method at a mining rate of 178.45 Mt/a, excluding the SK area. If the high density method is adopted, the tailings dam capacity will have a reduced lifespan until approximately 2019. The current paddy system will also not be able to be accommodated on the dam footprint until 2026.

However, for all three processing methods, the lifespan of the current site can be extended by increasing the height of the support walls, thus allowing the capacity of the tailings facility to extend vertically. The visual intrusion of the elevated tailings dam would then pose a significant impact and would need to be assessed. Alternatively, impacts on biodiversity have to be assessed when establishing the facility in an undisturbed area.

Such a possibility exists with establishing a new tailings disposal facility in the Dome area. This is a viable option from an engineering cost perspective due to its close proximity to the current SJ pit and future SK expansion area and the possibility of also using the site for the placement

of waste rock and the heap leaching facility. The financial benefits of shared engineering expenses during the construction phase should be one of the criteria applied in the site selection process.

From a biophysical impact point of view, managing the seepage from a tailings facility and rock dumps in the Dome area could pose reduced risk as the drainage would be via Dome Gorge and, by eventually extending the eastern wall of the SJ pit to intersect this gorge, seepage could be collected and managed within the SJ pit. The biophysical impact of the footprint of these facilities on an undisturbed area will be included in the assessment of alternatives.

Suitable site options will be assessed in detail in the next stage of the Phase 2 SEIA process.

#### **2.5.4 Infrastructure requirements**

Due to the present uncertainty regarding the location and method of tailings disposal, issues such as access roads and personnel requirements can only be addressed further in the detailed SEIA Report stage to follow. At that time, Metago would have completed their study and a clear indication of the way forward would be available on which to base a detailed assessment.

## **2.6 ESTABLISHMENT OF ACID HEAP LEACHING FACILITY**

### **2.6.1 Context**

Heap leaching is a well-established process for optimising the recovery of uranium from ore that is rejected for feeding through the conventional leach extraction process and is being widely used by other mining operations globally. It is economically an attractive option as uranium that would otherwise have been sacrificed, can be recovered relatively cost-effectively.

RU intends to implement this method as a new processing option to extract uranium from low grade and high calc stockpiles, currently an unutilised source of uranium. Leaching can be achieved by using an acidic leaching solution and such a system is currently being researched by RU as an additional uranium recovery method.

### **2.6.2 Process**

Simply stated, heap leaching is a process by which ore crushed to a certain size over which a leaching solution is applied, either by spraying or drip irrigation, and which filters through the heap and extracts uranium on its downward flow path. The feed material (crushed ore) is crushed to achieve a uranium leach factor of above 50%. The “pregnant” solution (leachate solution containing uranium) is collected in drainage pipes within the base layer below the heap and stored in collection ponds. The uranium is then removed from this solution and the resulting uranium concentrate is piped to the conventional metallurgical processing plant.

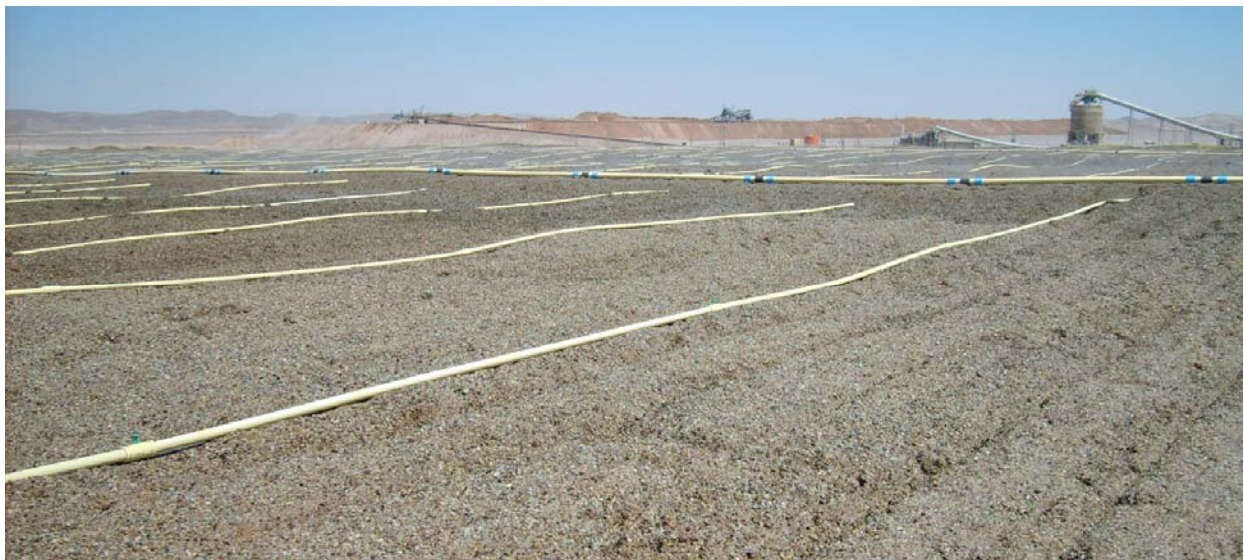
The generation of two input streams, i.e. from the current tank leaching system and from the proposed heap leaching system, into the metallurgical circuit may result in a range in composition of the two potential input streams. This will need to be well understood in advance, in order for the metallurgical circuit to be optimised to receive input from either the conventional or the heap leach sources (or both).

The “pregnant” solution can be recycled through the heap until an acceptable concentration is reached before pumping it to the processing plant. The estimated amount of water required in the leaching solution is determined by the volume of water required to entirely soak the heap and make up the evaporation losses from the surface. As mentioned previously, the management of water use for heap leaching will be integrated with existing systems, although the need exists for additional water supply to supplement the metallurgical processes. RU’s existing practices to minimise resource use will apply.

### 2.6.3 Design, layout and site

The two layout designs being considered are either a race track or “on-off” design, or a permanent matrix layout. Figure 11 is an example of an “on-off” design, currently favoured by RU.

The “on-off” layout requires a prepared surface or leach pad for the placement of raw material in the form of processed ore. It is a fixed footprint design, with fresh raw material being loaded onto the leach pad after spent leach ore is removed and disposed of at suitable disposal sites. Ultimately, the same amount of spent waste material will need to be disposed of, whether that be at the leach site as in the case of the matrix layout, or at a suitable disposal area in the case of an “on-off” design.

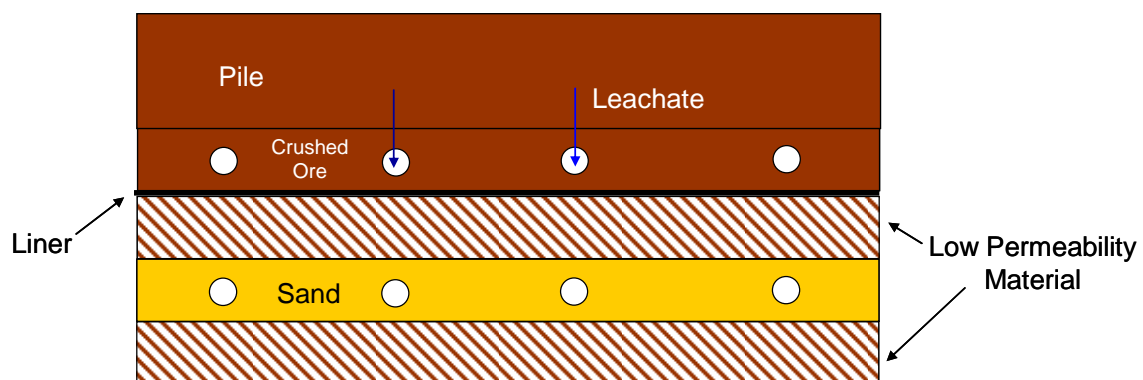


**Figure 11: Example of an “on-off” layout for heap leaching** (source: RU)

The matrix design consists of a dedicated area on which “heap blocks” are created side by side and the spent heaps being left in place.

Due to the competition for space emerging as a recurrent issue in RU's expansion project, not just for a heap leaching facility but also for suitable disposal sites for additional waste rock and tailings described previously, the "on-off" design would be the better option since it utilises less space than the more extensive linear design of the matrix layout. An increased footprint from the additional space and infrastructure requirements for a matrix layout potentially results in increased biophysical impacts. A disadvantage of the "on-off" design is that spent ore is disposed of on unlined dumps, resulting in potential leaching of residual acid, uranium and trace metals into the soil and groundwater.

The heap leach pile should be placed on either a multiple liner system with leak detection in place if the heap is located over a bedrock aquifer (refer Figure 12), or a single composite liner system if the heap is not placed over a bedrock aquifer and has the open pit and a groundwater collection dam in downstream gorges as secondary containment measures. Adequate perimeter monitoring should be implemented to ensure acidic leachate is not released from the pile. Adequate sealing protection through provision of a suitable liner is vital to avoid any harmful seepage escaping into the surrounding drainage lines. RU is therefore not considering placing the facility on any current waste dump sites due to their proximity to the Khan River. A preferred location from an engineering feasibility point of view at this time is the Dome area, as any solution that escapes will drain towards the existing SJ pit. The Dome area appears as a preferred common placement area for a number of RU's expansion project components, including additional tailings disposal capacity, new rock dumps and as a site for the heap leaching facility.



**Figure 12: Conceptual design of a multiple liner heap leach system** (source: RU)

The type of inert substrate needed for the base-course layers of the heap leach pad could be either quartz or dolerite. The source of this material appears to be problematic as RU is committed to not allowing mining for a supply of this rock in or around the mine. Local existing commercial quarries would need to be identified and the cost of importing enough material would need to be considered. Testing is also currently underway of the different types of rock found in the rock dumps to determine their suitability for this purpose.

Evaporation at the Rössing site is in orders of magnitude greater than the precipitation received. Consequently, there is a considerable potential for an amount of the water applied during the heap leaching process to be lost via evaporation. Covering of the pile with a synthetic liner would result in a large reduction in water usage and potentially could be used as part of an

engineered cover when the pile is eventually taken out of commission. Drip irrigation could also be used in preference to irrigation using sprinklers when applying the leaching solution.

## 2.7 SULPHUR HANDLING IN THE PORT OF WALVIS BAY

### 2.7.1 Context

While undertaking the assessment of the acid plant and related sulphur handling during Phase 1 of the SEIA process, it was necessary to exclude the activities related to sulphur handling in the Port of Walvis Bay. This was due to Grindrod, the operators of the bulk handling terminal, already having initiated its own assessment process for such a facility. However, Rössing has identified three additional locations for sulphur storage that it is considering and it is now necessary to undertake an assessment process for these alternatives. Grindrod will continue with the assessment for a similar facility within its lease area in the port and Alexandra Speiser Environmental Consultants are presently undertaking the required process. Rössing's assessment of an alternative location for sulphur handling will be a parallel process to Grindrod's, since these represent different locations and different proponents. It is not the intention to develop two sulphur handling facilities in the port and the plan is for a single facility that meets the requirements of all stakeholders.

It is therefore intended to subject the additional sulphur handling alternatives in the Port of Walvis Bay to a parallel assessment process. Once input from the public has been received, an SEIA Report for the sulphur handling facility in the port as an individual component of Rössing's expansion project will be compiled and submitted to MET:DEA.

### 2.7.2 Design, layout and site

Bulk sulphur would be unloaded from the ship's hold by a Siwertell Continuous Ship Unloader (Figure 13) with a rated capacity of 650 metric tonnes per hour. The average rate of unloading will be 450 metric tonnes per hour. An installed Siwertell collector conveyor extending the length of the berth, parallel to the quayside, would be configured specifically to receive product transferred from the ship unloader. From the quayside collector conveyor sulphur would be conveyed, preferably by a pipe conveyor, to a fully enclosed storage building. The pipe conveyor would discharge onto a shuttle conveyor that would extend throughout the length of a linear storage building above the stockpile. This closed storage shed should have a holding capacity of a minimum of 36 000 and a maximum of 40 000 metric tonnes.

The conveyor systems are envisaged to be of a design to have minimum transfer stations in order to achieve a zero spillage system. Stockpile management inside the storage shed would be done by rubber-tyred front-end loader. Sulphur reclaimed from the storage building would be loaded into railcars for transport to the mine. To maintain the required logistics, the railcar loading system should have the capability to load 25 railcars with 42 tonnes of product in two hours or less. The rail loading system in the storage shed that has been selected comprises of a radial conveyor extending from a feed chute at the pivot point to the railcar loading station. As each railcar is indexed into position, the loading conveyor is started and loading of the rail car commences. As the loading proceeds, the operator moves the discharge chute of the conveyor



along the length of the railcar until the required loading is completed. Sulphur is to be loaded into specially designed railcars currently being investigated. A design for an indexing system is required for indexing of railcars during loading operation at the loading station in order not to tie up a locomotive during loading operations.

Although sulphur is essentially non-toxic, dust that may be generated in the handling process would be controlled by the use of fine water sprays. The sprays would be installed at transfer points in the materials handling system, such as in conveyor chutes and bins. As a safety precaution, infra-red monitors would be installed in the storage shed to immediately detect the start of a potential sulphur fire. The fire fighting system that would be implemented would consist of water reticulation lines, hose reels and fog nozzles located at strategic places and used to extinguish a fire in the sulphur handling process and storage. The necessary environmental bunding, wash down and drainage collection systems would be installed throughout the facility.



**Figure 13: A typical Siwertell ship unloader and covered storage building (source: RU)**

The most important social and environmental concerns about the proposed handling of sulphur in the Port of Walvis Bay are related to dust and it being regarded by the public as a dangerous substance due to a perceived explosion risk. In the past, sulphur spillages resulted in concerns on the part of people in the area. Rössing is proposing a closed system of sulphur handling that will allow it to strive for zero spillage and the application of management procedures where this is not possible. Attention will specifically be given to issues of human health in the Social and Environmental Impact Assessment for the proposed sulphur handling facility. Other areas of specialisation that will be attended to in the assessment are the noise and visual impacts of the proposed facility.

## 3 PUBLIC PARTICIPATION PROCESS

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### 3.1 INTRODUCTION AND SYNOPSIS OF ISSUES

Engagement with the public and stakeholders interested in or affected by development proposals forms an integral component of the environmental assessment process. Thus, I&APs will have an opportunity at various stages throughout the SEIA process to gain more knowledge about the proposed project, to provide input and to voice any issues of concern.

Stakeholders and I&APs have had several opportunities to participate in the SEIA process for RU's proposed mine expansion project. Table 9 provides a summary of correspondence, documentation and meetings to date and the useful inputs received are acknowledged. The following are the most noteworthy of the issues raised by I&APs regarding RU's expansion project, as they relate to the Phase 2 components of the SEIA:

- Employment opportunities;
- Workplace health and safety concerns, including air and water pollution and noise;
- Housing implications;
- Services such as schools, medical care and water availability;
- Effects on the regional and local economy, including tourism;
- Negative social impacts from newcomers seeking work;
- Possible social and biophysical threats from the handling of sulphur in the Port of Walvis Bay (such as food contamination, proximity to RAMSAR<sup>10</sup> site, polluted effluent, noise and dust, and contingency planning);
- Possible dust and noise threats to humans and the environment from the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility;
- Biodiversity implications, particularly in the SK mining area and the Dome area;
- Supply, storage, application, runoff and reuse of water from the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility;
- Regional implications of bulk water supply;
- Visual impacts of the extension of the SJ pit, new mining activity in the SK area, increased tailings and waste rock disposal areas, and establishment of a heap leaching facility; and
- Energy use.

The objectives of public participation will be maintained throughout this SEIA process. These are to provide information to the public, identify key issues and concerns at an early stage, respond to the issues and concerns raised, provide a review opportunity, and document the process properly.

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<sup>10</sup> Walvis Bay was declared a Ramsar Wetland of International Importance by Namibia in 1995. The approximate 9,000 ha Ramsar wetland area includes the coastal zone, salt pans and mud flats to the south of the Walvis Bay Port and excludes the deep waters of the bay and the Pelican Point peninsula.



## 3.2 IDENTIFICATION OF STAKEHOLDERS

The following stakeholder groups were identified as the key ones to be consulted throughout the SEIA process:

- Central government ~ Ministries of:
  - Mines and Energy,
  - Health and Social Services,
  - Labour and Social Welfare,
  - Environment and Tourism,
  - Agriculture, Water and Forestry,
  - Regional and Local Government and Housing, and
  - Education;
- Regional and local government:
  - Erongo Regional Council,
  - Swakopmund Town Council,
  - Walvis Bay Town Council, and
  - Arandis Town Council;
- The !Oe#Gan Traditional Authority;
- Other uranium mines in the Erongo Region;
- Rössing Uranium;
- The Rössing Foundation;
- The media;
- NamPort;
- NamWater;
- NamPower;
- TransNamib;
- Farmers, both small-scale and commercial;
- Other economic sectors which may be affected by mineral exploitation, e.g. tourism;
- Community groups and social institutions in Swakopmund, Walvis Bay and Arandis;
- Service providers; and
- Organised labour.

## 3.3 INITIATING THE PROCESS

The SEIA process for the entire RU expansion project was initially advertised in national, regional and local newspapers in August 2007, as reflected in Table 7 below. Annexure C provides an example of one of these advertisements, which announced the commencement of the SEIA process, provided information about the public participation meetings and invited registration as I&APs. The aim was to raise wide public awareness of RU's expansion project.

**Table 7: Schedule of newspaper advertisements, August 2007**

<b>Newspaper</b>	<b>Placement Dates</b>
Namib Times	14 & 17 August 2007
Republikein	15 & 17 August 2007
Republikein	20 August 2007
Namibian	15 & 20 August 2007
Namibian	17 August 2007
All.Zeitung	15 & 17 August 2007
All.Zeitung	20 August 2007
New Era	15 & 17 August 2007
New Era	20 August 2007
Economist	17 August 2007
Informante	16 August 2007
Southern Times	18 August 2007
Observer	18 August 2007
Plus Weekly	17 August 2007

A Public Information Document (PID) for RU's overall proposed expansion project was prepared early in the process and was forwarded to I&APs, made available at the first public participation meetings and provided on request. Annexure E provides a copy of the first PID released.

Three public participation meetings were held during the initiation of the SEIA process for RU's envisaged expansion project, as follows:

- Alte Brücke, Swakopmund : 20 August 2007
- Pelican Bay Hotel, Walvis Bay : 21 August 2007
- Arandis Town Hall, Arandis : 22 August 2007

A comment sheet was provided at the public participation meetings, inviting comments on issues that I&APs saw as critical for inclusion in the SEIA. A record of comments was compiled in a form which records the comment, the name of the commentator, the form the comment took and the response thereto. This comprehensive list of comments made at all the meetings held during the initial public participation process is provided as an annexure to the Phase 1 Scoping Report of November 2007, which is available on request.

Focus group and key informant meetings were also held during the initiation of the process and a full list of these, together with minutes from the meetings, are also provided in an annexure to the Phase 1 Scoping Report of November 2007.

### 3.4 PUBLIC PARTICIPATION DURING THE PHASE 2 SCOPING STAGE

Table 8 below reflects the placement of press notices of public meetings that were held during January 2008. The purpose of these meetings was to share the findings of the Phase 1 draft SEIA Report as well as to make known the initiation of the present Phase 2 Scoping stage of the SEIA process for RU's expansion project.

**Table 8: Schedule of newspaper advertisements, January 2008**

Newspaper	Placement Dates
Namib Times	18 & 22 January 2008
Republikein	16, 17 & 18 January 2008
Namibian	16, 17 & 18 January 2008

Notices of the public participation meetings held in January 2008 were posted in public places in Swakopmund, Walvis Bay and Arandis. Annexure D provides an example of one of these press and public notices. The meetings that were held were as follows:

- Alte Brücke, Swakopmund : 22 January 2008
- Pelican Bay Hotel, Walvis Bay : 23 January 2008
- Arandis Town Hall, Arandis : 24 January 2008

A focus group meeting to deal specifically with the issue of sulphur handling in the Port of Walvis Bay was held on 7 February 2008. A PID that addresses this issue was compiled and made available to the participants and other I&APs before the focus group meeting and a copy is included as Annexure E of this report.

Minutes of the public participation meetings that relate to RU's expansion project, as well as minutes of the focus group meetings are found in Annexure G. Issues relevant to the Phase 2 components have been compiled in the form of records of stakeholder issues, comments and responses. These records are provided in Annexure H of this Scoping Report.

Annexure F provides a list of all meetings held to date in the public participation process and all I&APs who have registered themselves since the initiation of this project are listed in Annexure I. For ease of reference, all correspondence to date is summarised in Table 9.

The draft Scoping Report for RU's Phase 2 SEIA process was made available for I&APs and stakeholders to review, at the following venues:

- Windhoek Public Library;
- Swakopmund Public Library;
- Rössing Foundation Library in Arandis; and
- Walvis Bay Public Library.

It was also available on RU's website at <http://www.rossing.com>, from where it could be downloaded. I&APs and stakeholders were invited to submit any comments they may have by 30 April 2008, to Marie Hoadley, the Public Participation Manager for the SEIA, at email: [mariehoadley@iafrica.com](mailto:mariehoadley@iafrica.com); post: Private Bag 5005, Swakopmund, Namibia; or fax: 064 520 2286.

During the public comment period for the draft Phase 2 Scoping Report, the RU website was visited 90 times to view the report, and 150 times to download specific sections of the report.

Interest in the entire SEIA process was also expressed by Elizabeth Hofeni of the University of Namibia and on-going communication with her is continuing.

### **3.5 PUBLIC PARTICIPATION – THE WAY FORWARD**

All I&APs and stakeholders will be informed of the availability of this finalised Phase 2 Scoping Report and of its submission to MET:DEA.

During the SEIA stage that will follow the present Phase 2 Scoping stage, public participation and engagement will comprise the following:

- engagement with I&APs who did not register in the scoping stage process;
- presenting the findings of the draft Phase 2 SEIA Report;
- registering any additional I&APs;
- noting and responding to questions and/ or issues of concern; and
- investigating issues at greater depth where the need for this has been indicated.

All I&APs and stakeholders will be informed of the availability of the draft Phase 2 SEIA Report, the period for review and the venues where the report will be available.

The draft Phase 2 SEIA Report, including the specialist studies, will be presented to the public at public participation meetings in Arandis, Swakopmund and Walvis Bay planned for the latter half of 2008 but possibly in 2009. At the same time, copies of the draft Phase 2 SEIA Report will be lodged for public viewing at the venues mentioned above and the report will also be placed on RU's website.

**Table 9: Summary of correspondence, documentation and meetings to date**

Project Activity	Dates	Notices	Letters	Documents	Meetings
Project Preparation – all phases	14 June 2007			Minutes of meeting	Multistakeholder Risk Identification Workshop, Swakopmund.
Project Initiation – all phases	August 2007				Meetings with authorities.
Initiation of Public Participation – all phases		Newspaper adverts. Notices in public places in Arandis, Swakopmund and Walvis Bay. RU's website.	Notification of project & invitation to stakeholders' meeting.	PID	Meeting with media.
	20-22 August			Stakeholder Issues Sheet (1)	Public Participation meetings in Swakopmund, Walvis Bay and Arandis.
	23 August – 22 September			Minutes of meetings. Stakeholder Issues Sheet (2)	Key informant and focus group meetings.
Notification of Phase 1 Scoping Report	13-14 November 2007	Notification of release of Phase 1 Scoping Report in print media and on RU's website.	Letters to I&APs notifying them of release of Phase 1 Scoping Report.	Phase 1 Scoping Report.	Key stakeholder meetings.
Focus group participation	13-14 November 2007			Minutes of meetings.	Meetings held with identified stakeholders.
	6 December 2007			Minutes of meeting.	Meeting with farmers.
Notification of Draft Phase 1 Social and Environmental Impact Assessment (SEIA) Report for comment	12 - 16 January 2008	Notification of release of Draft Phase 1 SEIA Rep in print media and on RU's website.	Letters to I&APs notifying them of release of Draft Phase 1 SEIA Rep.	Draft Phase 1 Social and Environmental Impact Assessment Report.	
Public Participation for Draft Phase 1 SEIA Rep and introduction of Phase 2 project components	22 – 24 January 2008	Newspaper adverts. Notices in public places in Arandis, Swakopmund and Walvis Bay, and RU's website.	Notification of public meetings.	Phase 1 Stakeholder Issues Sheets	Public Participation meetings in Swakopmund, Walvis Bay and Arandis.
Focus Group participation – expansion project component dealing with bulk storage & handling of sulphur at Walvis Bay Port	7 February 2008	Emailed notification	Letter of invitation	Stakeholder issues sheet	Meeting held identified stakeholders.

## 4 IDENTIFICATION OF ALTERNATIVES

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### 4.1 CONTEXT

The identification and consideration of alternatives is recognised as required practice in environmental assessment procedures globally. Regulatory requirements in Namibia accord with this requirement, as reflected in the Environmental Management Act and the Environmental Assessment Policy, namely as a step in the earliest proposal development stage<sup>11</sup>.

Alternatives are typically considered at various stages in the formulation of proposed developmental policies, plans and projects. With reference to development policies and plans, these are usually addressed at the higher level of national and regional strategy and forward-planning, and are termed strategic alternatives. As far as project alternatives are concerned, their assessment is limited to the level or site of the particular project. The examination of alternatives for RU's proposed expansion project is thus mainly concerned with the assessment of project-level alternatives, although strategic and cumulative implications will be addressed as far as possible (see next section). Part of the Scoping process is to screen out those alternatives that will not be considered in the SEIA Report stage. Unless there is valid and logical justification to screen them out, all feasible alternatives should be considered in the SEIA Report stage.

During the next stage in the Phase 2 process, i.e. the SEIA Report stage, each of the selected alternatives will be assessed in terms of their potential impacts on the socio-economic and biophysical environment. The formulation of mitigation measures to reduce the significance of negative impacts is a key part of the assessment process. In deriving mitigation measures, process modifications to the preferred alternatives may be made.

At the end of the SEIA process, RU would be able to consider the assessment of the alternatives described in this section, together with any mitigation measures that are proposed, to select preferred options to submit to MET:DEA for their approval.

### 4.2 STRATEGIC ALTERNATIVES

As contextualised in the previous section, strategic alternatives refer to those alternatives that were considered at a higher level than this project-level SEIA. In this case, and as described in Section 1.2 above, the Constitution of the Republic of Namibia, Vision 2030, the Environmental Management Act and RU's Sustainability Assessment provide the overarching policy and planning framework within which RU's strategic decisions have been made. The present SEIA is thus part of the re-evaluation of the life of the Rössing uranium mine, beyond the present end of life of mine date of 2016, in terms of overall feasibility, i.e. including social and environmental criteria.

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<sup>11</sup> See Section 3 of Appendix A of the policy.

The Chamber of Mines of Namibia has recently initiated a Strategic Environmental Assessment aimed specifically at the uranium mining interests in the Erongo Region. RU has indicated a commitment to sustainable development in their recognising the need for an holistic approach to planning future mining activities as described above. Therefore, RU is intent on seeking continuity with this macro-level study, thereby filling the gap between the strategic and project levels of assessment in their expansion project social and environmental assessments. This is to be achieved by RU evaluating the optimisation of the sequence and rate of future ore exploitation from the financial perspective and being informed by the associated social and biophysical aspects as additional criteria in the evaluation. The rate of mining is one of the factors in strategic level decision-making and planning, as it potentially impacts significantly on socio-economic and biophysical aspects. The outcome of this evaluation will feed into the Phase 2 assessment process.

To optimise future ore exploitation as mentioned above, RU is presently engaged in a Strategic Planning Process that addresses life of mine planning. Sustainability criteria will be included in this ongoing process and, as such, life of mine planning will not only be based on financial considerations. By maintaining the current production rate, for instance, certain socio-economic and biophysical impacts associated with an increased production rate could be avoided. These could include changes in staff numbers, thus influencing the need for additional housing, schooling and services such as water and electricity.

As a further move towards filling the gap between the strategic and project levels of assessment, the cumulative impacts of both Phase 1 and Phase 2 will be evaluated and assessed in the SEIA documentation to follow in the next stage of this process.

There is also a requirement in terms of environmental best practice to examine the alternative of maintaining the *status quo*. This refers to the situation that would pertain if no development were to occur. In the case of the present SEIA process, this option would amount to the Rössing uranium mine closing in 2016. With the current opportunity of deriving strategic, economic and social benefit from prolonging the life of the mine, not taking up this potential opportunity is considered to be an unattractive alternative. As a result, the *status quo* alternative has not been evaluated at the same level of comparative detail that the project alternatives reflected in this report are. Rather, the *status quo* forms the baseline against which potential positive and negative social and environmental impacts of RU's proposed expansion project are assessed.

### 4.3 PROJECT-LEVEL ALTERNATIVES

Each of the six components of the Phase 2 SEIA of RU's expansion project is now described in terms of the project-level alternatives available for assessment<sup>12</sup>. A summary of these alternatives is provided at the end of this section.

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<sup>12</sup> Note that the initial expansion project components, referred to as Phase 1, have been dealt with in a separate but identical process that is subject to a different programme, as described in Sections 1.1, 1.5 and 2.1.



### 4.3.1 Extension of the current SJ mining activity

The four push-back areas being considered by RU for the extension of the current SJ pit, as described in Section 2.2, are not regarded as alternatives and would ultimately all be mined if the decision to do so is taken. The areas would, however, be mined in a time sequence beginning with the Northwest Stage 1 and Trolley 10 areas, followed by the Northwest Stage 2 and Southwest areas. This would extend the feasibility of the pit to 2026. The revision over time of the mine plan for the SJ pit would provide the basis on which the approach to its mining would be decided.

The alternative of underground mining of the ore bodies in the push-back areas has been raised by I&APs. However, a selective mining process as applied in an open pit allows the waste rock to be separated early enough in the process to not have to process the entire volume of material mined. The alternative of underground mining is thus not being considered, since it would not be financially viable.

The alternative metallurgical process options being considered for extracting the uranium oxide product from the ore derived from the extended SJ pit are dealt with in Section 4.3.5. Similarly, the need for additional waste rock disposal areas for waste rock from the extended SJ pit is dealt with in Section 4.3.4. There are thus no specific alternatives relevant to the extension of the SJ pit available for assessment. The SJ pit would be extended by continuing with the current mining method of drilling, blasting, loading and haulage.

### 4.3.2 New mining activity in SK area

As described in Section 2.3, exploitation of the entire SK ore body would follow on from the opening of the smaller SK4 pit assessed in Phase 1 of RU's SEIA for the proposed expansion project. As such, no site-specific alternatives are available for assessment since the SK ore body would already have been provided with a haulage road and water and electricity supply as a result of the SK4 pit being brought into operation. The larger SK ore body would be mined by continuing with the typical method of drilling, blasting, loading and haulage that would already be underway for the SK4 pit. The environmental controls applied by RU as a matter of course for their mining operations would similarly be applied in this case.

As is the situation with the extended SJ pit, the alternative metallurgical process options being considered for extracting the uranium oxide product from the ore derived from the extended SK pit are dealt with in Section 4.3.5. The requirement for additional waste rock disposal areas for waste rock from the extended SK pit is similarly dealt with in Section 4.3.4. There are thus no specific alternatives relevant to the extension of the SK pit available for assessment.

### 4.3.3 Increased tailings disposal capacity

As described in Section 2.4, there are three tailings disposal alternatives under investigation by Metago Environmental Engineers. These are:

- Current conventional paddy system;
- Dry disposal method; and
- High density tailings placement.

The dry disposal method and the high density tailings placement method, being new processes, are now described further. Thereafter, the implications for additional space for tailings disposal are addressed.

a) Dry disposal method

Dry disposal of tailings is only possible if a belt filter plant is installed. This is being considered by RU as an effective dewatering technology enabling more water to be retained in the water balance and recycled for use within the plant. The less water disposed of on the tailings dam, the less water is vulnerable to loss due to evaporation. Other dewatering options are being considered, including compaction thickeners to treat fine tailings.

The tailings that would be processed by the belt filter would be formed into “dry filter cake” (crumbled tailings material) which would be transported by conveyor to be stacked at the selected tailings site. This process would successfully remove a very high percentage of water before disposal at the tailings site. If this process is adopted, the current tailings dam site would be able to accommodate an additional 178.45 million m<sup>3</sup> of tailings. However, a disadvantage would be the elevation of the current tailings dam site with 35 m to a rest level of 670 mamsl.

b) High density tailings placement method

This method can be used with or without a belt filter plant and applies compaction thickeners to compact the tailings and force out water before being pumped to the selected tailings site, resulting in a significant water saving of approximately 20 %. The resulting product is thicker slurry, to which an optimum quantity of recycled plant water will be added to obtain the necessary density to allow pumping to the tailings site.

Due to most of the water being removed from the slurry, seepage is reduced to a minimum. Other advantages of this method are reduced dust generation and less chemical precipitation. Dust generation is reduced due to the rounded, scalloped shape of the slurry being expelled from the pipe as the pipe is slowly moved forward. The hollows between these scalloped ridges can then be filled with slurry in the same way, resulting in smooth contours, which minimizes the vacuum usually created on the lee side of sharp edges which is the cause of fine particulates being lifted from the surface below (as is experienced with the present tailings disposal process). Chemical precipitation is reduced due to the mounds having only one end-point from which chemicals can precipitate by wind erosion.

The thickener plants have a height of approximately 20 m and at least three may be required. This could present a visual intrusion, but, should the site choice be the current tailings dam site, these plants could be constructed at a lower level and the slurry pumped up to the tailings dam.

The disadvantage of high density tailings placement is that it requires considerable space, due to the lower angle required for the slope of the placed tailings (referred to as the “beach”).

Should the current tailings dam be utilized for high density placement, its lifespan would only be to approximately 2019. However, if the option of vertically extending the tailings dam to a rest level of 670 mamsl, as well as filling in surround low areas in Pinnacle Gorge, the current site could offer sufficient capacity until 2026 at a mining rate of 14 Mt/a that excludes the SK area. The tailings option that is ultimately adopted will be informed by Metago Environmental Engineers' investigation currently underway and could be one or a combination of the three tailings disposal alternatives.

#### c) Additional tailings disposal site implications

The current tailings dam footprint would be able to accommodate the paddy system presently in operation for the entire SJ pit mining operation. It would, however, not offer sufficient capacity for disposal of tailings resulting from the SK pit, for which an additional facility will have to be developed. If the high density method is adopted, the current tailings dam capacity would have a shorter lifespan. However, for all three processing methods, the lifespan of the current site could be extended by increasing its height. The biophysical impact associated with increased site footprints and visual intrusion that would result would present a significant constraint and would need to be assessed in detail.

As mentioned previously, the Dome area to the east of the mine processing plant offers a possible alternative site for tailings disposal. It could also be considered for additional waster rock disposal capacity and for the location of the proposed heap leaching facility. Its proximity to the processing plant, SJ pit and proposed SK pit is favourable from an engineering cost and economy of scale point of view. From an environmental point of view, managing seepage from the Dome area would be enhanced by the fact that it would drain via Dome Gorge and, by extending the eastern wall of the SJ pit to intersect this gorge; such seepage could be collected and managed within the SJ pit. Figure 14 provides a graphic illustration of the area in question.

These alternatives will be assessed in detail in the next stage of the Phase 2 SEIA.

#### 4.3.4 Increased waste rock disposal capacity

With reference to Section 2.5, additional disposal areas for waste rock from the mining of the extended SJ pit, from the proposed mining of the entire SK ore body and for spent ore from the proposed heap leaching facility would be required if the life of the Rössing mine is to be extended to 2026. Earlier investigations into possible sites for waste rock disposal have been addressed in the Scoping Report and SEIA Report for Phase 1 of RU's expansion project SEIA. However, only one of the initially identified sites offered potential, namely the valley in which the grit blasting yard is located immediately to the west of the conveyor between the course ore stockpile and the crushers.



**Figure 14: Possible site for additional tailings and waste rock disposal**

The previous section described the potential of using the Dome area for several space-demanding purposes, including additional waste rock disposal. The continued use of the designated waste rock dumps currently serving the purpose must also be kept for consideration, since these can accommodate significant additional volumes, notwithstanding the visual intrusion that would result.

The feasible alternatives for additional waste rock disposal that should be considered in the assessment stage of the Phase 2 SEIA for RU's proposed expansion project therefore comprise the Dome area, modifications or optimisation of the current tailings dam and deposition in valleys adjacent to the SK pit.

#### **4.3.5 Establishment of a heap leaching facility**

There are two process options available for the extraction of uranium from ore recovered from the extended SJ pit and the new SK pit, namely the conventional tank leaching system currently in use, and heap leaching.

Currently ore is processed through the existing plant where mill feed is classified by both uranium content and the calculated acid consumption (based on the calc index) required for successfully processing the ore. Ore with a high calc index is either not mined or assigned to a specific stockpile. The mill feed is crushed, ground and leached using sulphuric acid as a leaching agent. Leach liquor is stripped of uranium in a continuous ion exchange (CIX) plant. The uranium solution from the CIX plant is concentrated and purified in a solvent extraction (SX)



plant. The product of the SX plant is transported to a precipitation section for recovery, followed by roasting to produce uranium oxide.

A new processing option of heap leaching is being considered by RU, to extract uranium from low grade and high calc stockpiles. The technology of heap leaching for uranium extraction is described in Section 2.6. As far as alternatives are concerned, either a race track or “on-off” design, or a permanent matrix layout, are being considered. However, at this stage in the design formulation, RU is in favour of the “on-off” alternative. The issue of disposal of spent ore from the heap leaching process is addressed in Section 4.3.4. Thus, the only remaining issue where alternatives may be considered insofar RU’s proposed adoption of heap leaching is concerned, is the location of the facility.

Multiple lifts will be required to reduce the overall footprint of the proposed heap leaching facility. For example, assuming a bulk density of  $1.9 \text{ t/m}^3$  and 130 million tonnes of ore, a 6 m pile would occupy an area of approximately  $11.4 \text{ km}^2$ , an 18 m pile approximately  $3.8 \text{ km}^2$  and a 30 m pile about  $2.3 \text{ km}^2$ . The spatial implications for locating the proposed heap leaching facility, as well as optimising on the extent of its footprint, will be evaluated in terms of the related alternatives during the assessment stage of Phase 2 of this SEIA process. The Dome area described in Section 4.3.4 will be evaluated as a possible site for the heap leaching facility.

#### 4.3.6 Sulphur handling in the Port of Walvis Bay

With reference to the need for a sulphur handling system in the Port of Walvis Bay described in Section 2.7, RU would strive for a closed system and would employ best practice in the important areas of health, safety and the environment. Conventional practice would be employed where this is believed to be adequate for the purpose.

However, the location of the sulphur storage building and the alignment of the pipe conveyor from the quayside are being subjected to the consideration of alternatives. Of importance in the selection of a preferred alternative is the need to reduce the number of bends in the conveyor alignment from the covered quayside conveyor to the storage building. The preferred pipe conveyor is unable to negotiate tight bends and if a covered conveyor were to be used instead, the risk of spillage at the transfer points would be greater.

As mentioned previously, Grindrod is assessing a site within its lease area and this may yet prove to serve Rössing’s purpose as well (Option A in Figure 15). RU is nevertheless also assessing three other possible sites (Options B, C and D in Figure 15).



**Figure 15: Alternative sites for the sulphur handling facility in the Port of Walvis Bay** (source: RU)

It should be noted that RU presently favour Option B from an engineering cost perspective. However, this will be evaluated from a social and environmental perspective during the assessment stage that will follow the present Scoping stage of the current SEIA process.

#### 4.3.7 Other project level alternatives

Sections 4.3.1 to 4.3.6 have dealt with the extended SJ pit, the new SK mining area, increased tailings disposal capacity, increased waste rock disposal capacity, the heap leaching facility and sulphur handling in the Port of Walvis Bay. However, there are several potential environmental impacts that cut across the entire Phase 2 SEIA. These mainly relate to socio-economic issues that are common to the specific components of the expansion project. These are now briefly described insofar possible alternatives may be available.

Housing for additional permanent employees would be required. The options available for formal housing are unlikely to present an array of alternatives. The temporary construction camp/s may benefit from the consideration of possible mitigatory measures in terms of location and service provision.

The availability and adequacy of social services such as schools and medical care, to accommodate the increase in the numbers of employees, need to be examined. A related issue is the ability of existing infrastructure services such as domestic water supply, waste and wastewater management, electricity supply and transport services to accommodate the increased demand. The degree to which the provision of these services can be examined in the present SEIA process is dependent on regional resource availability and planning. This will

require attention to off-site and cumulative impacts and will be addressed as part of the socio-economic specialist study.

Also important in the regional context is the fact that several uranium mining developments are presently underway in the Erongo Region, underlining the need for an assessment of cumulative impacts on biodiversity and a regional radon dose assessment. Managing the social, infrastructure and resource issues mentioned above would benefit by a strategic or sectoral approach to their assessment. While the present SEIA will address cumulative and sectoral impacts as far as possible at the project level, RU would require co-operation from national, regional and local authorities, interested stakeholders, and the other uranium mining companies, if a properly integrated approach is to be brought about.

Due to the difficulty of addressing cumulative and sectoral impacts, the present SEIA process will be undertaken in an adaptable manner, to allow for new or additional information to be incorporated as the process unfolds.

#### 4.3.8 Summary of available alternatives

The following table provides a summary of the project-level alternatives that have been identified during the present Phase 2 Scoping stage, for further assessment during the SEIA Report stage of this assessment process.

**Table 10: Project-level alternatives to be carried forward into assessment stage**

Project component	Aspect
1. Extension of current SJ pit	Tailings management (dealt with under 3 below)
	Waste rock disposal sites (dealt with under 4 below)
2. New mining activity in SK area	Tailings management (dealt with under 3 below)
	Waste rock disposal sites (dealt with under 4 below)
3. Increased tailings disposal capacity	Tailings processing methods
	Disposal site selection
4. Increased waste rock disposal capacity	Disposal site selection
5. Establishment of heap leaching facility	"On-off" or matrix design (former preferred)
	Site selection
6. Sulphur handling facility in Walvis Bay	Site selection (Option B preferred)

These aspects of the listed Phase 2 SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.



## 5 THE AFFECTED ENVIRONMENT

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This chapter was compiled from a synthesis of the following reference materials:

Rio Tinto Technical Handbook Series. 2002

Rössing Closure Report. 2005

Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2004.

2006 Report to Stakeholders. 2007.

### 5.1 SOCIAL ENVIRONMENT

#### 5.1.1 Rössing Employees

The RU employment figure for 2007 is reported as 1076. During 2006 it was indicated that 96.6% of RU's employees were Namibian citizens, and it is estimated that more than 4000 persons (including workers and their direct dependants) rely on Rössing Mine for their livelihood. As a result of a low labour turnover rate and the tendency for retrenchments to occur predominantly within the lower age groups, the average age of RU worker in 2003 was 47, but this is improving as compared to the average age of 43.6 and 43.1 in 2005 and 2006 respectively.

Of the 310 RU workers living in Arandis in 2003, 66% own their own houses, bought from the mine in 1994, whilst the remainder continue to live in company-owned housing. The Arandis-based workers tend to be the lower skill grade workers and can afford the substantially cheaper properties sold by the mine. The remaining 500 workers live in Swakopmund, where property prices are five to ten times that of the Arandis properties, and where 333 workers own their own houses and the remainder live in company-owned houses.

Changes at the Rössing mine can have a significant effect on the employment rates and thus the social environment in the Erongo Region. It has been previously estimated that, provided the mine does not close or suffer other major economic hardships, the number of workers employed by RU would increase to an estimated 1333 by 2010 and to then remain reasonably constant for the foreseeable future. This approximation may increase, since by 2007 there were already 1175 permanent employees at Rössing.

RU has continually contributed to the development of its workers and the surrounding communities through their corporate social responsibility framework, centred on the establishment and funding of the Rössing Foundation. The Foundation is primarily involved with education, vocational training, skills development, small and medium enterprise development, agriculture and sustainable resource management in an effort to encourage a sustainable and self supporting local economy in the future absence of the mine.

### 5.1.2 The Erongo Region

The Erongo Region has experienced dramatic population growth in its larger urban centres, namely Walvis Bay and Swakopmund, since Namibia's independence. In 2000, the unemployment rate for the Erongo Region stood at 32.6% and much of this is attributed to migration from other Regions. The unemployment rate has resulted in the proliferation of informal settlements in and around urban centres. The Erongo Region boasts the third highest Human Development Index ranking in Namibia, as well as having the second lowest level of household poverty and a mean per capita income almost twice the national average.

### 5.1.3 Social Services

The Erongo Region has a relatively high level of social service provision, despite the rapid population growth rate.

#### Household water

In 2004, 100% of urban households in the Region are served with improved water and in rural areas, 89% of households are within the government stipulated distance of 2.5 km from an improved water source, making the Erongo Region the second highest Region in Namibia with regard to the provision of improved water to individual households or to within acceptable distances from households.

#### Health services

The Erongo Region has four state and three private hospitals, one health centre, fourteen clinics and seven outreach points, placing 98% of the population within ten kilometres of a health care facility.

HIV/AIDS-related deaths are the leading cause of death across the adult age group. In 2002, HIV/AIDS prevalence varied from 25% in Walvis Bay to 16% in Swakopmund and is similar to the national infection rate of 23.3%. HIV/AIDS is a burden on Government budgets due to increasing health care costs affiliated with AIDS related deaths, the loss of productivity of the working class, increased costs associated with training of replacement personnel, increased pension costs, increased sickness benefits and death benefits amongst other costs. Namibia is prone to the economic impacts of HIV/AIDS due to the shortages of skilled and semi-skilled personnel. The affects of HIV/AIDS have been felt in the fishing, tourism and construction sectors in the Erongo Region.

On the household and community economic level, the affect of HIV/AIDS is even more dramatic, where lost incomes have reduced disposable incomes and lowered consumptive spending, as well as depleted household savings. This causes many family groups to fall into or regress further into a state of poverty. Family groups within the community not directly infected by the virus are affected by the need to care for orphaned children or in supporting neighbours financially.

## Education services

As of 2004, the Erongo Region was relatively well served by education services as compared with other Namibian Regions. The Region had at that time a total of 56 schools, nine of which are secondary schools. The Erongo Region has the lowest pupil to teacher ratio in Namibia.

## Other services

The Erongo Region, particularly the coastal towns of Swakopmund and Walvis Bay, is well served with transport infrastructure, police services and productive services in the agricultural, fishing and small-scale mining sectors, amongst others.

### 5.1.4 The Arandis Community

Arandis was established in 1976 by RU for mine workers and their families. In its early years the town was well-equipped with modern infrastructure including schools, a health centre and sporting and recreational facilities. Municipal services, including electricity and water, have been heavily subsidised by RU. In 1994 Arandis was proclaimed as an independent town with an elected Local Authority falling under the Ministry of Regional and Local Government and Housing. The new Town Council has experienced problems in coping with its new responsibilities arising from a weak tax base and insufficient economic activity and has thus remained reliant on central government for financial support in meeting its operational costs and service provision responsibilities.

The Town Council and other partner organisations have embarked on a vigorous campaign to seek out and encourage investment and development in the town. Arandis has been promoted as an Export Processing Zone, has tried to attract Namibian enterprises and has tried to encourage local small enterprises. Arandis is also home to the Namibian Institute of Mining and Technology, established with the support of RU. The Town Council has considered establishing Arandis as a centre for educational excellence and plans to this end are currently being implemented. Key to this is the Rössing Foundation, established in 1978 as part of RU's CSR (Corporate Social Responsibility) programme, and mainly focused on advancing education facilities and initiatives. Around 2004 a decision was taken to focus approximately 75% of the Foundation's core finance toward projects located in Arandis in an effort to invigorate the local economy. To this end, the Foundation is implementing a strategic plan that focuses on Arandis and the need to establish effective community institutions, support community initiatives and expand educational opportunities in the town. The Foundation has been working with the Arandis Town Council to broaden the economic base of the town, including the proposal to establish a cultural village, a small enterprise fund for seed capital and promoting the growth of small and medium enterprises in general. In addition the Foundation has strengthened the library facilities at the Town's schools and at the Foundation's offices in Arandis. Computer facilities have been provided and a key objective is to promote computer literacy and skills development. In 2006 Rössing mine contributed N\$15,103,000 to the Rössing Foundation; The Rössing Foundation's activities were reviewed during April 2006. Following this review, a new

reporting structure and areas of focus were introduced and became operational in December 2006. Education became the primary focus area, while work with the Arandis Town Council was regarded as crucial to the sustainability of Arandis. Following this, a decision was taken that Rössing would assist the Arandis Town Council in selected infrastructure development projects while the Rössing Foundation would focus on capacity-building (Source: <http://www.rossing.com>, 2007).

Previous social assessments associated with RU's closure and expansion investigations have indicated that, based on public opinion; there remain serious challenges with regard to ensuring the long term sustainability of the town. Many people would like to continue to live in the town if a sufficient and diversified economic basis from which to make a livelihood exists.

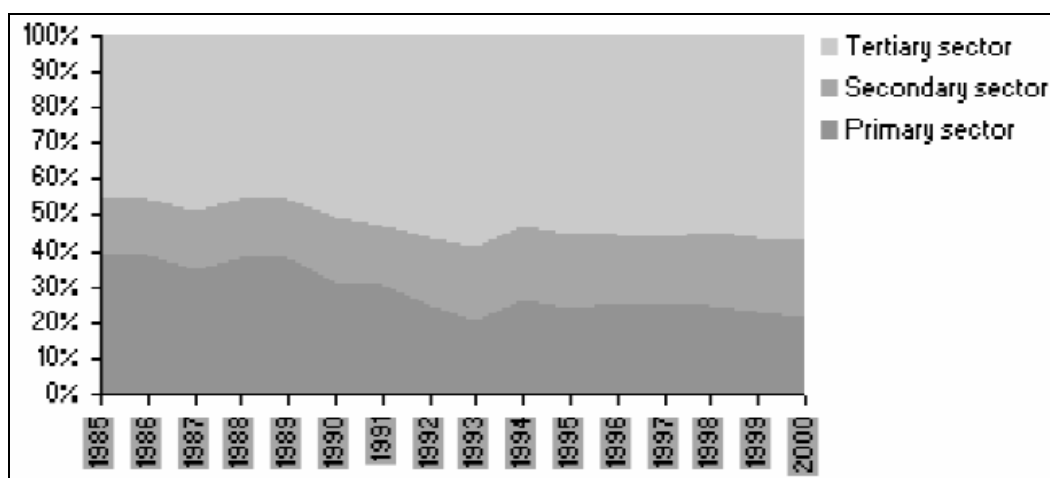
## 5.2 Economic Environment

RU is a major contributor to the Namibian economy and is central to the local economy. Mine closure and mine extension could have significant economic impacts to both the national and local economies.

### 5.2.1 RU in the Namibian economy

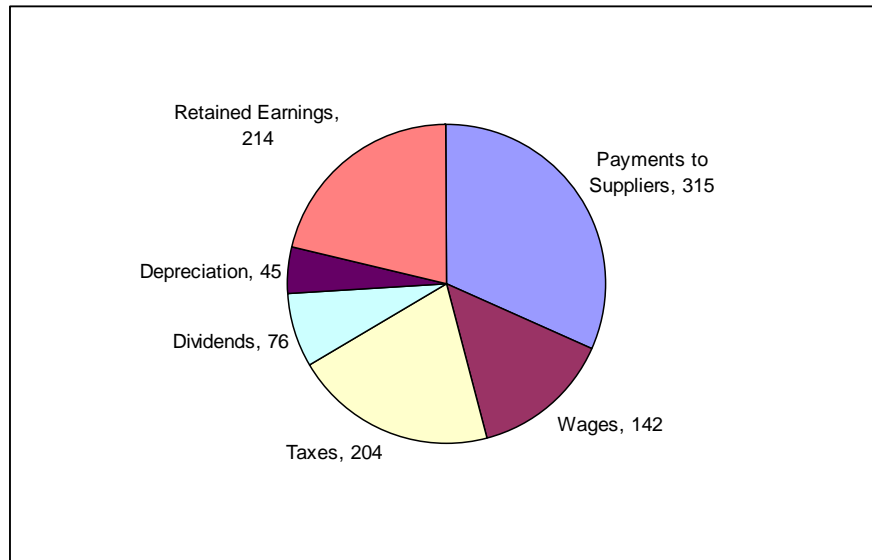
Since independence in 1990, Namibia's economy has stabilised and is now considered to be a mid-income level country, although the distribution of wealth is far from uniform with a 35% unemployment rate and 55% of the population living on less than US\$2 per day (World Bank Development Indicators, 2001).

Namibia is heavily reliant on the primary sector for its Gross Domestic Product, although a slow progression toward a less mining-based economy has been occurring during the past 15 years or more. During this period, the rate of growth of the mining sector has diminished and there has been an upsurge in the services and manufacturing sectors. Figure 16 depicts the sectoral contributions to the Namibian Gross Domestic Product during the period 1985 to 2000.



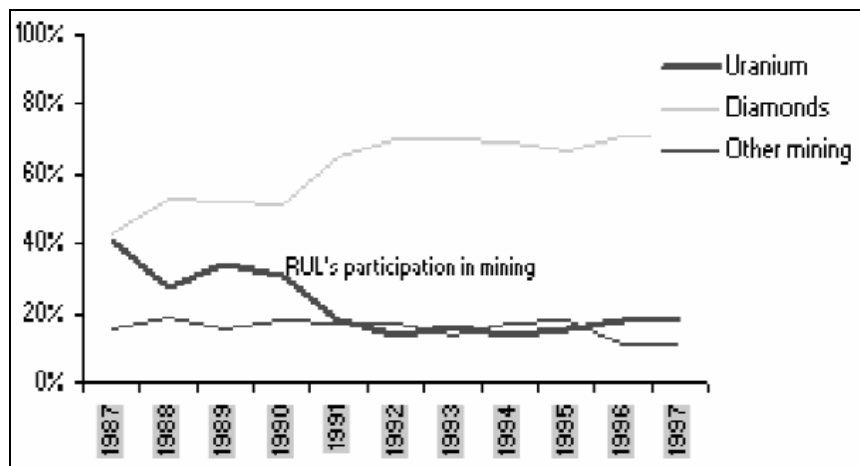
**Figure 16: Sectoral Contributions to the Namibian GDP** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

Figure 17 depicts RU's total and direct economic contributions in 2001. This only accounts for the direct contributions and does not take account of secondary and "knock-on" economic contributions arising from RU activities. RU, up until the end of 2006, was the only uranium producer in Namibia and thus its indirect contribution to the Namibian economy could be linked to the total uranium production in Namibia. In 1987, RU contributed 10% to the Namibian economy and this declined to around 2.5% of Gross Domestic Product in 2001, or N\$1,000 million, 68% in the form of value added and 32% in the payment of suppliers.

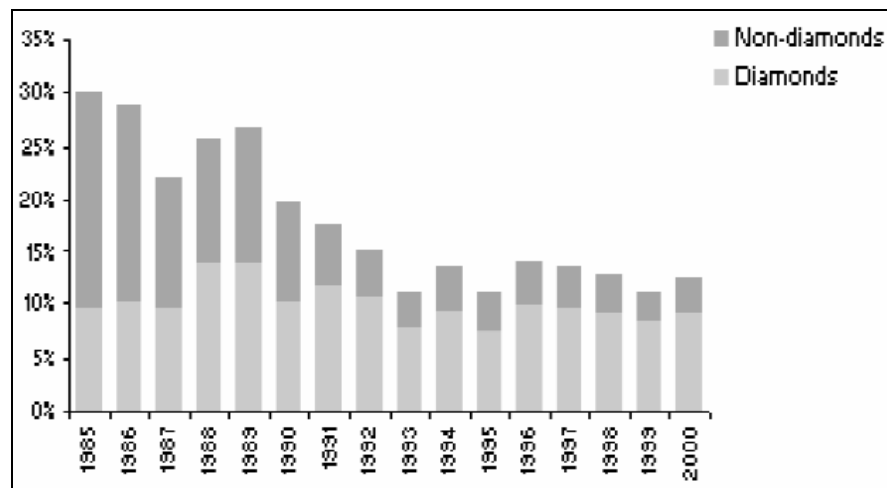


**Figure 17: Rössing Mine's economic contributions in N\$ millions** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

In 2004, Rössing mine accounted for 10% of Namibian exports (down from 26% in 1985) and was valued at 20% of the Namibian mining sector where the total contribution of the mining sector to the Namibian economy is estimated at 13%. Rössing mine was the fifth largest global uranium producer in 2001, contributing 6% or 2,643 tonnes of U<sub>3</sub>O<sub>8</sub> to the global market. Since 2001 uranium production at Rössing has increased annually to the 2006 tonnage of 3,617. Figure 18 depicts the contribution up to 1997 of RU within the context of the Namibian mining sector whilst Figure 19 depicts the contribution up to 2000 of the mining sector to the Namibian GDP.



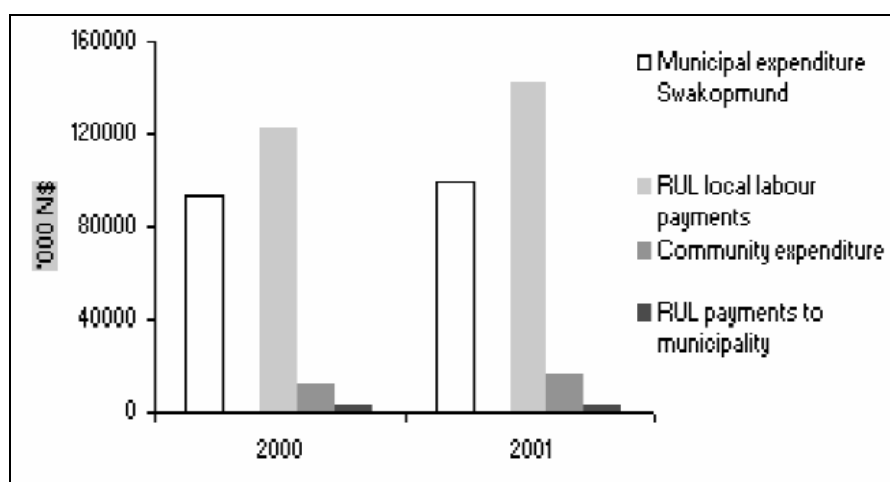
**Figure 18: Rössing Mine's contributions in context with the Namibian mining sector** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)



**Figure 19: Namibian mining sector's contribution to the Namibian GDP** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

### 5.2.2 RU in the local economy

The economic influence of the Rössing mine is far more pronounced on a local economic scale, in particular the centres of Swakopmund and Arandis. Whilst value added contributions, particularly taxes, are injected into the national economy, salaries and wages have a marked contribution at the local economic scale. Payments benefiting employees by Rössing during 2006 amounted to N\$245,593,000 and regional suppliers (within the Erongo Region) received N\$489,900,000 in that year. Rössing paid N\$158 million to the Namibian Government in 2006 in companies' taxes. The contributions of RU to the local economy is put into perspective in Figure 20 where selected contributions from the mine are compared with Swakopmund's municipal expenditure for 2000 and 2001. Reducing uranium prices resulted in Rössing mine running at a loss for 2003 and 2004 and realising a marginal profit in 2005. An improving uranium market price to 72 US\$/lb resulted in an after tax profit of N\$304 million in 2006 and reinvigorated the potential for the continuance of the Rössing mine.



**Figure 20: Selected Rössing mine contributions in comparison with Swakopmund municipal expenditure** (Sustainability Assessment for the Life Extension of the Rössing Uranium Mine. 2005)

Swakopmund came to the fore as a holiday destination in the 1940s and its development accelerated with the inception of the Windhoek to Swakopmund road in 1967 and again in the 1970s with the inception of the Rössing mine. Swakopmund currently has a population of



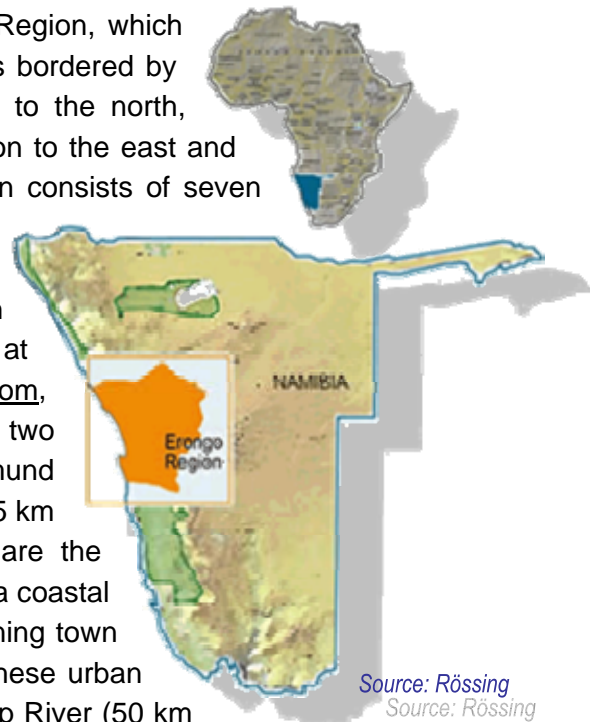
around 28,522 people (Source: <http://world-gazetteer.com>, 2007), and whilst RU still has a marked influence on the economy, the town has diversified its economy into commerce and tourism and, to a lesser extent, manufacturing. Registered businesses climbed from a stable 140 units in the 1970s (pre- Rössing mine) to 194 and 368 in 1980 and 1991 respectively. The number of registered businesses collapsed in 1992 in conjunction with a major downsizing at RU and then increased dramatically in 1998 to 504 units and continued to increase to 729 by the year 2002. The second major downsizing at RU mine did not impact negatively on the business registration rate in Swakopmund, potentially indicating a developing independence and diversification of the economy and increasing resilience to the potential economic impacts arising from the closure of Rössing mine.

The town of Arandis on the other hand remains heavily dependant on RU. The town is currently home to approximately 4 500 people of which 66% are directly and indirectly reliant on RU mine for their livelihood. The remaining population relies on one of two clothing factories (employing 165 persons), a water metering factory (12 employees), a few local shops, civil service and the Town Centre. Regardless of the distance, many Arandis residences still rely on Swakopmund for their shopping needs. The future of the town of Arandis is perhaps the most significant social economic issue associated with the proposed extension of the life of the Rössing uranium mine.

## 5.3 BIOPHYSICAL ENVIRONMENT

### 5.3.1 Site Location, Extent and Context

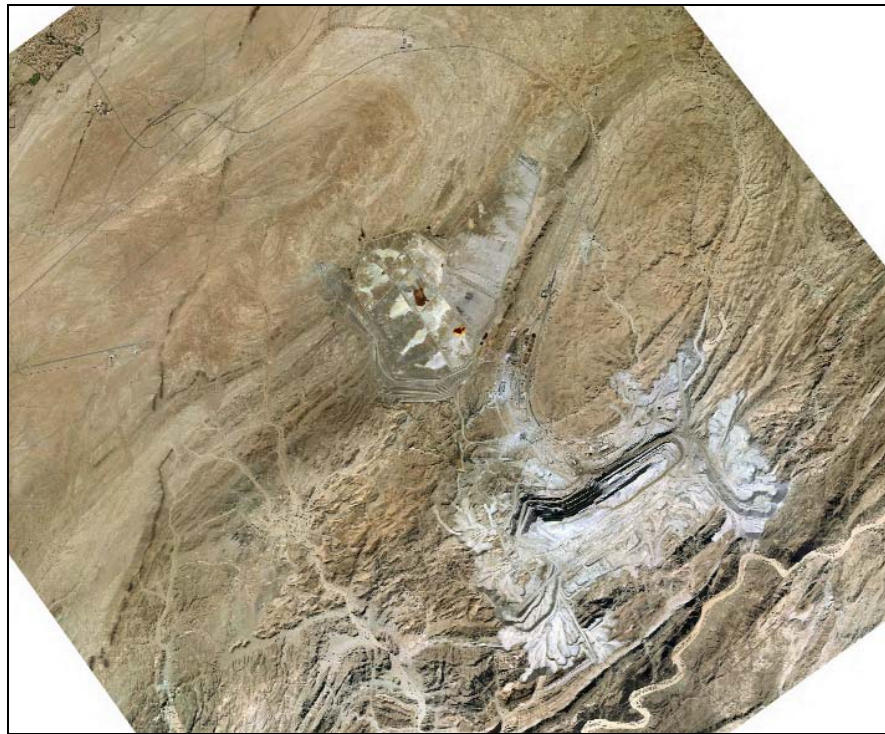
The Rössing uranium mine is located in the Erongo Region, which comprises the central western part of Namibia, and is bordered by the Atlantic Ocean to the west, the Kunene Region to the north, Otjozondjupa Region to the north east, Khomas Region to the east and the Hardap Region to the south. The Erongo Region consists of seven constituencies covering approximately 64,000 km<sup>2</sup> and is home to almost 108,000 people or approximately 6% of Namibia's populace in 2001. In 2007 the Erongo Region's population was calculated at 147,441 people (Source: <http://world-gazetteer.com>, 2007). The majority of this population reside in the two urban centres, namely, the tourist town of Swakopmund and the fishing and major port town of Walvis Bay (75 km SSW of Rössing). Also located within the region are the smaller towns of Henties Bay (88 km NW of Rössing), a coastal tourist town north of Swakopmund, and Arandis, a mining town associated with the Rössing mine. Notwithstanding these urban centres, the smallholdings located on the lower Swakop River (50 km SW of Rössing), twelve farms located between the Khan-Swakop confluence and the farm Tannenhof, and the farms located between there and the former Rössing Country Club, much of the land remains uninhabited and unproclaimed, apart from the designated National Parks and state controlled recreational areas further to the west. This sparse





inhabitancy and land use pattern in the surrounding areas arises from the lack of surface and ground water and associated low agricultural potential that characterises the area.

The Rössing mine site itself is found at 15° 27' 50" East and 22° 02' 30" South, approximately 65 km east north east and inland from Swakopmund and the Atlantic Ocean, in the Arandis Constituency. The 18,411 ha licensed mining and accessory works area is bordered by the town of Arandis, approximately 12 km to the north west and by the incised Khan River valley, approximately 4.5 km to the south east, as seen in the aerial photograph in Figure 21. The site is located on the generally south east-facing, rough and undulating slopes between the Khan River valley (at 350 mamsl) and the gravel plains closer to Arandis (at 600 mamsl) near the eastern edge of the Central Namib Desert. The topography is characterised by a series of steeply incised valleys, tributaries of the Khan River, intersecting the site and running in a northwest-southeast alignment. Of the licensed mining and accessory works area, approximately 2,165 ha (11.4%) has been disturbed by mining activity, mining waste disposal and mine infrastructure to date.



**Figure 21: Aerial photograph of Rössing mine (source: RU)**

### 5.3.2 Mine Infrastructure and Processes

The approximate 2,165 ha physical mining footprint comprises of the open pit, uranium extraction plant, tailings dam, waste rock dumps and infrastructure, all of which can be seen in Figure 21. Besides the open pit and processing plant, the mine infrastructure in general is comprised of the following:

- A double-lane tarred access road from the main Swakopmund-Usakos road;
- A full gauge railway line linking the mine's services areas with the main Windhoek – Usakos – Swakopmund – Walvis Bay railway line;
- Water supply pipelines and storage reservoirs;

- Connection lines to the NamPower 220kV power line supplying Swakopmund and Walvis Bay;
- Sewage treatment works;
- Storage facilities for diesel and explosives, acid, solvent, petrol and ammonia;
- Workshops, laboratories, personnel, medical and administrative buildings;
- Various un-tarred access and haul roads linking the lower portions of Dome, Pinnacle and Panner Gorges to the central mine operation area; and
- Borehole pumping and monitoring stations along the Khan River.

### The open pit

The Rössing open pit, opened in 1976, is roughly rectangular in shape, 3,060 m long by 900 m wide. In 2007 the open pit had reached 390 m in depth measured from the highest bench, comprised of 26 benches of 15 m in height, using a conventional drill, blast, load and haul operation.



**Figure 22: Aerial photo of the Rössing open pit (source: RU)**

Pit life is estimated to terminate in 2016 or beyond, depending on uranium prices, operating costs and the realised output from the ore body. Future pit expansion from the present mined area will take the form of mining push-backs on all walls of the present pit so that the final pit will be considerably extended in area and a pit depth of approximately 500 m will be achieved eventually. (Rio Tinto Technical Handbook Series. 2002)

## The rock disposal areas

During 2006, waste rock comprised 58% of the rock mined at Rössing during the year. This high proportion is due to the requirement of having to remove surface material to expose underlying ore rock. Waste rock consists primarily of barren country rock and of sub-economic uranium ore, as determined by the in-pit radiometric scanners. The waste rock varies in consistency from large boulders to finer sands and gravel-sized particles.

At the end of 2006, the footprint area of the various rock disposal areas amounted 658 ha. These are comprised of number waste rock disposal areas and a number of low and high-grade-high-carbonate content (high calc) stockpiles in close proximity to the open pit. The low grade and high calc stockpiles are situated on top of inactive waste rock dumps, where they remain accessible for potential future uranium extraction.

All of this material is transported by haul truck and disposed of at one of several designated sites surrounding the open pit. The rock dumps are predominantly situated in the valleys and dry river gorges that drain towards the Khan River. Waste dumps 2, 5 and 6 overlie Pinnacle Gorge, while Waste dumps 4 and 7 fill various tributaries of the Dome Gorge system. Rock dumps extend up to 2 km away from the open pit. With the exception of the amphibole schist lithological unit, which comprises a small proportion of the total rock mass mined, the rocks are not prone to weathering. The rate at which mechanical weathering processes act on natural material is measured in geological time; i.e. it is very slow. However, chemical processes affect the rocks, which are covered with residuals from the blasting process in the form of nitrates. Rainwater runoff has the potential to leach these residuals through the rock mass into the underlying aquifers. As a result, control mechanisms have been installed to prevent potentially contaminated rainwater from entering the Khan River. Due to the high carbonate content of some rocks, the low annual precipitation and the coarseness of the rock fragments, storm water drains through the waste rock dumps rapidly and thus the potential formation of acid mine drainage is very low.

## Tailings dam

All solid waste arising from the uranium extraction process (tailings) are conveyed or pumped to the tailings facility, located the west of the north east trending ridge, effectively separating the facility from the rest of the mine workings. The facility has been in operation since the commencement of activities in 1976 and was approximately 650 ha in area in 2005. The tailing dam is 95m at the highest point and the starter wall was constructed using waste rock, effectively damming the upper portion of Pinnacle Gorge. The upper portion of Pinnacle Gorge is intersected by the seepage collection dam wall and the gorge itself is filled with waste rock for a distance of 3 km, which acts as a safety mechanism to prevent any solids eroding into the Khan River in the event of a failure of the tailings dam wall.





**Figure 23: Tailings paddocks showing grey and yellow chemical precipitates after desiccation** (source: RU)

Generally the tailings produced by Rössing's activities are coarse, containing a relatively low proportion of fines by industry standard. The tailings, 50 – 58% solids are pumped into one of eleven 30 ha tailings paddocks. Coarser sediments are rapidly deposited and the tailings solution is pumped back to the recycling ponds for reuse in the processing plant. Mine life extension until 2016 will require that an additional 164 million tonnes of tailings be deposited, resulting in the need for the extension of the tailings dam footprint.

After a paddock has dried out chemical precipitates are left behind in the former pond area. The chemical precipitate, powdery in texture, reaches 5 cm in thickness and is comprised of clay, gypsum, iron hydroxides and traces of radionuclide. The dry precipitate is readily picked up during wind velocities approaching 40 km/h and thus there is a need to implement dust control mechanisms which include grading of the precipitates to cover the finer material with the coarser substrata, forming evenly spaced wind breaks and then spraying with a chemical dust-binder.

To prevent seepage from the tailings facility entering the natural drainage lines in the area a number of seepage control mechanisms have been installed, including trenches at the toe of the facility and a plastic core surface water collection dam further downstream. During 2006 this seepage trenches and dam recovered an average of 5 992m<sup>3</sup> per day which was recycled. The alluvial aquifers in Pinnacle, Panner and Dome Gorges are protected by cut-off trenches that intercept alluvial seepage. In 2006 the trenches recovered an average of 135 m<sup>3</sup> of seepage per day. A number of recovery boreholes have been sunk, particularly in the vicinity of Panner Gorge, west of the tailings facility, where bedrock is fractured in places. In 2006, 170 m<sup>3</sup> per day of seepage water was recovered from the boreholes. Boreholes have also been sunk into the tailings dam to recover inventory water and these produced an average of 312 m<sup>3</sup> per day

during 2006. Boreholes and trenches around the northern toe of the tailings facility contributed another 672 m<sup>3</sup> per day. During 2006 these systems combined, recovered 1 289 m<sup>3</sup> per day, nearly 100% of the groundwater seepage generated and with no direct discharges into the Khan River having occurred.

### 5.3.3 Topography and drainage

Rössing is located on the generally south-east-facing, rough and undulating slopes at a mean elevation of 575 mamsl near the Western edge of the Central Namib Dessert. The topography in the southern reaches of the site is characterised by the several steeply incised and deep storm-wash gullies and gorges that drain into the Khan River to the south, resulting in a rugged and hilly landscape. As one moves north from the Khan River, toward the town of Arandis the storm-wash gullies become less pronounced and are interspersed with resilient rock ridges and occasional inselbergs, resembling a more typical Namibian desert plain.



**Figure 24: West facing aerial photo of the Rössing Dome** (source: Rio Tinto Technical Handbook Series: 2002)

The site is divided into two sections by a steep-sided north easterly trending ridge of hills between Pinnacle Gorge and Dome Gorge (Figure 24), rising to 707 mamsl at Westdome Hill. The areas to the north and west of the ridgeline are characterised by rolling hills, whilst areas to the east are more rugged, with crested and steep-sided hills. These hills and ridges continue to the south of the Khan River, where after they dissipate abruptly giving way the gravel plains of the Welwitschia Flats, which covers almost the entire area between the Khan and Swakop rivers up to the confluence between them, an area forming part of the Namib-Naukluft Park.

### 5.3.4 Geology

- The following is an extract from the Rio Tinto Technical Handbook Series: 2002.

The Rössing uranium deposit lies within the central zone of the late pre-Cambrian Damaran orogenic belt that occupies much of central and northern Namibia. The early pre-Cambrian Abbabis formation is overlain by the Etusis and Khan formations of the Nosib group. The Abbabis rocks, which include variegated gneisses, phyllites, recrystallised carbonates and biotite schists, are exposed in the cores of anticlinal or domal structures. Intense deformation and high grade metamorphism are characteristic for the entire district.

The Etusis and Khan formations consist of metasediments that are overlain by marble, biotite-cordierite gneiss, conglomerates and feldspathic quartzite of the Rössing Formation.

Various types of granitic rocks were generated by syntexis and partial melting, and emplaced into the Damaran metasediment sequence some 510 million years ago. Dolerite dykes of Triassic age are prevalent and crosscut all older features.

Some migmatitic dome structures contain abnormally high concentration of uranium, giving rise to an increased local, natural radioactivity level. Elevated radioactivity levels can be found in water samples taken from the Khan and Swakop Rivers. The Rössing uranium mine is amongst the lowest grade uranium mines in the world and thus the exposure to radiation is limited. In 2006, no Rössing employees exceeded the International Atomic Energy Agency (IAEA) exposure standard of 20 millisieverts per annum (mSv/a). The additional radiation dose from mining activity has been calculated for Arandis residents at 130  $\mu$ Sv/a (0.13 mSv/a), substantially below the ICRP recommended dose limit of 1000  $\mu$ Sv/a (or 1 mSv/a).

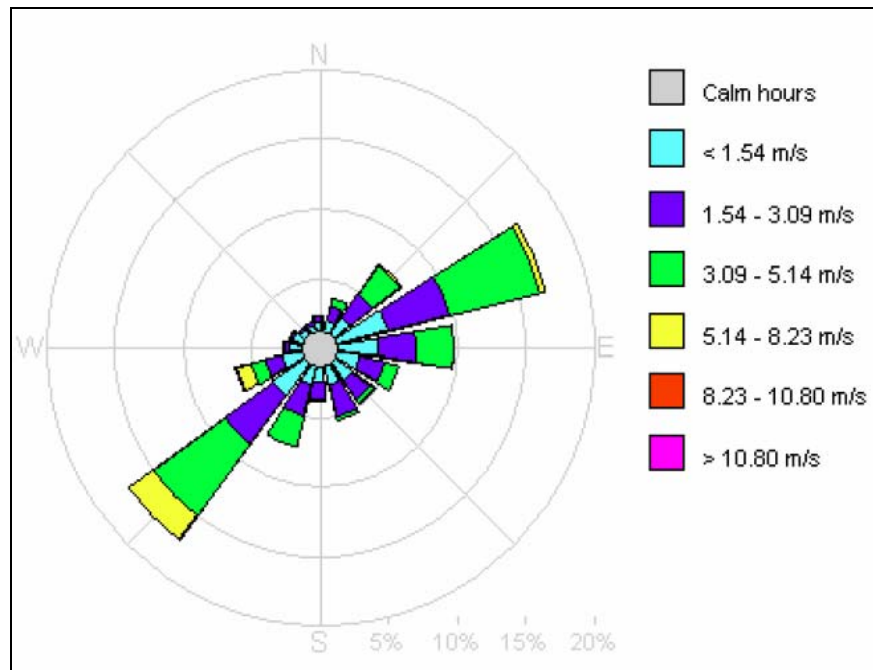
### 5.3.5 Climate

Climatic variance and conditions play an important role in the distribution and type of organisms inhabiting the area as well as the rate of diffusion, direction and distribution of atmospheric pollutants.

#### Wind

Three thermo-topographic wind systems are identified as characterising the Rössing environment, namely the on- and off-shore winds resulting from the cold sea and hot desert. Secondly, the anabatic and catabatic valley wind systems affected by the Khan River valley. Thirdly, the mountain-plain system, brought about by the relationship between the desert plains, plateau plains and their separation from one another by the escarpment.





**Figure 25: Average wind speed and direction measured during 1998 at Rössing mine** (source: Sustainability Assessment for the Life Extension of the Rössing Uranium Mine, 2004)

Berg winds are a fourth and noteworthy wind system affecting the Rössing environment. High pressure cells further inland can cause already warm desert air to cascade off the escarpment, undergoing further heating by adiabatic processes. This results in a super-heated, sometimes high velocity off-shore wind, approaching 125 kms/h, the key factor affecting the Aeolian erosion and deposition processes and gives rise to the characteristic dust storms of the Namib Desert.

Predominant winds at Rössing, listed in order of magnitude, are the south westerlies, the north easterlies and the easterlies. The 1998 wind rose shown in Figure 25 illustrates the predominant wind direction and velocities.

The wind systems at Rössing are the pivotal influencing factor affecting the extent and direction of the dust plumes emanating from the Rössing mine site. The tailings dam, coarse ore stockpile, fine ore conveyor belts and the crusher plant area, despite engineering controls, generate significant quantities of dust that are picked up by the wind and dispersed across the site.

### Precipitation and evaporation

Rainfall in the Central Namib Desert region is very low. The average rainfall for the region over the long term is less than 100 mm per year but due to the erratic distribution, much of the area receives less than 50 mm per annum. This variance is seen by the 400 mm falling in the headwaters of the Khan versus the 200 mm at Usakos and a mere 35 mm at Khan Mine. The average annual rainfall at Rössing mine is between 30 mm and 35 mm. Much of this rainfall is received in late summer and early autumn in the form of high intensity, short duration showers or thundershowers. Virtually no rainfall occurs during the winter months. This erratic rainfall pattern combined with the topographic and ecological environment creates a situation where flash-flooding is a risk.

Evaporation rates near the Rössing mine are very high, and have been recorded at between 6 mm and 15 mm per day during the hot December month with lower rates outside of this time and at this evaporation rate the entire annual rainfall, if left exposed at the surface, would dry up in a couple days. The imbalance between annual rainfall and annual evaporation losses is the keystone around which all considerations relating to Rössing's water management program are orientated.

### 5.3.6 Ecology

The mine is located towards the eastern edge of the Central Namib Desert vegetation zone. A marked east-west vegetation distribution pattern is evident, closely related to the inland distribution of coastal fogs, which can penetrate as far inland as the mine. All plant species found here are considered to be drought tolerant, drought resistant or succulent. Livestock grazing has extensively modified the vegetation in the Swakop River. The large mammal species found in the area are considered to be nomadic, moving widely and entering an area when food is plentiful after rains. Short-lived annuals, which occur after local rainfalls and floods, provide a vital source of good quality grazing for plains game. Klipspringers are frequently seen around the Khan River gorges, whilst Gemsbok, Springbok and Hartmann's Zebra are occasionally seen at natural seeps along the Khan River. Dassies, Black-backed jackal and troops of Chacma baboons have been observed in Panner and Pinnacle Gorges. The environment is particularly rich in insect fauna, with a large proportion of endemic species. In the order of 280 invertebrate species have been recorded in the vicinity of the Rössing mine from surveys undertaken in 1984 and 1985. New species have been described from these collections and some specimens await description. Three frog species and 33 reptile species are also known to occur in the area.

There are four habitat types that can be differentiated in the area of the Rössing mine, namely:

#### **Rocky hillsides**

Little vegetation and loose surface rocks. Very shallow soil or no soil.

#### **Open plains**

Scattered shrubs and bushes. Deeper soil on plains interrupted by rocky outcrops.

#### **Watercourses**

Normally dry but may flow for short period as a result of rainfall. Soils typically sandy and not compacted. Vegetation in the form of bushes and scattered trees occur along the watercourses.

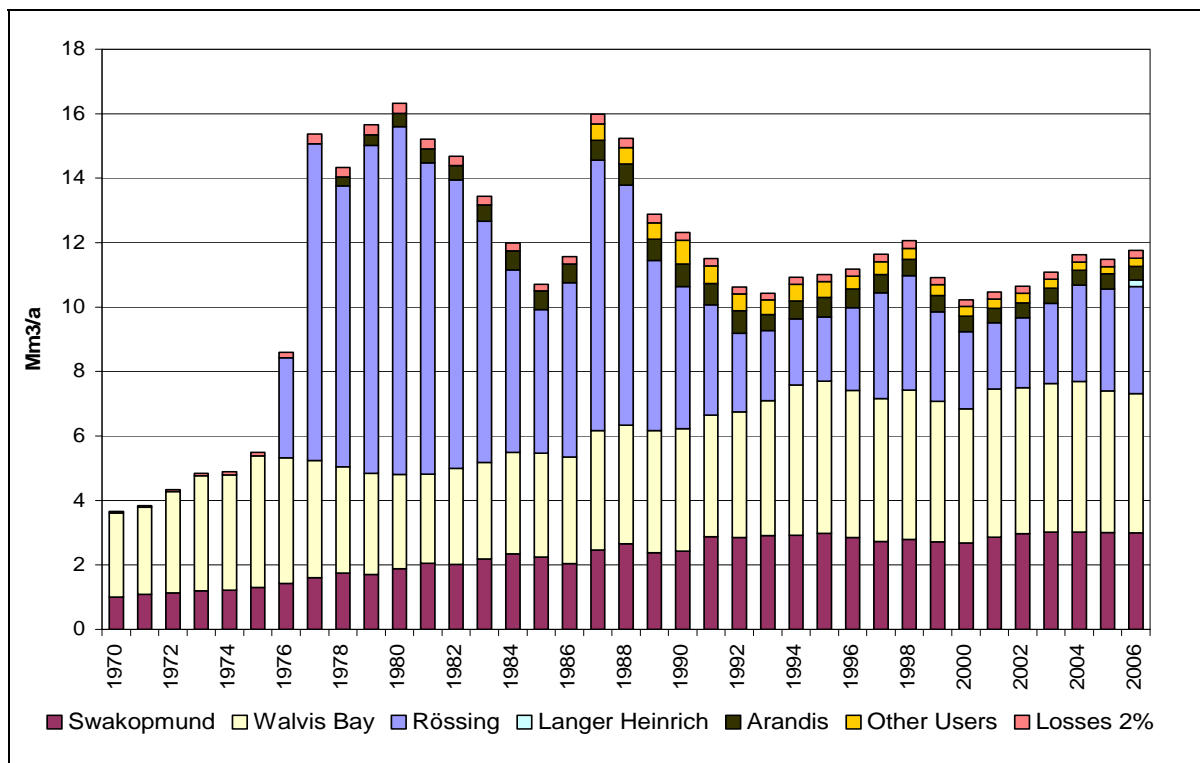
## 5.4 NATURAL RESOURCES AND RESOURCE USE

### 5.4.1 Water

Water in the Central Namib area is primarily sourced from two large alluvial aquifers, namely, the west flowing Kuiseb and Omaruru Rivers, which by NamWater's calculations can sustain a supply 15.05 Mm<sup>3</sup> per annum. NamWater operates large wellfields in the Kuiseb and Omaruru

deltas and supplies Swakopmund, Walvis Bay, Henties Bay, Arandis, small scale Swakop River farmers as well as the three large industrial users, Walvis Bay Port Authority, and the Langer Heinrich and Rössing mines. The Omdel water supply scheme in the Omaruru River Delta currently supplies 68 % of its water to the towns of Henties Bay, Swakopmund and Arandis and a further 28 % is utilised by the Rössing.

The Khan and Swakop Rivers have previously been used for water supply, but high salinity levels render the water unsuitable for human consumption and expensive to treat. Rössing mine abstracts water from the Khan River for use as industrial water. These abstractions, in 2003, accounted for 8% of the total water usage at Rössing mine. Under a Department of Water Affairs abstraction license, Rössing mine may abstract a maximum volume of 0.87 Mm<sup>3</sup> per annum, reduced to 0.6 Mm<sup>3</sup> per annum in 1995 due to poor rains, provided that water level drawdown does not exceed 15m below the surface and that vegetation monitoring occurs on a regular basis. In compliance with this requirement, Rössing mine undertakes a biannual survey of the Khan River riparian vegetation by assessing the vitality, growth rate, productivity and decay together with the sub-surface water levels to assist in the sustainable management of this resource. The last significant recharge of the Khan River aquifer occurred in 2000 and as a result of this and the findings of the monitoring program, Rössing mine reduced annual abstraction volumes to approximately 0.25 Mm<sup>3</sup>. Abstraction from the Khan River is currently occurring at a rate of 0.25-0.28 Mm<sup>3</sup>/a. In 2006 it was calculated that between 60 % and 70 % of fresh water utilised at Rössing was recycled and Rössing is targeted to reduce its water consumption per tonne of U<sub>3</sub>O<sub>8</sub> by 10 % over that recorded for 2003. Whilst these targets were met for 2004 and 2005, 2006 saw an increase in water consumption to 77 m<sup>3</sup> per tonne of U<sub>3</sub>O<sub>8</sub> produced above the 2006 target when Uranium production was accelerated. New water saving initiatives are planned to ensure future targets are consistently met by 2008.



**Figure 26: Historical use of freshwater from the Kuiseb and Omaruru aquifers between 1970 and 2006 (Rössing Uranium Mine. 2007)**

Rössing has a ground water pollution control system in place, whereby potentially polluted ground water is abstracted and recycled, and to monitor this, Rössing undertakes annual ground water quality monitoring of between 80 and 120 of its boreholes per year, around the mining site, and reports the findings directly to the Department of Water Affairs, who monitor compliance with the permit conditions.

### 5.4.2 Alluvial Sand

Alluvial sand deposits in the gorges vary in thickness up to about 8 m and up to 20 m in the Khan River bed. Alluvial sand has been mined from the dry river beds to the north of the Khan River and used for various purposes at Rössing mine, including rehabilitation, building material and road material. The open pit requires large quantities of sand for the surfacing of haul roads, ramps and waste rock disposal areas. Since 2003 RU has mined an average of 133 000 tonnes of sand per year. In an effort to conserve the alluvial sand resource, mining of alluvial sand for road dressing material ceased in early 2007 and material for this purpose is currently obtained from the tailings facility.

### 5.4.3 Energy

In 2005 Rössing mine consumed approximately 30 MW of electricity, which was about 3 % of Namibia's installed capacity. At that point, approximately 60 % of Namibia's energy is supplied via the Southern African Power Pool (SAPP) with largest generation contributor being the South African-based Eskom. The national grid is also supplied by a number of Namibian-based facilities, including, Ruacana Hydro-electric Scheme (249 MW), Van Eck coal fired power station in Windhoek (120 MW) and the Walvis Bay coal fired power plant (24 MW).

In 2003 Eskom was already experiencing capacity problems in meeting South Africa's peak electricity demands and the NamPower is thus investigating alternative power generation and supply sources to meet Namibia's growing domestic and industrial demand.

More recently, Rössing started to express energy consumption in megajoules per tonne (MJ/t) of ore processed, which is the combined energy usage incorporating electricity and fuels per tonne of ore processed, allowing for the measurement of total energy efficiency. Rio Tinto has set a target to improve energy efficiency by 5 % in 2008 from that expended per tonne in 2003. Due to activities associated with mine extension in 2006, RU exceeded its target of 91 MJ/t when they realised an energy consumption rate of 113.6 MJ/t.

## 6 IDENTIFIED IMPACTS

The components of the Phase 2 SEIA of RU's proposed expansion project are anticipated to impact on a range of socio-economic and biophysical aspects of the environment. One of the main purposes of the SEIA process is to understand the significance of these potential impacts and to determine if project alternatives are available that are more beneficial to the socio-economic and biophysical environment, or if the impacts can be minimised or mitigated to an acceptable level. This section of the Scoping Report identifies the full range of potential impacts and proposes which impacts should be considered in detail in the SEIA stage to follow. It should be noted that the identification of the impacts described in Sections 6.3 and 6.4 have been derived from concerns raised during the public participation undertaken to date, as well as input from the project team and responsible RU personnel. Section 3.1 describes the most noteworthy issues raised by I&APs in particular.

### 6.1 ESTABLISHMENT PHASE IMPACTS

These are impacts on the socio-economic and biophysical environment that would occur during the establishment phase of the proposed extended SJ pit, the new SK mining area, increased waste rock disposal capacity and tailings disposal capacity, the heap leaching facility and sulphur handling in the Port of Walvis Bay. They are inherently temporary in duration, but may have longer-lasting effects, e.g. the contamination of groundwater could have long lasting effects. Establishment phase impacts could potentially include:

- Disturbance of biodiversity resources;
- Impacts on heritage sites;
- Impacts on water resources, namely groundwater occurrences;
- Socio-economic impacts, e.g. temporary housing, in-migration of work seekers;
- Management of materials required for establishment;
- Increase in traffic volumes to the mine and in the vicinity of the sites;
- Windblown dust and concomitant release of radioactive materials from exposed substrate;
- Noise pollution and vibration; and
- Pollution from waste and other contaminants.

Based on the temporary duration of the establishment phase and the fact that negative impacts thereof can generally be reliably predicted and mitigated, more attention will be given to the operational phase impacts of the proposed Phase 2 components than to the establishment phase impacts. This is certainly the case in this instance, since the extension of the SJ pit and exploitation of the SK ore body would essentially amount to continuations of existing mining activities and the related establishment phase impacts may be regarded as low. These impacts can easily be accommodated within a generic Social and Environmental Management Plan (SEMP) and RU's own best practice.

However, wherever relevant, specialist studies would consider establishment phase impacts, and in certain cases, would be focussed on establishment phase impacts e.g. impacts on biodiversity resources are mainly establishment phase impacts.

It should be noted that a comprehensive establishment phase SEMP will be developed and implemented to regulate and minimise the impacts during the establishment phase. This SEMP will be developed as part of the SEIA Report phase.

## 6.2 OPERATIONAL PHASE IMPACTS

Given their long term nature, operational phase impacts will come under close scrutiny in the assessment stage of this SEIA process, effectively prompted by this Scoping Report. The specialist studies will identify and assess the implications of these impacts and include measure to minimise predicted impacts. The assessment of potential impacts will help to inform RU's selection of preferred alternatives or to confirm that the best available technologies have been identified and selected, and for these to be submitted to MET:DEA for their clearance. In turn, MET:DEA's decision on the environmental acceptability of the proposed project and the setting of any conditions will be informed by the assessment of alternatives and selection of technologies, together with the specialist studies, amongst other informants, to be contained in the SEIA Report.

It is normal practice that, should RU's proposed developments be authorised, the formulation and implementation of an operational SEMP would be required. The operational SEMP is designed to mitigate negative impacts associated with the operational phase of the project and will be informed by the mitigation measures that emerge from the SEIA process.

## 6.3 SOCIO-ECONOMIC IMPACTS COMMON TO ALL THE PROJECT COMPONENTS

The identified impacts to be assessed during the SEIA process, that relate to the social and economic implications common to the construction and operation of the proposed Phase 2 developments, are as follows:

- The extent of employment opportunities created as a consequence of the proposed developments, both for permanent and contracted workers;
- The occupational health and safety of workers, both permanent and contracted, including air pollution (emissions, dust, radioactivity), and noise;
- The public health and safety of surrounding communities and visitors to the area;
- The need for housing for the envisaged increase in employee numbers;
- The extent of commercial benefits for the local and regional economies;
- The in-migration of people seeking employment;
- The availability and adequacy of social services such as schools and medical care;
- The availability and adequacy of infrastructure services such as domestic water supply, waste management, electricity supply and transport services;



- The social ills and community health issues that may accompany in-migration of work seekers, the densification of settlements and unfulfilled expectations; and
- The implications for both local residents and tourists of the possible visibility and noise of the proposed developments.

## 6.4 IDENTIFIED IMPACTS PER PROJECT COMPONENT

The subsequent sections list potential impacts identified per project component for further assessment during the SEIA process.

### 6.4.1 Extension of current SJ mining activity

The identified impacts related to the extension of mining activity in the current SJ pit that will be assessed during the SEIA process are:

- Additional personnel requirements;
- Additional mining plant, equipment and infrastructure;
- Increased radon emission from enlarged exposed surface areas;
- Increased energy use; and
- Increase demand for water for use in dust suppression.

### 6.4.2 New mining activity in SK area

The following identified impacts related to the proposed new mining in the SK area will be assessed during the SEIA process:

- Additional personnel requirements;
- Additional mining plant, equipment and infrastructure;
- Increased waste rock disposal capacity;
- Increased pressure on land use and biodiversity;
- Increased noise levels;
- Increased radon emission from enlarged exposed surface areas;
- Increased energy use; and
- Increase demand for water for use in dust suppression.

### 6.4.3 Increased waste rock disposal capacity

The following identified impacts related to the need for increased waste rock disposal capacity will be assessed during the SEIA process:

- Volumetric capacities of identified waste rock dump sites;
- Increased pressure on land use and biodiversity;
- Consequences of rainwater run off and groundwater infiltration;
- Increased radon emission from enlarged exposed surface areas;

- Visual intrusion and final geometry of elevated waste rock dump sites; and
- Closure considerations, e.g. public exposure to radiation.

#### 6.4.4 Increased tailings disposal capacity

The identified impacts related to the need for increased tailings disposal capacity that will be assessed during the SEIA process are:

- Increased radon emission from enlarged exposed surface areas;
- Increased pressure on land use and biodiversity;
- Increased demand for water use depending on deposition methodology, i.e. current conventional paddy system, dry disposal method or high density tailings placement;
- Increased need for seepage control;
- Increased dust levels;
- Visual intrusion of elevated tailings dam surfaces; and
- Closure considerations, i.e. wind and water erosion, and public exposure to radiation.

#### 6.4.5 Establishment of acid heap leaching facility

The identified impacts related to the proposed establishment of an acid heap leaching facility that will be assessed during the SEIA process are:

- Location and extent of suitable site;
- Need for a dedicated crushing plant;
- Increased pressure on land use and biodiversity;
- Operational alternatives, i.e. “on-off” or matrix (permanent);
- Increased water requirement for leaching solution;
- Groundwater infiltration;
- Increased spent ore disposal capacity; and
- Closure considerations, e.g. residual acidity, cover and groundwater protection.

#### 6.4.6 Sulphur handling in the Port of Walvis Bay

The following identified impacts related to the handling of sulphur in the Port of Walvis Bay will be assessed during the SEIA process:

- Sulphur dust explosions;
- Sulphur fires;
- Spillage of sulphur;
- Increased noise levels;
- Visual intrusion; and
- Quality of water used for washing down and from site drainage.

## 6.5 SPECIALIST STUDIES

As described in Section 1.7, Ninham Shand has formed a team comprising a suite of specialist consultants in the various disciplines of relevance to RU's proposed expansion project. As part of the Scoping stage of the Phase 2 SEIA process, the team of specialists will attend a site visit and workshop to determine, on the basis of available information and the site inspection, that the envisaged scope of their work is appropriate and that their Terms of Reference can be confirmed.

Descriptions of the proposed specialist studies and an overview of each Terms of Reference are provided below. This will allow the public the opportunity to comment on, and the authorities to approve of, the proposed approach to the SEIA stage. Assurance is thus provided that the work to be undertaken will address the issues of concern at the requisite level of confidence and that a robust basis for informed debate and decision-making is provided.

The following specialist studies by the relevant specialists are proposed to be undertaken in the assessment stage of the Phase 2 SEIA process:

- |  |  |
|--|--|
| • Socio-economic impact assessment -         | Marie Hoadley Independent Consultant                     |
| • Air quality impact assessment -            | Airshed Planning Professionals                           |
| • Quantitative risk assessment -             | RisCom   |
| • Visual impact assessment -                 | Visual Resource Management Africa                        |
| • Radioactivity and public dose assessment - | Nuclear Energy Council of South Africa                   |
| • Biodiversity assessment -                  | Environmental Evaluation Associates of Namibia           |
| • Archaeology/heritage assessment -          | Quaternary Research Services                             |
| • Water resources assessment -               | Sandra Müller (RU) and<br>Metago Environmental Engineers |
| • Noise and vibration -                      | Namibian Vibration Consultants                           |
| • Legal review -                             | Environmental Science Associates                         |
| • Groundwater model update -                 | Aquaterra Consulting                                     |
| • Waste rock and tailings management -       | Rio Tinto T&I and Metago Environmental Engineers         |
| • Toxicology assessment -                    | Infotox  |

### 6.5.1 Socio-economic impact assessment

The socio-economic implications of the proposed Phase 2 assessment components will be assessed by Marie Hoadley, an independent social impact consultant. The scope of her specialist study is as follows:

This socio-economic study, to include both construction phase and operational phase socio-economic impacts, will investigate and describe the national, regional and local (being both at the mine and the Port of Walvis Bay) socio-economic conditions before investigating and describing the direct, indirect and cumulative social and economic impacts.

The study will build on that completed for the Phase 1 assessment and specific activities to be attended to during the study are to undertake a desktop study of current literature on social impact assessments, Namibian legislation and policy, the development environment in Namibia and existing information on the communities of interest, to establish broad baselines of the receiving socio-economic environments, to undertake wide, inclusive, transparent and ongoing public participation and consultation. Identified impacts will be assessed to develop a management framework to address negative impacts and optimise benefits. Continued liaison with the other SEIA specialists so as to supplement the socio-economic study with information from their areas of expertise and to ensure integration of socio-economic issues into the overall SEIA Report will be included in the brief.

The study will address socio-economic aspects including employment, training, housing, inward migration, the potential for increased social ills, and demands on and capacity of local services. Cumulative effects and environmentally induced socio-economic impacts, including land-use, water quantity and quality, local concerns and perceptions of environmental impacts will be assessed. Mitigation measures to address identified impacts and measures to optimise benefits will be specified. The study will comply with Namibian legislative and policy requirements and the Rio Tinto standards and guidelines as these relate to the socio-economic aspects of the project.

### **6.5.2 Air quality impact assessment**

The air quality specialist study will build on that completed for the Phase 1 assessment components. It will be undertaken by Airshed Planning Professionals and the scope of their study is as follows:

As a baseline assessment, a general description of the climate for the greater region would be determined from the existing monitoring data and historical records. Meteorological mechanisms govern the dispersion, transformation, and eventual removal of pollutants from the atmosphere. All available local meteorological data will be analysed and where necessary, missing data inter- and extrapolated. For the purposes of establishing the local climatology, it is a necessity to analyse at least one year's data to provide a general description of the local climate and calculate fugitive airborne dust emissions, for use in the dispersion simulations. Air quality data will be analysed in comparison to both local and international guidelines and standards. The USA Environmental Protection Agency, the European Union and the World Health Organisation are normally cited.

An impact prediction study will follow, and the modeling scope includes the dispersion of air pollutants arising from all potential sources at the proposed new mining areas, increased waste rock disposal and tailings disposal areas, acid heap leaching facility and sulphur handling facility in the Port of Walvis Bay. When addressing airborne pollutants, both routine and upset emissions will be included. The quantification of fugitive dust emissions from mining operations always requires use of past experience, and the availability of emission factors. The most readily available emission factors are those published by the USA Environmental Protection Agency. The parameters important in estimating fugitive dust emission rates from mining operations include overburden handling, topsoil removal, movement of mining equipment, operating procedures, terrain, vegetation, precipitation and surface moisture, and wind speeds.

Emission factors for typical mining operations have been used successfully in the past. These factors and equations include vehicle traffic, storage piles and dust emissions generated by wind erosion of exposed areas. Ground level concentrations of pollutants for all such sources at the Phase 2 assessment components will be performed. Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions from various sources.

All emission scenarios will be simulated using a recognised international model such as the ADMS 3 (UK), USA Environmental Protection Agency's Industrial Source Complex Model (version 3), and in particular the short term component (ISCST3), or the US Environmental Protection Agency's AERMOD model. The particular model selection will be based on the complexity of the terrain and the availability of detailed meteorological data.

### 6.5.3 Quantitative risk assessment

The quantitative risk assessment will build on that completed for the Phase 1 assessment components. It will be undertaken by RisCom and the scope of their study is as follows:

Development of accidental release scenarios for the acid heap leaching facility, and for accidental release and fire scenarios for the handling and storage of elemental sulphur feedstock in the Port of Walvis Bay. Generic failure rate data for tanks, pumps, valves, flanges, pipe work, gantry, couplings, etc will be utilised to determine the probability of each accident scenario assessed. For each scenario, the consequences (such as toxic end points, thermal radiation, domino effect, etc), will be determined and maximum individual risk values calculated, taking accidents, meteorological conditions and lethality into account. This information will then be used to identify any shortcomings and rank the risks for possible risk reduction programmes.

The results of the assessment will be tabled in a document, typically addressing the topics listed in the Major Hazard Installation Regulations in terms of the South African Occupational Health and Safety Act (Act No. 85 of 1993). It should be noted that the risk assessment will not constitute an environmental risk assessment, i.e. it will be confined to risks to human health and not to possible biophysical impacts. The risk assessment will exclude natural events such as earthquakes and floods.

### 6.5.4 Visual impact assessment

The visual impact assessment will build on that completed for the Phase 1 assessment components. It will be undertaken by Visual Resource Management Africa (VRMA) and the scope of their study is as follows:

The *VRM methodology* developed by the Bureau of Land Management (BLM) of the United States Department of Internal Affairs will be used to measure contrast in order to analyse potential visual impacts associated with proposed projects and activities. The basic philosophy underlying the system is that the degree to which the visual quality of a landscape is affected depends on the visual contrast created between a project component and the existing



landscape. The study consists of the following stages: visual inventory, contrast rating, impact assessment and recommendations for management actions.

The visual inventory is compiled through a site visit to create a photographic assessment, a viewshed analysis to determine the extent to which the proposed modifications (and alternatives) would be visible to the surrounding areas, and a visual inventory to map and quantify the visual significance of the impacted areas. In this way, it defines visual resource management objectives for such areas. The contrast rating is based on measuring the degree of contrast that the proposed modifications would create from identified key observation points, that feeds into the impact assessment itself. Recommendations for management actions are based on possible avoidance, mitigation measures, compensation and offsets, rehabilitation and restoration.

### **6.5.5 Radioactivity and public dose assessment**

The radioactivity and public dose assessment will build on that undertaken for the Phase 1 assessment components. It will be undertaken by the Nuclear Energy Council of South Africa (NECSA) and the scope of their study is as follows:

This potential impact will be assessed by means of collating available information and extrapolating predicted dispersion of radioactive material by means of modelling. The acceptability of the findings derived in this way is then confirmed. The public dose assessment will be informed by modelling of emissions through the atmospheric pathways and by modelling of potential exposures through the aquatic pathway. Public exposure will be considered at a number of receptor locations through the atmospheric pathway (radioactive dust and radon). The future scenario to be assessed is the operational phase of RU's maximum expansion scenario, taking all developments foreseen in this expansion process into account.

The purpose is to determine whether a maximum mine expansion will increase public exposure of the critical population at Arandis above the dose constraint of 300 millisieverts per year during the operational phase. If required, prevention strategies or mitigation of exposures above the dose constraint will be prescribed. It is assumed that post-closure exposures caused by the maximum expansion will be equal to or lower than the exposure in the operational phase. A number of key receptor locations are to be assessed. The deliverables include an assessment report and sensitivity analyses, with sufficient illustrations for the reviewers to understand the input parameters and sources for the model, and a set of digital maps showing receptor locations, source geometry and isodose contours for the maximum expansion scenario.

### **6.5.6 Biodiversity assessment**

The biodiversity assessment will build on that completed for the Phase 1 assessment components. It will be undertaken by the Environmental Evaluation Associates of Namibia, the consulting arm of the Desert Research Foundation of Namibia (DRFN) and the scope of their study is as follows:

The study will build on plant an animal biodiversity work previously conducted in the area and will identify sensitive areas and apply a system of biodiversity quantification that includes the level of endemism of species and their conservation status. Rio Tinto, as RU's parent company, intends to use this mine as a pilot site for its international biodiversity strategy to identify sensitive areas. Status, distributional and ecological information pertaining to the known animal site endemics will be ascertained and compiled into an appropriate format. All species in all taxonomic groups will be identified and listed, and their known distributions mapped in relation to the intended areas of expansion. They will all be ranked according to the criteria of vulnerability and irreplaceability, to identify those that have high conservation priority.

Field surveys of the biological soil crusts and lichens, invertebrate pit-trapping and collecting surveys and small vertebrate censuses will be conducted in the area to obtain information pertaining to the distribution and occurrence of the prioritised species. Habitats shown to host high-priority species will be identified, described and mapped, both within the footprint areas of the Phase 2 assessment expansion project components and adjacent areas. The existing database will be updated following the study, followed by presentation of the findings in a report that includes multi-layered maps, all of which could serve as a useful baseline for future monitoring of occurrence and abundance of high-priority species.

### 6.5.7 Archaeology/heritage assessment

The archaeology/heritage assessment will build on that completed for the Phase 1 assessment components. It will be undertaken by Quaternary Research Services and the scope of their study is as follows:

Heritage surveys were undertaken during 2006 and 2007, for the entire RU mine licence area and areas of the proposed SH and SK pits respectively. A consequence of these studies was the issuing of permits for the exploration phase of the expansion project. Their renewal and amendment will be undertaken in this study that will include desktop preparation work, a field survey, impact assessment that is integrated into project GIS data and specification of conservation measures or mitigation. For the heritage study, the intensity of field survey (i.e. percentage cover) is determined by a desk assessment which involves a statistical weighting of types of terrain that usually yield archaeological remains. Heritage-related occurrences (palaeontological, archaeological and historical finds) are assessed according to their significance and their vulnerability to impacts. Significance is estimated on a scale of 0 – 5, according to the value of a particular site or object to the cultural history of the property and the surrounding region. The significance rating is also affected by the state of preservation and the degree of previous impact. Vulnerability is estimated on a parallel scale of 0 – 5, according to the exposure of the site or object to future impact. The two scales allow value and risk to be independently assessed.

Conservation measures are focused around the limiting of unintended impacts by imposing buffer zones with corresponding signage or barriers on the ground. Unavoidable impacts need to be mitigated by means of excavation, surface collection or other procedures to rescue materials and information that would otherwise be lost. Integration of the heritage survey GIS with the mine environmental management system will reduce or eliminate inadvertent impacts.

### 6.5.8 Water resources assessment

The water resources assessment will build on that completed for the Phase 1 assessment components. It will be undertaken by Sandra Müller (of RU) and Metago Environmental Engineers and the scope of their study is as follows:

The objective of the study is to assess the impact of the proposed Phase 2 assessment expansion project components on water management aspects, especially water use, runoff and groundwater quality. The existing Rössing Water Management Plan, which describes the current status of the aquifers, will provide the required baseline information for this study. The additional projected water demand of the mine and potential sources of freshwater will be determined with the help of the relevant design engineers. This will include the increased demand for dust suppression water associated with increased mining activity, as well as the additional water requirements for the heap leaching facility. An engineering project to supply recycled water from the seepage control system to the open pit is in progress. RU will not increase abstraction from the Khan River to meet freshwater needs and is reliant on NamWater to meet the demand. The proposed NamWater regional desalination plant to meet the growing water demand will be factored into planning to meet shortfalls in supply. The impact of the increased abstraction on the coastal aquifers and other water users will be described in the report.

The potential for contaminated runoff and effluent generation will be investigated for each project component. Increased mining activity will generate additional waste rock, which may form leachates containing sulfate, nitrate and uranium after intense rainfall of more than approximately 20 mm per event. RU will carry out geochemical characterisation studies according to procedures recommended by Rio Tinto experts. The determination of acid rock drainage potential will form part of these tests.

### 6.5.9 Noise and vibration

The noise and vibration study will build on that completed for the Phase 1 assessment components. It will be undertaken by Namibian Vibration Consultants (NVC) and the scope of their study is as follows:

The noise and vibration study is intended to identify noise and vibration sources, evaluate and prioritise the sources according to significance of potential impacts and then recommended effective measures to design and implement appropriate control and mitigation measures. The findings of this study are unlikely to be detrimental to decision-making, since these impacts are well understood by RU and have been monitored and managed on the mine for a considerable period of time. The outcomes of the study will, however, result in continued and enhanced application of RU's occupational health and safety procedures.

The baseline noise and vibration study will be based on noise measurements in accordance with the SANS 10103: 2004 and SANS 10328:2001, or equivalent National or International Standards. The study will determine the existing levels within and around the proposed mine areas, as well as selected positions within any noise and vibration exposed community.

Components and activities which are key contributors to external noise and vibration levels will be identified, based on an inventory of all noisy and/or vibrating equipment and machinery, and a risk assessment conducted to identify whether management controls and/or ongoing monitoring/modelling are required to address significant risks.

A qualitative assessment will be made of the effect of vibration from blasting and in-pit mechanical activities. This task will include blast and ground vibration measurements at the site boundaries and/or sensitive receivers remote from the pit. A model or real time assessment of near and far field noise and vibration levels throughout the life of mine operation will be established and a noise and vibration impact assessment done according to applicable standards (SANS 10103:2004, SANS 10328:2006, SANS 11204:1995/ISO 11204:1995 and SANS 13474:2005/ISO/TS 13474:2003). The analysis of the data produced will be utilised to produce recommendations for control mechanisms suitable for ongoing noise reduction measures to meet regulatory requirements.

Based on the outcome of the study, environmental noise and vibration monitoring program, methodology and equipment will be recommended as well as recommendations for monitoring machines' vibration to ensure optimal conditions to avoid noise and vibration emission. RU has set a target to achieve a 20% reduction in the number of employees/10 000 exposed to noise >85 dB (A) without allowance for hearing protection by the end of 2008.

#### **6.5.10 Legal review**

The legal review will be undertaken by Environmental Science Associates and the scope of their study is as follows:

The main aim of this review is to present an interpretation of policy and applicable legal requirements within the context of RU's mine expansion plans to ensure that mine expansion planning processes are informed by government requirements, and should the expansion be deemed viable, operational and closure requirements are addressed and catered for. The scope of the review includes the identification and contextualisation of legal requirements relevant to the approval, operation and decommissioning phases of proposed mine expansions (not necessarily limited to environmental and minerals legislation and including legislation expected to be promulgated in the near future), identification of aspects to be catered for in the SEIA process and the updating of the legal register last updated in 2005.

#### **6.5.11 Groundwater model update**

The groundwater model update will build on that completed for the Phase 1 assessment components. It will be undertaken by Aquaterra Consulting and the scope of their study is as follows:

A comprehensive hydrogeological study consisting of geophysical borehole siting, drilling of monitoring boreholes, yield testing, water quality sampling and 3D flow modeling was initiated during the Phase 1 assessment and will be completed as part of this Phase 2 assessment.

The work done includes the evaluation of the geological structure of an area covering the Rössing Dome to identify suitable sites for monitoring boreholes, and drilling of these boreholes. The borehole data provides baseline water quality data for the area potentially affected by mine expansion projects. The hydrogeological parameters and water levels will be used as input for an extension to the existing 3D flow model of the mine site. The model boundaries will be extended to include the relevant areas and the hydrogeological flow model will be updated to simulate the impact of the new mining pits on the water table. The output of this model will later be used to set up a geochemical transport model that will identify contamination flow paths and velocities, and allow for the effective design of the control measures.

### 6.5.12 Waste rock and tailings management

The mineral waste and tailings management study will build on that completed for the Phase 1 assessment components. It will be undertaken by Rio Tinto Technology & Innovation and Metago Environmental Engineers and the scope of their study is as follows:

The proposed expansion project components will necessitate the revision of existing mineral waste and tailings management. These activities are well understood by RU, due to their having been managed for a considerable period of time. The Rio Tinto *Excellence in Mineral Waste Management Program* has been developed to help operations and projects reduce the environmental, health, financial and reputational risks posed by mineral wastes such as tailings, waste rock and open pits. This programme is designed to help reduce the risks posed by reactive mineral wastes by identifying issues of potential concern and developing cost effective and realistic management and control strategies. The program is intended to provide expert technical analysis and guidance outside of the formal corporate assurance framework. It is pertinent to any environmental exposure hazard posed by mineral wastes including but not limited to acid rock drainage (ARD), salinity, contaminants soluble at neutral pH, radionuclides, cyanide, spontaneous combustion and asbestos. The program is focused on environmental management issues rather than geotechnical stability issues, which are addressed separately. Management and control strategies should be designed to meet the required limits in a reliable, cost effective manner that meets or exceeds local regulations and permit conditions, and is consistent with the Rio Tinto HS&E standards. The *Excellence in Mineral Waste Management Program* assesses the operation's performance against a set of key performance areas and benchmarks. Areas of unacceptable risk or uncertainty will be highlighted, conceptual solutions will be identified and action plans developed through interactive cooperation between site staff and specialists. An advantage of using the Rio Tinto Technology & Innovation section is that on-going technical support could be provided, as agreed and as required for implementation of the identified solutions. More complex data collection, modelling, analysis and design should only be performed if the key questions cannot be resolved simply.

Results in each project performance area will be compared to benchmarks that are appropriate to each site's unique geochemical and environmental setting. Issues identified during this assessment will be discussed with key technical personnel at the site and conceptual solutions will be identified during a one to two day workshop. After agreement is reached with senior management on the recommended conceptual solutions, a draft prioritised action plan will be issued to the site for final signing off.



### 6.5.13 Toxicology assessment

The toxicology study of the proposed Phase 2 assessment components will be done by Infotox. The scope of their specialist study is as follows:

The handling and storage of sulphur in the Port of Walvis Bay requires a health risk assessment, since sulphur dust could emanate from such a facility. The study excludes any aspect of the process handled by Grindrod as they have initiated separate specialist studies. Since three alternative sites are being considered in the Port, the assessment will be done for all three sites in parallel. The aim of the study would be to assess the potential generation of sulphur dust, and to evaluate proposed mitigation measures such as the use of fine water sprays at key transfer points in the system and safety precautions such as infra-red monitors that could detect sulphur fires. Recommendations with regard to the fire-fighting system to be installed, required bunding wash down and drainage collection systems would be included in the report. RU is proposing a closed system to minimise the risk of sulphur spillages as far as possible.

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## 7 CONCLUSION AND RECOMMENDATIONS

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### 7.1 CONCLUSION

The Scoping Report for the Phase 2 SEIA process has been informed by the issues and concerns raised by the authorities, the proponent (RU) and by the project team, as well as by the public participation process to date. It has presented the context and rationale for the project, described the project components and screened the suite of possible alternatives and environmental implications. We submit that the report provides sufficiently comprehensive documentation of the initial Scoping stage of an assessment process.

An internal review of the draft version of the Phase 2 Scoping Report was undertaken by Dr Peter Ashton of the CSIR and is included as Annexure J. The reviewer found the Draft Phase 2 Scoping Report to be acceptable in fulfilling the requirements of such a report.

### 7.2 RECOMMENDATIONS

In response to the Scoping stage of the SEIA process currently underway, the following specialist studies are proposed to be undertaken:

- Socio-economic impact assessment;
- Air quality impact assessment;
- Quantitative risk assessment;
- Visual impact assessment;
- Radioactivity and public dose assessment;
- Biodiversity assessment;
- Archaeology/heritage assessment;
- Water resources assessment;
- Noise and vibration;
- Legal review;
- Groundwater model update;
- Waste rock and tailings engineering and management; and
- Toxicology assessment.

As far as strategic level assessment is concerned, RU is presently engaged in a Strategic Planning Process that addresses life of mine planning. As discussed in Section 4.2, sustainability criteria will be included in this ongoing process and, as such, life of mine planning will not only be based on financial considerations. As a further move towards filling the gap between the strategic and project levels of assessment, the cumulative impacts of both Phase 1 and Phase 2 will be evaluated and assessed in the SEIA documentation to follow in the next stage of this process.

As discussed in Section 4.3, the following project level alternatives are proposed to be taken forward to the next stage of the EIA process for detailed assessment:

- Extension of current SJ pit:
  - Tailings management
  - Waste rock disposal sites
  
- New mining activity in SK area:
  - Tailings management
  - Waste rock disposal sites
  
- Increased tailings disposal capacity:
  - Tailings processing methods
  - Disposal site selection
  
- Increased waste rock disposal capacity:
  - Disposal site selection
  
- Establishment of heap leaching facility:
  - “On-off” or matrix design
  - Site selection
  
- Sulphur handling facility in the Port of Walvis Bay:
  - Site selection

These aspects of the listed Phase 2 SEIA project components will be subjected to the consideration and evaluation of alternatives in the assessment stage of the process. The aspects that do not have alternatives will nevertheless also need to be assessed. This will be done by means of determining that acceptable levels of mitigation are available, or by confirming that the best available environmental design or practice is being applied.

This finalised Phase 2 Scoping Report is to be submitted to MET:DEA for their acceptance. This will allow the Phase 2 SEIA process for Rössing Uranium's proposed developments to continue into the actual assessment stage.

## 8 BIBLIOGRAPHY

---

Aquaterra Consulting (2005)

*Rössing Groundwater Model: Updated Calibration.* (Authors: Hall. J. and K. Rozlapa)  
Rössing Uranium.

CSIR (1991)

*An Environmental Impact Statement for the Rössing Uranium Mine, Namibia.* (Authors: Ashton. P. J., C. A. Moore and P. H. McMillan) Technical Report to Rössing Uranium Limited by Quality Information Systems, Division of Water, Technology, CSIR, Pretoria.

CSIR (2000)

*Environmental Management Plan: Environmental Impact Assessment of the Proposal to Expand the Importation, Storage and Transfer of Bulk Sulphuric Acid to Rössing Mine, Namibia.* (Authors: Ashton. P. J., R. Meyer, L. Godfrey and G. Dunn) Technical Report to Rössing Uranium Limited by Division of Water, Environment, & Forestry Technology, CSIR, Pretoria. Report No. ENV-P-C-2000-040.

CSIR (2000)

*Environmental Impact Report: Environmental Impact Assessment of the Proposal to Expand the Importation, Storage and Transfer of Bulk Sulphuric Acid to Rössing Mine, Namibia.* (Authors: Ashton. P. J., R. Meyer, L. Godfrey and G. Dunn) Technical Report to Rössing Uranium Limited by Division of Water, Environment, & Forestry Technology, CSIR, Pretoria. Report No. ENV-P-C-2000-020.

CSIR. (2000)

*Scoping Report: Environmental Impact Assessment of the Proposal to Expand the Importation, Storage and Transfer of Bulk Sulphuric Acid to Rössing Mine, Namibia.* (Authors: Ashton. P. J., R. Meyer, L. Godfrey and G. Dunn) Technical Report to Rössing Uranium Limited by Division of Water, Environment, & Forestry Technology, CSIR, Pretoria. Report No. ENV-P-C-2000-020.

EFMA (2000)

*Production of Sulphuric Acid: Best Available Techniques for Pollution Prevention and Control in European Sulphuric Acid and Fertiliser Industries.* European Fertiliser Manufacturers Association.

Envirosolutions (2001)

*An Environmental Impact Assessment for an Ore Sorting Production Plant at Rössing Uranium Limited.* Rössing Uranium.

Government of Namibia (1992)

*Green Plan.* Ministry of Environment, Government of the Republic of Namibia.

Government of Namibia (1994)

*Environmental Assessment Policy.* Ministry of Environment, Government of the Republic of Namibia.

Government of Namibia (1992)

*Minerals Act (No. 33 of 1992)*. Ministry of Mines and Energy, Government of the Republic of Namibia.

Government of Namibia (1990)

*The Constitution of the Republic of Namibia (GRN 1990)*. Government of the Republic of Namibia.

Quaternary Research Services (2006)

*Heritage Survey of the Rössing Uranium Limited License Area ML-28*. (Author: Kinahan. J.) Rössing Uranium.

Quaternary Research Services (2007).

*Archaeological Assessment of SK Area in ML-28 (Rössing Uranium Ltd)*. (Author: Kinahan. J.) Namibia. Rössing Uranium.

Quaternary Research Services (2007)

*Report on Archaeological mitigation fieldwork at QRS 72/48 (SH Area of ML-28, Rössing Uranium Limited)*. (Author: Kinahan. J.) Rössing Uranium.

Rio Tinto (2002)

*Technical Handbook Series: Rössing Uranium*. Rio Tinto.

Rio Tinto (2005)

*The Way We Work: Our Statement of Business Practice*. Rio Tinto.

Rio Tinto Technical Services. (2005)

*A Review of Environmental Aspects of Potential Sites for the Storage of Waste Rock from the Rössing Ore Sorter*. (Author: Davis. R. T. H) Rössing Uranium.

Rössing Foundation (2001)

*Rössing Uranium Communities Plan 2002 to 2006*. Rössing Foundation.

Rössing Uranium Limited Assisted by SIAPAC and Golder Associates Africa (2004)

*Sustainability Assessment for the Life Extension of the Rössing Uranium Mine*. Rössing Uranium.

Rössing Uranium (2005)

*Rössing Uranium Limited: Closure Management Plan: October 2005* (Authors: D. Bailey T. Davis, L. Le Roux, E. McGovern, R. Schneeweiss and L. Wall) Rössing Uranium.

Rössing Uranium (2007)

*RU Public Participation Material*. Rössing Uranium.

Rössing Uranium (2007)

*Rössing Foundation: Arandis*. (<http://www.rossing.com/arandis.htm>). Webpage accessed in November 2007.



Rössing Uranium (2007)

*Draft Environmental Management Plan: Extension of Mining Activities into SK4.*  
(Authors: Garrard. S and R. Schneeweiss) Rössing Uranium.

Rössing Uranium. (2007)

*2006 report to Stakeholders: Social, Economic, Environmental.* Rössing Uranium.

Rössing Uranium. (2007)

*Draft of "Excellence in Mineral Waste Management – Rössing Uranium Mine Expansion Options" – (not yet published)*

SNC-Lavalin Fenco (2007)

*Order of Magnitude Study on Options for Making Acid at Rössing Uranium Limited.*  
(Author: Read. J.) Rössing Uranium.

World Gazetteer (2007)

*Erongo* (<http://world-gazetteer.com/wg.php?x=&men=gpro&lng=en&dat=32&geo=242407452&srt=npan&col=aohdq&geo=-2635>). Webpage accessed in November 2007.

World Gazetteer (2007)

*Swakopmund* (<http://world-gazetteer.com/wg.php?x=&men=gpro&lng=en&dat=32&geo=-154&srt=npan&col=aohdq&pt=c&va=&geo=242407452>). Webpage accessed in November 2007.

# ANNEXURE A

## GLOSSARY

# ANNEXURE B

## LETTER TO MET:DEA INITIATING PHASE 2 ASSESSMENT

# ANNEXURE C

## EXAMPLE OF NEWSPAPER ADVERTISEMENT

# ANNEXURE D

## EXAMPLE OF PUBLIC NOTICES



# ANNEXURE E

## PUBLIC INFORMATION DOCUMENTS

**ANNEXURE F**

**LIST OF ALL MEETINGS HELD TO DATE IN PUBLIC**

**PARTICIPATION PROCESS**

**ANNEXURE G**

**MINUTES OF ALL MEETINGS HELD TO DATE IN PUBLIC  
PARTICIPATION PROCESS**

# ANNEXURE H

## STAKEHOLDER FEEDBACK FORMS

# ANNEXURE I

## REGISTER OF INTERESTED AND AFFECTED PARTIES



**ANNEXURE J**  
**INTERNAL REVIEWER'S REPORT**

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**PROPOSED EXPANSION PROJECT FOR RÖSSING URANIUM MINE IN NAMIBIA: PHASE 2 ASSESSMENT ~**  
 Extension of current SJ open pit mining activity  
 New mining activity in SK area  
 Increased waste rock disposal capacity  
 Increased tailings disposal capacity  
 Establishment of acid heap leaching facility  
 Sulphur handling in the Port of Walvis Bay

**PROJECT NUMBER:** 402239  
**REPORT TITLE:** Final Scoping Report  
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