QRS Job 172

Specialist archaeological contribution to a linear infrastructure SEIA for the proposed Rössing Uranium Z20 mining development

FINAL REPORT
Project Name: Specialist archaeological contribution to a linear infrastructure SEIA for the proposed Rössing Uranium Z20 mining development

Stage of Report: Final archaeological specialist report

Client: Aurecon (Pty) Ltd & SLR (Pty) Ltd

Specialist Consultant: Dr John Kinahan, Quaternary Research Services, Namibia

Date of Release: 12 November 2012

Contributors to the Report: Dr John Kinahan

Contact: jkinahan@iafrica.com.na

Declaration
I, Dr J. Kinahan, do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed.
Signed:

[Signature]

COPYRIGHT
Copyright vests with QRS and the author/s of this report unless otherwise agreed to in writing. The reports may not be copied or transmitted in any form whatsoever to any person without the written permission of the Copyright Holder. This does not preclude the authorities’ use of the report for consultation purposes or the applicant’s use of the report for project-related purposes.
SUMMARY
The proposed development of an aerial ropeway and related linear infrastructure for the Rössing Uranium Z20 mining project may threaten a small number of important Pleistocene archaeological sites, and would therefore require appropriate mitigation measures including design and construction guidelines. The sites, and in particular the QRS 72/48 chert quarry and workshop, have a high potential for further research. This site and its nearby satellites, are located in a relatively undisturbed physical setting. The development of the Z20 infrastructure project in its proposed form will disrupt the unique visual qualities of the site location, but this impact is reversible. A number of small and relatively insignificant sites may be affected on the southern side of the Khan River.
TABLE OF CONTENTS

1. Introduction
2. Approach to study
   - Terms of Reference
   - Methodology
   - Information reviewed
3. Assumptions and limitations
4. Legislative context
   - Applicable laws and policies
   - Relevant standards
5. Description of the affected environment
6. Impact assessment
7. Management Plan
8. Recommendations
9. Conclusions
1. Introduction

Rössing Uranium Limited (RUL) is considering a possible mining operation in the area known as Z20, a discrete granite-hosted ore-body. The Z20 site is separated from the existing area of mining operations by the Khan River valley which presents severe difficulties of access. The Z20 area is entirely without infrastructure, and RUL is therefore considering the use of an aerial ropeway as a means to convey ore to the existing plant on the northern side of the valley. The aerial ropeway will form part of an infrastructure corridor including a road and water and/or power supply lines.

The western Erongo Region of Namibia has a well preserved archaeological record with evidence of human occupation spanning the last 800,000 years. The extent and extraordinary richness of this material record has been substantially revealed during the last decade, by a series of detailed archaeological assessments carried out in the course of exploration and mining operations, and the development of infrastructure required by these operations.

In order to implement the Z20 project Rössing Uranium Limited is required to follow the environmental assessment process directed by the Environmental Management Act (2007) and its Regulations (2012). As part of the mandatory assessment process, and to comply with the Community Standards of Rio Tinto, the SEIA also requires that an archaeological, or heritage assessment is carried out. The archaeological assessment presented here was carried out between 29th and 31st October, 2012.

Available records of archaeological surveys carried out in the immediate vicinity of the Rössing Uranium mining operation provide a sound basis for this assessment, and direct field survey was only required for one small area that had not been covered in detail by previous work. The present report is therefore based largely on existing data.

2. Approach to study

- **Terms of Reference**

  The primary task of the archaeological assessment was to identify sensitive archaeological sites that could be affected by the Z20 infrastructure corridor project. The assessment addresses the anticipated impacts of the project on the archaeology of the area, with particular emphasis on the various phases of the project (i.e. development, operation and decommissioning phase). The impact assessment forms the basis of recommended management actions to avoid or reduce negative impacts, and sets out associated long-term monitoring requirements. The assessment is required to satisfy the requirements of the Environmental Management Act (2007), and those of the National Heritage Act (2004).

- **Methodology**

  The archaeological assessment combines two standardized methodologies: the methodology adopted by Aurecon from the applicable South African standards for environmental assessment, and the protocol developed for archaeological assessment in Namibia, as outlined below.

**Environmental assessment methodology:** With respect to each specific source of impact risk, the assessment methodology estimates the extent of impact, the magnitude of impact, and the duration of impact. The scales of estimation are set out and explained in Table 1. The significance of potential impacts is derived from the combined temporal and spatial scales of impact according to the rating scale set out in Table 2. The significance of impact is further elaborated by determining both the probability of the impact occurring, and the confidence level of the data on which the assessment is based (Tables 3 & 4). Finally, the assessment the potential reversibility of the identified impacts...
Table 1: Assessment criteria for the evaluation of impacts.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>CATEGORY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent or spatial influence of impact</td>
<td>National</td>
<td>Within Namibia</td>
</tr>
<tr>
<td></td>
<td>Regional</td>
<td>Within the Erongo Region</td>
</tr>
<tr>
<td></td>
<td>Local</td>
<td>On site or within 100 m of the impact site</td>
</tr>
<tr>
<td>Magnitude of impact</td>
<td>High</td>
<td>Social and/or natural functions and/or processes are severely altered</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Social and/or natural functions and/or processes are notably altered</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Social and/or natural functions and/or processes are slightly altered</td>
</tr>
<tr>
<td></td>
<td>Very Low</td>
<td>Social and/or natural functions and/or processes are negligibly altered</td>
</tr>
<tr>
<td></td>
<td>Zero</td>
<td>Social and/or natural functions and/or processes remain unaltered</td>
</tr>
<tr>
<td>Duration of impact</td>
<td>Short term</td>
<td>Up to 3 years</td>
</tr>
<tr>
<td></td>
<td>Medium Term</td>
<td>4 to 10 years after construction</td>
</tr>
<tr>
<td></td>
<td>Long Term</td>
<td>More than 10 years after construction</td>
</tr>
</tbody>
</table>

Table 2: Definition of significance ratings.

<table>
<thead>
<tr>
<th>SIGNIFICANCE RATINGS</th>
<th>LEVEL OF CRITERIA REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>• High magnitude with a regional extent and long term duration</td>
</tr>
<tr>
<td></td>
<td>• High magnitude with either a regional extent and medium term duration or a local extent and long term duration</td>
</tr>
<tr>
<td></td>
<td>• Medium magnitude with a regional extent and long term duration</td>
</tr>
<tr>
<td>Medium</td>
<td>• High magnitude with a local extent and medium term duration</td>
</tr>
<tr>
<td></td>
<td>• High magnitude with a regional extent and construction period or a site specific extent and long term duration</td>
</tr>
<tr>
<td></td>
<td>• High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration</td>
</tr>
<tr>
<td></td>
<td>• Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term</td>
</tr>
<tr>
<td></td>
<td>• Low magnitude with a regional extent and long term duration</td>
</tr>
<tr>
<td>Low</td>
<td>• High magnitude with a site specific extent and construction period duration</td>
</tr>
<tr>
<td></td>
<td>• Medium magnitude with a site specific extent and construction period duration</td>
</tr>
<tr>
<td></td>
<td>• Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term</td>
</tr>
<tr>
<td></td>
<td>• Very low magnitude with a regional extent and long term duration</td>
</tr>
<tr>
<td>Very low</td>
<td>• Low magnitude with a site specific extent and construction period duration</td>
</tr>
<tr>
<td></td>
<td>• Very low magnitude with any combination of extent and duration except regional and long term</td>
</tr>
<tr>
<td>Neutral</td>
<td>• Zero magnitude with any combination of extent and duration</td>
</tr>
</tbody>
</table>
Table 3: Definition of probability ratings

<table>
<thead>
<tr>
<th>PROBABILITY RATINGS</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite</td>
<td>Estimated greater than 95% chance of the impact occurring.</td>
</tr>
<tr>
<td>Probable</td>
<td>Estimated 5 to 95% chance of the impact occurring.</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Estimated less than 5% chance of the impact occurring.</td>
</tr>
</tbody>
</table>

Table 4: Definition of confidence ratings

<table>
<thead>
<tr>
<th>CONFIDENCE RATINGS</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certain</td>
<td>Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.</td>
</tr>
<tr>
<td>Sure</td>
<td>Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.</td>
</tr>
<tr>
<td>Unsure</td>
<td>Limited useful information on and understanding of the environmental factors potentially influencing the impact.</td>
</tr>
</tbody>
</table>

Table 5: Definition of reversibility ratings

<table>
<thead>
<tr>
<th>REVERSIBILITY RATINGS</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irreversible</td>
<td>The activity will lead to an impact that is permanent.</td>
</tr>
<tr>
<td>Reversible</td>
<td>The impact is reversible, within a period of 10 years.</td>
</tr>
</tbody>
</table>

Archaeological assessment methodology: The archaeological assessment aims to identify potential sources of risk posed by the construction, operation and decommissioning of the Z20 infrastructure project. These sources of risk are specific to the archaeology of the area as it is known from existing data and the results of the limited additional field survey reported here.

Archaeological impact assessment in Namibia follows a basic three-phase process of evaluation – usually by desk study; followed by assessment based on field survey with limited sampling and including proposals for mitigation of impacts (if required); and mitigation – involving detailed field investigation, laboratory analysis and the preparation of site management plans (if required). The assessment process, summarized in Figure 1, may combine evaluation and assessment (as in the present case), and may conclude with assessment if no significant impacts are identified.

The archaeological survey and assessment of the proposed Z20 infrastructure is based on a desk assessment of existing archaeological survey data, using available archaeological GIS data and project design data, and direct field survey of ground not covered by previous surveys. In the field, archaeological sites are assessed according to standard criteria, including the physical setting of the site – mainly with reference to geological or topographic features; the type of archaeological site; the affinity of the site – based on a field estimation of the site age and cultural affinity, and observations, where pertinent, on the size, density and characteristic features of the site.

1 All archaeological assessment in Namibia is subject to permits issued by the National Heritage Council, in this instance Permit 14/2011. This permit allows field testing and collection for analytical and identification purposes.
The archaeological significance of the sites, and their vulnerability to disturbance in the course of project development activities, were evaluated according to parallel 0-5 scales, summarized in Table 6. Unlike conventional sensitivity scales, these allow independent assessments of significance and vulnerability which can be expressed as ratio values for delineation of sensitivity zones in survey areas. The scales were devised by QRS to reflect Namibian conditions and are accepted as a basis of evaluation by the National Heritage Council.

![The QRS archaeological assessment process](image)

Figure 1: The standard archaeological assessment process used in Namibia
Table 6: Rating scales for the assessment of archaeological significance and vulnerability

<table>
<thead>
<tr>
<th>Significance ranking</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no archaeological significance</td>
</tr>
<tr>
<td>1</td>
<td>disturbed or secondary context, without diagnostic material</td>
</tr>
<tr>
<td>2</td>
<td>isolated minor find in undisturbed primary context, with diagnostic material</td>
</tr>
<tr>
<td>3</td>
<td>archaeological site forming part of an identifiable local distribution or group</td>
</tr>
<tr>
<td>4</td>
<td>multi-component site, or central site with high research potential</td>
</tr>
<tr>
<td>5</td>
<td>major archaeological site containing unique evidence of high regional significance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vulnerability ranking</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not vulnerable</td>
</tr>
<tr>
<td>1</td>
<td>no threat posed by current or proposed development activities</td>
</tr>
<tr>
<td>2</td>
<td>low or indirect threat from possible consequences of development (e.g. soil erosion)</td>
</tr>
<tr>
<td>3</td>
<td>probable threat from inadvertent disturbance due to proximity of development</td>
</tr>
<tr>
<td>4</td>
<td>high likelihood of partial disturbance or destruction due to close proximity of development</td>
</tr>
<tr>
<td>5</td>
<td>direct and certain threat of major disturbance or total destruction</td>
</tr>
</tbody>
</table>

- Information reviewed
A number of archaeological field survey and assessment reports have been commissioned by Rössing Uranium Limited. The three principal studies relevant to the present assessment are as follows:

QRS Job 72  Heritage Survey of the Rössing Uranium Ltd Licence Area ML-28  21 August 2006

QRS Job 72 (component)  Archaeological investigation of a Late Pleistocene Chert Quarry & Workshop Site  QRS 72/48  20 May 2009

QRS Job 119  Archaeological reconnaissance survey of area Z19/20, ML-28  27 March 2010

A further ten archaeological reports commissioned by Rössing Uranium Limited are listed in Appendix 1. Spatial data and a common site gazetteer derived from these reports comprise the main body of information reviewed in this report.

Additional information is derived from reports on archaeological surveys of adjacent exploration and mining leases, as well as of surveys carried out for related infrastructure projects, for example:

QRS Job 105 Archaeological reconnaissance survey of the Husab Uranium Project.  6th June 2009

QRS Job 131 Archaeological impact assessment of proposed linear infrastructure for the Swakop Uranium Husab project, Erongo Region.  28th January 2011

QRS Job 144 Archaeological mitigation report on the Husab Uranium Project  28th November 2011

3. Assumptions and limitations
The archaeological survey and assessment reported here relies on the indicative value of surface finds. Based on these finds, it is possible to predict the likely occurrence of further archaeological sites with some accuracy, and to present a general statement (see below: 5. Description of the affected environment) of the local archaeological site distribution. However, since the survey is limited to surface observations, it is necessary to caution the proponent that hidden, or buried archaeological remains might
be exposed during and after construction (see below: 8. Management plan, especially Chance finds procedure). A further limitation, regarding the archaeological assessment itself, is that continuing development in the project area will over time raise the significance of finds reported here as the extent of undisturbed ground steadily diminishes.

4. Legislative context

- **Applicable laws and policies**
  The principal instrument of legal protection for heritage resources in Namibia is the National Heritage Act (27 of 2004). Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains (defined in Part 1, Definitions 1), while Section 48 ff sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Section 51 (3) sets out the requirements for impact assessment. Part VI Section 55 Paragraphs 3 and 4 require that any person who discovers an archaeological site should notify the National Heritage Council.

  It is important to be aware that no regulations have been formulated for the implementation of the National Heritage Act provisions concerning impact assessment. However, archaeological impact assessment of large projects has become accepted practice in Namibia, especially where project proponents need also to consider international guidelines. In the present case the appropriate international guidelines are those of the World Bank OP and BP 4.11 guidelines in respect of “Physical Cultural Resources” (R2006-0049, approved April 17, 2006). Of these guidelines, those relating to project screening, baseline survey and mitigation are the most relevant.

  Archaeological impact assessment in Namibia may also take place under the rubric of the Environmental Management Act (7 of 2007) which specifically includes anthropogenic elements in its definition of environment. The List of activities that may not be undertaken without Environmental Clearance Certificate: Environmental Management Act, 2007 (Govt Notice 29 of 2012), and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Govt Notice 30 of 2012) both apply to the management of impacts on archaeological sites and remains whether these are considered in detail by the environmental assessment or not.

- **Relevant standards**
  Although subject to the relevant Namibian legislation, the operations of Rössing Uranium Limited are also governed by the Community Standards of the parent company, Rio Tinto. To comply fully with these standards, Rössing Uranium Limited initiated a series of actions, including a Heritage Survey of the RUL leasehold ML-28 (2006), and a series of archaeological assessments of exploration targets and other areas of interest (2006 to 2010). In 2011, Rössing Uranium Limited initiated a Heritage Risk Assessment and commissioned a Cultural Heritage Management Plan. A related initiative by Rössing Uranium Limited was the compilation of a document entitled *Archaeological Guidelines for Mineral exploration and Mining in the Namib Desert*.

  In the absence of clear regulatory standards in Namibia, the mining sector in the Erongo Region has endeavored to implement the implicit standards or Environmental Quality Objectives (EQO’s) proposed by the Strategic Environmental Assessment for the Central Namib Uranium Rush2. The specific EQO’s that are relevant to archaeological or heritage concerns are:

  **EQO 1.** The importance of good corporate citizenship in the conservation and management of the archaeological record.

  **EQO 2.** The need to improve awareness of sensitive archaeological sites through appropriate management of data.

  **EQO 3.** To compile archaeological guidelines for mineral exploration in the Erongo Region (see *Archaeological Guidelines*, above).

---

5. Description of the affected environment

Detailed archaeological surveys at several points along the Khan River valley have revealed a consistent pattern of human occupation during the last 5,000 years. It appears from these survey results that the Khan River valley itself, as well as the many tributary ravines that drain towards it, were not the main focus of settlement. Although episodic flooding of the Khan River valley would have removed evidence of settlement, it does appear that the desert areas to the north and south of the valley were more important. This pattern is clearly illustrated in Figure 2 which shows the outline of ML-28 and the approximate alignment of the proposed aerial ropeway, in relation to the local distribution of archaeological sites.

The bulk of archaeological sites dating to the last 5,000 years in this area reflect the initial re-occupation of the Namib Desert following the mid-Holocene Climatic Optimum, when hunter-gatherer groups began to develop increasingly specialized modes of subsistence. Evidence of earlier occupation is scarce, and while this must reflect the differential preservation of earlier evidence, there are indications that the Namib was subject to brief spells of occupation, interspersed by long periods of relative inactivity. One of these occupation events that appears more intense than any other, could relate to the Eemian, or Riss-Wurm Interglacial during the late Pleistocene, approximately 120,000 years ago.

Holocene occupation evidence is relatively diverse, and includes local concentrations of stone features representing the remains of windbreaks and hunting blinds, small surface scatters of stone artefact debris and suchlike. The Holocene sites clearly show the use of the landscape as a resource base, as a strategic terrain for ambush hunting, and as a complex set of communication routes. In contrast, the earlier, Pleistocene, evidence appears to indicate heavy concentration of effort on prime resources, especially high quality chert, used in the manufacture of stone artefacts. While the climatic conditions of Holocene settlement were much as we know them today, Pleistocene occupation probably occurred under far wetter conditions.

The archaeological sites located in relatively close proximity to the proposed infrastructure corridor are shown in Figure 3, labelled for comparison with the following extracts from the archaeological gazetteer for the area:

QRS 72/11
Setting: Panner Gorge, above Khan River.
Description: Camp used by geologist Nash in 1950’s. Ruins of stone and mortar storage building, and white square painted on rock-face, apparently used as a movie screen. The site is now used as a picnic spot.
Records: Site notes and position data.
Significance rating: 1
Vulnerability rating: 1 (3-4)

QRS 72/13
Setting: Massive chert outcrop exposed by incision of Panner Gorge and tributaries.
Description: The chert is exposed mainly on the northern and north-western slopes of a narrow gap between schist outcrops. There is a dense talus scatter with many flaked nodules and several clearly identifiable flaking areas.
Records: Site notes and position data; photographs, and raw material sample QRS 72/013 for ICP analysis.
Significance rating: 3
Vulnerability rating: 3 (3-4, in the event that development work in the “SH” prospecting area extends to the western side of Panner Gorge).

QRS 72/14
Setting: Large isolated boulder in streambed as above.
Description: Dense surface scatter of stone artefact flaking debris on southern side over approximately 400m² with densities of 1-10 objects/m².
Records: Site notes and location data.
Significance rating: 2
Vulnerability rating: 2 (3-4, in the event that development work in the “SH” prospecting area extends to the western side of Panner Gorge).

QRS 72/48
Setting: Weathered granite outcrop with deep gully erosion.
Description: Extensive chert quarry with clear artefact debris scatters visible within talus.
Records: dGPS site map, GIS files, site notes, locality data, photographs and limited surface collection. Reference to detailed report, Appendix 1.
Significance rating: 4-5
Vulnerability rating: 3

QRS 72/49
Setting: Small outcrop of chert at foot of low spur.
Description: Discrete quarry and flake preparation area.
Records: Site notes and locality data.
Significance rating: 2
Vulnerability rating: 1 (3-4)

QRS 72/80
Setting: Gneiss outcrop
Description: Low shelter with marble grindstone
Records: site notes, locality data
Significance rating: 2
Vulnerability rating: 1 (3-4)

QRS 105/31
Setting: Granitic outcrop
Setting schist
Type/Affinity rock basins
Records Field notes and locality data.
Significance 3
Vulnerability 2 (3-4)

QRS 105/32
Setting: Granitic outcrop
Setting schist
Type/Affinity rock shelter LSA with yellow chert in surface scatter >20pcs/m2
Records Field notes and locality data; C14 sample collected for dating.
Significance 2
Vulnerability 1 (3-4)

In summary, four of the sites relate to local exploitation of chert as raw material for artefact production. These are sites QRS 72/13, 14, 48 and 49, with QRS 72/48 the most significant of all local sites with evidence of late Pleistocene occupation. The site has been documented in considerable detail but it is considered to have a high potential for further research. The site and its local setting are also considered to have some potential for specialized visitor access, and possibly for training of archaeology students. Sites QRS 72/80. Among the sites on the southern side of the Khan valley, QRS 105/30 is insignificant, while QRS 105/31 and 32 relate to recent pre-colonial occupation. A radiocarbon sample from QRS 105/32 yielded a date of 250 ± 40 years BP (Beta-259158). Evidence of recent historical occupation was found at QRS 72/11 which was used as a geologist’s field camp during the early exploration of the Rössing uranium find.
Figure 2: The archaeological setting of the Z20 infrastructure project.
Figure 3: The location of archaeological sites (labelled) in close proximity to the proposed aerial ropeway.
6. Impact assessment
Considered in terms of the methodology adopted by Aurecon from the applicable South African standards for environmental assessment, the spatial impact (Table 1) of the project (without mitigation) could be characterized as local, with a medium/high magnitude. Duration of impact on archaeological sites must be considered as long term (i.e. permanent).

However, there will be little direct impact from the aerial ropeway other than the footings of the support pylons. The ropeway will have a negative effect on the visual integrity of the area, but it will be removed when the mining operation ceases and is therefore reversible. The other components of the infrastructure corridor will be confined to the Panner Gorge on the northern side of the Khan valley, and the area of possible encroachment on the archaeological sites is easily defined and managed.

The significance of impact (Table 2) in the case of the Pleistocene sites would be considered as medium/high (without mitigation). Within this criterion, the impact would be characterized as having a high magnitude and local extent. The probability of impact (Table 3) should be considered as probable (without mitigation), and unsure/unsure in terms of confidence (Table 4). Reversibility (Table 5) is not feasible.

In the case of the relatively insignificant sites (i.e. all except the four Pleistocene sites) the impact rating of the sites could be reduced adopting appropriate mitigation measures such as more detailed site documentation, systematic surface collection and photographic documentation. In the case of the four significant sites appropriate mitigation could also reduce the impact rating although this would be more detailed, and would probably involve limited excavation. This mitigation action would be required if the infrastructure encroached on the group of sites indicated in Figure 3.

Considered in terms of the protocol developed for archaeological assessment in Namibia, the sites that would be affected by the proposed development have a low (1) to medium/high (3+) significance, with only QRS 72/48 considered as a 4-5 significance rating. The initial assessment of vulnerability of these sites (before the present development scenario emerged) was uniformly low. However, these are all elevated to a medium/high 3-4 in anticipation of the Z20 project.

The environmental assessment methodology used by Aurecon is a useful means to outlining a general assessment of impact for the project as a whole, but it is of limited use as a method of archaeological impact assessment. The archaeological assessment identifies specific sites as having high value and attaches specific vulnerability ratings. This provides a more directed and precise method for identifying possible management actions.

7. Management Plan
The (Draft) Cultural Heritage Management Plan compiled by Rössing Uranium Limited sets out the main requirements for management actions that would be compliant with the relevant Rio Tinto Community Standards. The Archaeological Guidelines for Mineral exploration and Mining in the Namib Desert provides more explicit and detailed instructions regarding the steps to be taken and methods to be adopted for actions such as the demarcation of "no-go" areas and dealing with chance finds. However, it is uncertain whether these two documents have been officially adopted by Rössing Uranium Limited.

8. Recommendations
Having identified the main sites that are likely to be affected by the proposed development, and the relative significance of these sites, it is recommended that the planning of the Z20 project allows sufficient time for possible mitigation work to be carried out. Mitigation with a view to possible destruction of the site in the course of mining and infrastructure development will require approval from the National Heritage Council.
It is important that project planning should allow for considerable delays in this process.

The project planning process should prioritize final definition of the infrastructure corridor so that the sites that are likely to be affected can be identified with certainty. Once this is done, the corridor to be developed should be clearly marked on the ground, and contractors informed of their responsibilities under the heritage legislation. Mitigation work should be scheduled as early as possible in the development programme.

It is recommended that Rössing Uranium Limited should give serious consideration to a solution for the Z20 project that does not require construction of a highly intrusive road and aerial ropeway. Two possible alternatives might be a haul road based on the largely unused road to Valencia, and a possible shared-use agreement with the new Husab Project access road. Alternatives should be based on a general principle of reducing the number of infrastructure corridors across the Khan valley.

9. Conclusions
The Z20 infrastructure project may affect a relatively small number of archaeological sites, depending on the final design of the project components. The footprint of the infrastructure largely covers the Khan River valley and its immediate vicinity, an area that appears to have had little importance for past human settlement. The impacts of the proposed development can be managed to acceptable levels provided sufficient time is allocated for mitigation work.
APPENDIX I:

Archaeological survey reports commissioned by Rössing Uranium Limited

QRS Job 72 (component)  Archaeological assessment of exploration drilling on an ancient quarry site in ML-28 (Rössing Uranium Ltd) 13 August 2006.

QRS Job 78  Preliminary assessment of Khan Mine for possible restoration and establishment of visitor attraction (with memorandum Resoration of historic Khan Mine by Braam Saayman) 15 August 2006

QRS Job 72 (component)  Archaeological assessment of SK Area in ML-28 (Rössing Uranium Ltd) 26 January 2007

QRS Job 72 (component)  Report on archaeological mitigation fieldwork at QRS 72/48 (SH Area of ML-28, Rössing Uranium Ltd) 3 April 2007

QRS Job 78 (continued)  Khan Mine restoration project: suggested guidelines for Phase 1 Contractor’s Terms of Reference 2 November 2007

QRS Job 72  Fulfilment of National Heritage Council permit conditions 30 November 2007


QRS Job 72 (component)  Progress report on archaeological mitigation analysis: Site QRS 72/48 (SH Area of ML-28, Rössing Uranium Ltd) 4 July 2008

QRS Job 72 (component)  QRS 72/48 Erosion control and soil rehabilitation measures 23 September 2009

QRS Job 72  Phase 2 Social & Environmental Impact assessment for Rössing’s Expansion Project: Archaeological survey and assessment revised 23 July 2010

QRS Job 72  Heritage Survey of the Rössing Uranium Ltd Licence Area ML-28 21 August 2006

QRS Job 72 (component)  Archaeological investigation of a Late Pleistocene Chert Quarry & Workshop Site  QRS 72/48 20 May 2009

QRS Job 119  Archaeological reconnaissance survey of area Z19/20, ML-28 27 March 2010