QRS

J. & J. KINAHAN, Archaeologists
t/a Quaternary Research Services
P.O. Box 22407, Windhoek, Namibia
email: *jkinahan@iafrica.com.na*
Tel./fax +264+61+236216/256702 Cell 081 3320832
Field communications V5Z 3476 via +264+64+203582

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Risk-based Solutions
P.O. Box 1839
Windhoek

For attention: Dr Sindila Mwiya

QRS Job 133: Archaeological desk assessment of EPL 3602

Dear Dr Mwiya
In fulfilment of our agreement dated 1st November, the following report presents an archaeological assessment of EPL 3602, Erongo Region, based on existing field data.

The report describes the archaeological context of the area, summarizes the available evidence and considers the sensitivity of the local archaeology to disturbance or encroachment in the course of mineral exploration and mining activity.

In its recommendations, the report sets out the likely scale of field survey that would be required to assess those parts of EPL 3602 that have not been examined so far.

Archaeological context:
Located in the central Namib Desert, EPL 3602 straddles the lower Khan River in an environmental setting that is not only hyper-arid, but rugged and relatively inaccessible. Despite these inhospitable conditions, however, the central Namib Desert has an extensive and well preserved archaeological record, with the late Pleistocene and Holocene periods particularly well represented[1].

Surface accumulations of Pleistocene stone artefacts and artefact production debris occur throughout the Namib, although relatively few sites have been studied in detail, or accurately dated. Only one site is dated to approximately 800 000 years[2] but there is a sharp increase in the number of dates for the more recent part of the record, notably within the last 40 000 years, the effective limit of the radiocarbon method on which most archaeological dating relies.

1 Mitchell, P. 2002. *The Archaeology of Southern Africa.* Cambridge University Press. 515pp.; Kinahan, J. in press The archaeological background to Namibian history. In Wallace, M. & Kinahan, J. *A history of Namibia from the beginning to 1990.* Hurst, London.

2 Corvinus, G. 1983. *The Raised Beaches of the West Coast of South West Africa/Namibia: an interpretation of their Archaeologicaland Palaeontological Data.* Forschungen zur Allgemeinen und Vergleichenden Archäologie, 5, C.H. Beck, München. 108pp.; Volman, T. 1984. Early prehistory of southern Africa. in Klein, R.G. ed. *Southern African Prehistory and Palaeoenvironments.* Rotterdam, Balkema, 169-395.

Of the earlier sites, the largest are located at outcrops of rock providing raw material suitable for stone artefact manufacture; some are located on the edges of ephemeral pans and one notable example is associated with the remains of the extinct Pleistocene elephant *Elephas reckii*. Very little work has been done on the earlier part of the record which presents an area of high potential for future research on early human responses to conditions of extreme aridity, a field that is of great relevance to the study of global climate change[3].

Available evidence confirms that the Namib Desert was probably unoccupied during the Last Glacial Maximum which marked the end of the Pleistocene period[4]. Current research suggests that the Namib remained effectively unoccupied for several thousand years in the first half of the Holocene, despite the resumption of climatic conditions as they exist today. A possible explanation for this phenomenon might be that the human population, diminished by sustained aridity of the Glacial Maximum, required several millennia to recover its former extent.

The re-occupation of the Namib approximately 6 000 years ago coincided with a global warming event known as the mid-Holocene Climatic Optimum, which is associated with a temporary sea level rise of about 2m and evidence of a significant increase in rainfall over this region. It appears that at this stage human settlement in the Namib focussed on major granite *inselbergen* features with reliable water sources and a high concentration of food resources. These areas became important ecological refuges as the aridity of the area increased in recent millennia.

One of the most remarkable features of the desert *inselbergen* is their high concentration of rock art, including an array of engraved and painted motifs rooted in a complex shamanistic religious tradition. The rock art of this region is acknowledged as having global significance; one site has been accorded World Heritage status and at least one other may be considered in future. These sites have also been the focus of several archaeological survey and excavation programmes which have yielded much detailed evidence of hunter-gatherer life.

Hunter-gatherer society in the Namib was transformed during the last 2 000 years following the adoption of domestic livestock and the rise of a nomadic pastoral economy. Sheep, then goats and cattle entered the region with Bantu-speaking farmers whose expansion was limited by the rainfall requirements of their cereal crops, millet and sorghum. Some archaeological controversy persists over the timing of livestock adoption, but by the middle of the last millennium pastoral production dominated the Namib subsistence economy[5].

A combination of recurrent drought, internecine stock raiding and livestock disease – most notably the *Rinderpest* epidemic – brought the cattle economy to the brink of collapse at the end of the 19th century. A large proportion of the people living in the Namib became ecological refugees and reverted to hunter-gatherer subsistence, while others became dependent on the charity of newly-arrived European settlers. As a result of these calamities, much of the Namib was once again deserted, just as it had been over 10 000 years earlier.

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3 Shackley, M.L. 1985. *Paleolithic archaeology of the Central Namib Desert: a preliminary survey of chronology, typology and site location.* Cimbebasia Memoir 6, National Museum of Namibia.

4 Deacon, J. and Lancaster, N. 1988. *Late Quaternary Palaeoenvironments of Southern Africa.* Clarendon, Oxford. 225pp

5 Kinahan, J. 1993. The rise and fall of nomadic pastoralism in the central Namib Desert. In Shaw, T., Sinclair, P.Andah, B. and Okpoko, A. eds. *The Archaeology of Africa: food, metals and towns.* Routledge, London, 372-85.

Although the Namib region has been an important focus of research interest for almost a century, large parts remain archaeologically unknown. In the last decade, however, significant advances in archaeological knowledge have occurred in the course of archaeological assessment work related to various uranium exploration projects[6], as required under the provisions of the National Heritage Act (27 of 2004).

Assessment surveys are the major source of new archaeological research in Namibia today and have added more than 1 000 new site records and dozens of new radiocarbon dates during the last decade. In contrast to earlier research-motivated investigations, assessment surveys tend to be based on highly detailed mapping of local site distributions. These, in turn, provide a reliable Bayesian foundation for the prediction of archaeological site distributions in previously unsurveyed terrain.

Finally, the requirement of archaeological assessment that it should estimate the heritage value of sites within proposed development areas, as well as the risk of their possible destruction, has resulted in the need to develop specific protocols of assessment. In the course of uranium project assessments, particularly, QRS has devised an explicit methodology of assessment, as well as formal scales for the ranking of archaeological significance and vulnerability[7].

Archaeology of EPL 3602 and environs:

The results of several detailed surveys over parts of EPL 3602 and its environs may be used to characterize the archaeology of the area as well as to identify specific terrain conditions that are likely to be of archaeological interest. The relevant archaeological surveys are as follows:

Archaeological reconnaissance survey of area Z19/20, ML-28. Commissioned by Rössing Uranium Limited (2010). QRS Job 118 (2010).

Archaeological survey of proposed water pipeline route from Rössing Terminal Reservoir to the Valencia Mine access road. Commissioned by NamWater (2009). QRS Job 108 (2009).

Specialist archaeological contribution to the Strategic Environmental Assessment of Uranium Mining in the Erongo Region. Commissioned by the Southern African Institute for Environmental Assessment onbehalf of the Ministry of Mines and Energy (2009). QRS Job 109 (2009).

Archaeological reconnaissance of the Husab Uranium project area. Commissioned by Extract Resources (Swakop Uranium). QRS Job 105(2009).

Archaeological assessment of proposed Omburu-Husab power-line: Phase 2 field survey from Ebony to Husab. Commissioned by EnviroDynamics (Pty) Ltd. QRS Job 94(2008).

Archaeological assessment of two water supply pipeline routes to Trekopje. Commissioned by Turgis Consulting for UraMin (Namibia) Pty Ltd. QRS Job 82 (2007).

6 http://antiquity.ac.uk/projgall/kinahan325/

7 See Appendices I and II.

Archaeological survey of the proposed Valencia uranium project. Commissioned by Valencia Uranium (Pty) Limited QRS Job 81(2007).

Heritage Survey of the Rössing Uranium Limited Licence Area ML28. Commissioned by Rössing Uranium Limited. QRS Job 72 (2006).

The distribution of archaeological sites recorded in the course of these surveys is presented in Figure 1, below[8]. The map identifies within this distribution four specific areas, labelled A – D and containing well studied groups of sites associated with particular terrain conditions. The relationship between these local site distribution patterns and their terrain setting is such that it is possible to predict the likely archaeological significance and sensitivity of areas containing similar terrain where no detailed field survey has been carried out. The detailed archaeological survey results from areas A – D may be summarized as follows:

Area A: Located in typical central Namib steppe terrain, this area is characterized by subdued topography with complex ephemeral stream drainage on substrate dominated by coarse, locally calcretized gravel. A key feature of this terrain is the presence of minor granite outcrops. These are of archaeological significance due to the occurrence of small rock shelters and basin-like rock cavities which retain quantities of rainwater for periods of several weeks following local rainfall events. The minor concentration of archaeological sites within Area A is centred on a granite outcrop with two rock shelters and a single rock cavity. The evidence from Area A is of opportunistic occupation by hunter-gatherer groups engaged in the exploitation of wild grass seed, a major subsistence staple during mid-Holocene to recent. This evidence is mainly in the form of diagnostic concentrations of shallow diggings associated with grindstones, simple storage cairns and low density surface scatters of stone artefact flaking debris.

Area B: This is a rocky escarpment of outcropping granite, forming a narrow zone between the Khan River and the Namib steppe terrain to the north and south of the river. The escarpment area has high but localized concentrations of archaeological sites mainly lying within less than one kilometre of a small seepage or a rainwater basin as described above. The sites include an array of small natural rock shelters with open air surface scatters of stone artefact flaking debris, storage cairns and grindstones. A further important feature of the escarpment zone is the occurrence of small groups of hut circles representing small homesteads. The hut circle sites generally date to within the last 1 000 years and include a variety of evidence such as pottery, metal tools and other items such as glass trade beads. Under favourable circumstances the sites also contain evidence of food, including a small range of hunted species such as hares, antelope and mountain zebra. Radiocarbon dates from these sites cover the last 2 500 years.

Area C: Conditions in this area share some characteristics of Areas A and B, with well drained expanses of coarse gravel suitable for the exploitation of wild grass seed, and ready access to the narrow ribbon of riparian woodland flanking the Khan River. Areas A, B and C all exhibit desirable combinations of terrain conditions and resource availability, and each is able to serve

8 QRS maintains a cumulative GIS database of archaeological sites in Namibia which is designed to assist the Phase 1 stage of assessment by providing empirically-based estimates of likely archaeological impacts. QRS provides developer clients with digital data acquired in the course of field surveys, accompanied by a warning that uncontrolled distribution of digital data may threaten sensitive sites. QRS does not provide developer clients with digital data acquired in the course of other field surveys or data capture exercises; these are used in desk studies and provided in map layout form only. The QRS site database is also used as a tool to assist cost estimation of field surveys and mitigation studies, by providing a means to predict likely archaeological site concentrations, and to allow comparative evaluation of site significance as a basis for mitigation proposals.

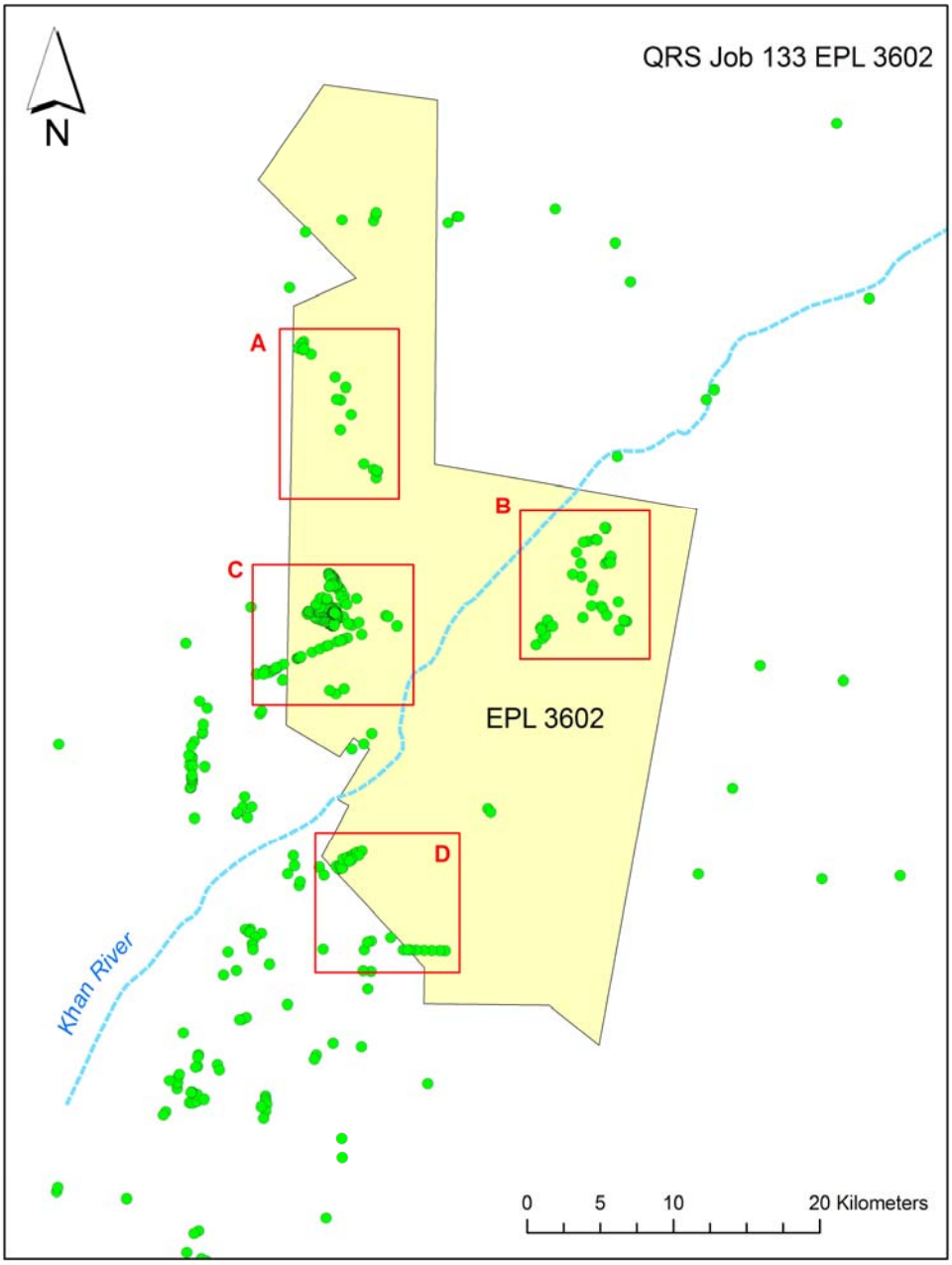


Figure 1: The known distribution of archaeological sites (green circles) in the environs of EPL 3602, with the location of areas A – D as discussed in the text.

some key needs of hunter-gatherer survival, limited by the availability of water and the distance from other resource concentrations. The Area C sites appear to represent short gathering expeditions, probably limited to a single day at a time, within range of base-camp sites similar to those found in Area B. These base-camp sites could have been located along the Khan River, although little trace of such sites has been found so far. High flood levels in the Khan are thought to have periodically removed traces of human occupation from the banks of the river.

Area D: Significant local clusters of sites as in Area B do not occur throughout the length of the escarpment above the Khan River. The availability of water would have been one major limiting factor, as would have been suitable rock shelters. Spacing of sites would also have been influenced by the human demography of the Namib as it is very likely that the low carrying capacity of the local environment dictated the spatial limits of foraging from any one water source. There is, nonetheless, evidence of very low density occupation associated with small seepages, apparently associated with hunting expeditions into areas that could not sustain larger groups. This evidence is in the form of small stone artefact scatters and the remains hunting blinds positioned on game paths where they cross hill saddles and other strategic points.

Archaeological sensitivity of EPL 3602:

The ranking protocols set out in Appendix I treat archaeological significance and vulnerability according to separate parallel scales. Thus, a highly significant archaeological site (one that contains evidence that is important to our understanding of the regional sequence) may or may not be vulnerable to impacts arising from a proposed development. A site of low significance may be highly vulnerable and identified as such. This separation of significance and vulnerability on a site scale forms the basis of a second level of analysis: archaeological sensitivity on the landscape scale.

As described in the previous section, human settlement in the Namib is represented by combinations of sites, such as base-camps near to ephemeral water points from which expeditions were made to seed gathering areas or hunting blinds. These combinations are closely tied to terrain and resource conditions which together with the archaeological sites comprise the archaeological landscape. The sensitivity of these landscapes is determined by the degree to which their archaeological significance may be compromised (rendered vulnerable) by a proposed development.

In the case of EPL 3602, the most significant archaeological sites are located in the escarpment zone overlooking the Khan River. These are the sites with the most concentrated, diverse and well preserved evidence of human settlement, and without them it would be difficult to interpret the archaeological record. In contrast, the gravel plains and steppe sites, while interesting in themselves, represent a narrower range of activities and are generally not well preserved. The evidence from these sites is also well represented in other parts of the Namib and the examples found on EPL 3602 are therefore not unique.

A simplified zonation of EPL 3602 is presented in Figure 2 which identifies the escarpment as high sensitivity zone, the steppe as a medium sensitivity zone and the Khan River course as a medium to low sensitivity zone. While this zonation is based on a relatively large body of field survey data it must be subject to the caveat that because the entire area has not been surveyed, and because the archaeology of the central Namib is not known in every detail, any future development should involve site specific archaeological survey.

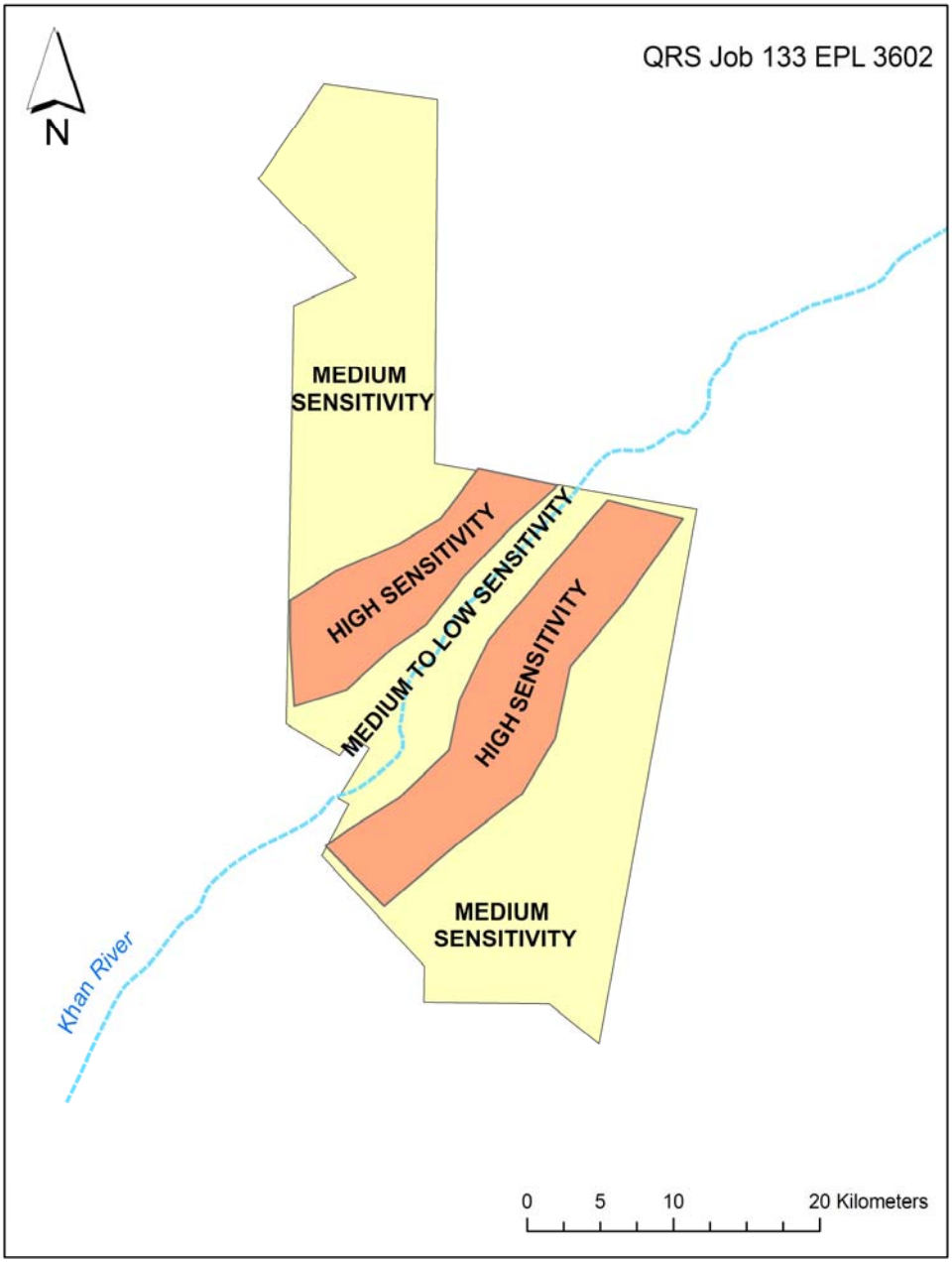


Figure 2: The generalized archaeological sensitivity of EPL 3602 with the areas of highest archaeological sensitivity corresponding to the rocky escarpment zones flanking the Khan River.

The importance of site specific survey in the Namib cannot be over emphasized since some sites, such as graves can occur almost anywhere on the landscape. Others, such as Pleistocene quarry sites, are difficult to predict on the basis of available geological data and can only be identified by direct inspection.

Recommendations for further assessment:

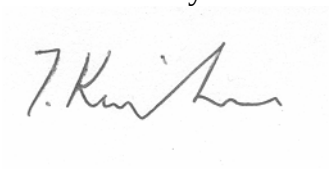
This report serves to indicate that EPL 3602 is an area of known archaeological significance and confirms that future development planning should include detailed archaeological assessment. The available data also serve to alert potential developers to high probability of negative archaeological impacts in some parts of the property, especially within the escarpment zone.

Mineral exploration requires the use of access routes and convenient locations for field camps and other facilities. When such routes and locations are selected, the project environmental officer should consider the archaeological sensitivity of the area and commission a field survey in advance of any site development. The same process should be followed in an incremental fashion as the project advances, as set out in the assessment process in Appendix I.

If archaeological assessment locates sites that may be damaged or encroached upon by the project activities specific mitigation measures should be adopted. Where possible, the project should seek to avoid damage not only to the site itself but also to its landscape setting. Mitigation proposals based on archaeological assessment will specify the type of mitigation required, whether field documentation in the case of minor sites, or excavation in the case of more important sites. The mitigation proposals may also specify the need for buffer zones to be maintained around sensitive sites.

As a general guideline, field survey in this part of the central Namib can cover approximately 10km per day for linear or corridor developments such as pipeline routes or roads, and about $5km^2$ per day for footprints of camps, borrow pits and similar developments. Areas or low archaeological sensitivity will be more rapidly covered, as would areas or open terrain. It should also be borne in mind that for every three days or field survey, one day should be added for purposes of analysis and report compilation.

I hope you will find this report satisfactory, and I look forward to your further instructions.
Yours sincerely



John Kinahan PhD MSAIE & ES

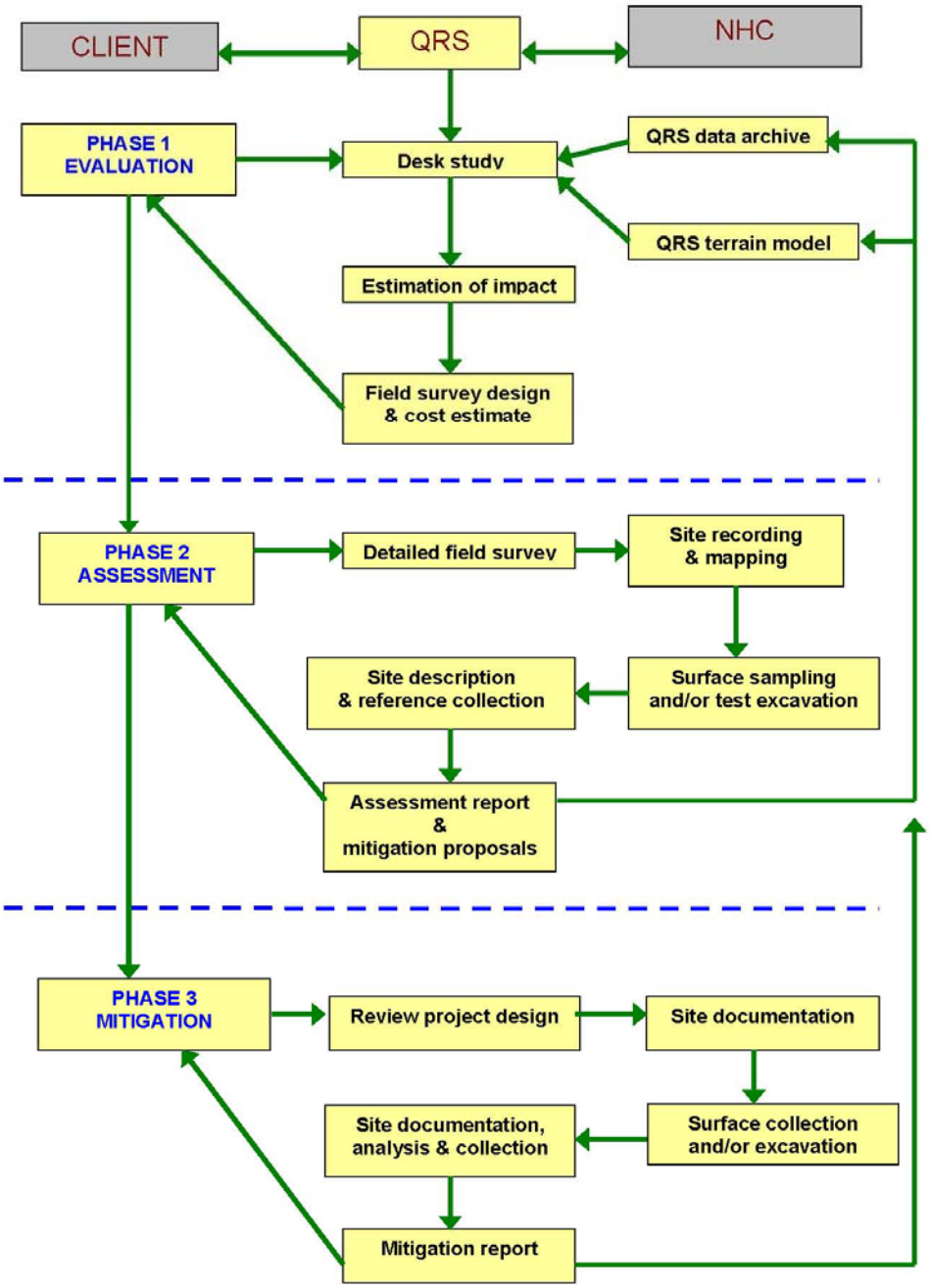
Partner

Encls.

APPENDIX I:

Archaeological Impact Assessment: Client Information Sheet # 5

The QRS archaeological assessment process



APPENDIX II:

Archaeological Impact Assessment: Client Information Sheet # 4

Significance and Vulnerability Ranking of Archaeological Finds

The evaluation and ranking of site significance and vulnerability is an essential component of archaeological impact assessment. QRS has developed an approach to significance and vulnerability estimation that combines accepted international practice[α] with the results of more than 80 field surveys we have carried out in Namibia and elsewhere.

Our standard procedure involves an estimate of the archaeological value and the risk of damage, using ordinal scales of zero to five. These separate values can be combined as a significance and vulnerability index, e.g. 3/2, 4/0. The same data are used in the preparation of archaeological sensitivity maps and predictive models which form the empirical basis of our time and cost estimates for archaeological field surveys.

It is important to realize however, that such estimates have a degree of subjectivity. For this reason, we estimate significance with specific reference to the value of the site as a component of the Namibian archaeological record, while our estimation of vulnerability refers primarily to the potential consequences of the development project under consideration.

SIGNIFICANCE RANKING

0 no archaeological significance
1 disturbed or secondary context, without diagnostic material
2 isolated minor find in undisturbed primary context, with diagnostic material
3 archaeological site forming part of an identifiable local distribution or group
4 multi-component site, or central site with high research potential
5 major archaeological site containing unique evidence of high regional significance

VULNERABILITY RANKING

0 not vulnerable
1 no threat posed by current or proposed development activities
2 low or indirect threat from possible consequences of development (e.g. soil erosion)
3 probable threat from inadvertent disturbance due to proximity of development
4 high likelihood of partial disturbance or destruction due to close proximity of development
5 direct and certain threat of major disturbance or total destruction

QRS has adopted the practice of identifying the specific research value of archaeological sites documented in the course of field surveys. This means that we evaluate the likely research benefits of more detailed investigations on sites of high significance, or local site clusters of potential research importance. We indicate the immediate benefits in terms of sequence resolution or yield of comparative material and present this in the form of an expected research dividend. Similarly, we evaluate the consequences of damage or destruction as an expected loss of research dividend. These estimates form part of our proposals for mitigation of impacts.

α e.g. Banning, E. B. (2002) *Archaeological Survey.* Manuals in Archaeological Method, Theory, and Technique. Kluwer Academic, New York.