Archaeological and Palaeontological Impact Assessment

FOR THE UPDATED EMP OF THE TRANS HEX MINING OPERATIONS, RICHTERSVELD, NORTHERN CAPE

Prepared For

Myezo Environmental Management Services

By

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I, Jaco van der Walt, as duly authorised representative of Wits Heritage Contract Unit, University of the Witwatersrand, hereby confirm my independence as a specialist and declare that neither I nor the Heritage Contract Unit have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Myezo was appointed as Environmental Assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No.107 of 1998), other than fair remuneration for work performed on this project.

SIGNATURE: _____

Executive summary

Site name and location: Trans Hex Diamond Concession: Richtersveld Mining operations in the district of Namaqualand, Northern Cape Province.

1:50 000 Map: 2816 BB

EIA Consultant: Myezo Environmental Management Services

Developer: Trans Hex Operations (Pty) Ltd.

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Date of Report: 02 December 2010

Findings of the Assessment: 109 sites of heritage significance are now on record for the Trans Hex lease area. Several other heritage issues were also identified that need to be addressed. Please refer to Section 9 of this report for recommended management actions.

General

If during construction any possible finds are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find. The possibility of the occurrence of informal or unmarked graves and archaeological sites cannot be excluded. It is important to note that the scope of service was to survey only the active mining areas and not the entire property.

Disclaimer: *Although all possible care is taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. Wits Heritage Contracts Unit and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.*

CONTENTS

ANNEXURE

FIGURES

1. INTRODUCTION

Wits Heritage Contracts Unit was contracted by Trans Hex Operations (Pty) Ltd through Myezo Environmental Management Services to conduct an Archaeological and Palaeontological Impact Assessment as part of the updating of the existing environmental management programme (EMP) for the Richtersveld Mining operations (Fig 1.) in the district of Namaqualand, Northern Cape Province.

The aim of the study is to identify heritage sites in the existing mining areas, to document and assess their importance within local, provincial and national context. This study also aims to assess the impact of the existing mining operations on non renewable heritage resources and to submit appropriate recommendations with regard to the responsible cultural resources management as part of the Environmental Management Program (EMP) in order to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and to develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilized before and during the survey, which includes in Phase 1: Brief Desktop study; Phase 2: Physical surveying of the area on foot and by vehicle; and Phase 3: Reporting the outcome of the study.

During the survey, 109 sites of heritage significance were identified including previous sites found in the area. General site conditions and features on sites were recorded by means of photos, GPS location, and site description. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to SAHRA provincial office for peer review.

Figure 1: Google image of the location of the Trans Hex mine lease area

1.2 TERMS OF REFERENCE

The initial terms of reference were to survey the area to be disturbed for possible heritage resources such as archaeological and historical sites and features and graves, to assess the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources and management measures that may be required at affected sites / features. In addition, maps providing GPS locations of identified sites were prioritized.

Due to the size of the mine lease area of 28 905.86 hectares it was recommended under the scope of work that the study focuses on the current mining areas to make recommendations regarding the management of the identified cultural resources and future developments.

During the time of the study a mine plan was not available and therefore it was not possible to assess areas earmarked for future mining and therefore areas was assessed that is currently impacted on by the mining activities to determine the status quo.

Reporting

Reporting will describe the anticipated impacts, as well as cumulative impacts, of the operational units of the proposed project activity on the identified heritage resources for all 3 phases of the project, i.e. construction, operation and decommissioning phases. The report considers alternatives should any significant sites be impacted adversely by the proposed project. Reporting will ensure that all requirements of the local South African Heritage Resources Agency (SAHRA) are met; and ensure that all studies and results are sufficient to comply with the relevant requirements of the Equator Principles, World Bank Standards and IFC Principles and Performance Standards and National legislation. This will assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

1.3 Nature of the development

Mining by Trans Hex Operations in the Lease Area consists of three major methods namely:

(i) **Primary Exploration** (drilling and modelling of palaeo channels and sedimentology).

(ii) **Secondary Exploration** (by mega - trench) leading to reserve calculation and financial feasibility modelling.

(iii) **Mine Block Development**

As an area proved by trenching becomes large enough in relation to its overburden depth and fits the overall mine plan coherently, it is identified as a Mine Block and earmarked for development.

1.4 Description of study area

The Alexander Bay area experiences cool winters and relatively hot and dry summers. The mean annual temperature is approximately 18 °C; the hottest months are December to February (with maximum temperatures of 30 °C in January) and the coldest months being between June and August (with minimum temperatures of 7 °C in July). The mean annual precipitation of parts of coastal Richtersveld and areas adjoining the Namib Desert is normally less than 80 mm with the majority of the rainfall occurring during the winter months. The rainfall regime of the area is relatively predictable and long droughts are rare. There is a high frequency of coastal fog in the area and extreme wind speeds and sand blasting from the south are common. Frost is rare in the area, occurring on only one day per year on average. The study area is dominated by sandy soils and rock outcrops with several ridges and mountains. The majority of the Richtersveld region falls within the Succulent Karoo biome and the boundary of the Desert biome.

2. APPROACH AND METHODOLOGY

A desktop study of published and unpublished literature on heritage work conducted in the study area was reviewed to compile a background history, chronology and cultural site distribution in the study area.

2.1 DESKTOP STUDY

The study area is fairly remote and little published material is present for the study area. The most relevant of the published material is on excavations conducted on Later Stone Age open sites at Jakkalsberg A & B (Mehl Mining Area) dating to between AD 650 and AD 800 (Miller & Webley 1994, Brink & Webley 1996, Webley 1997) and more recently Jakkalsberg N and L (Mehl Mining Area) by Orton and Halkett (2010). These sites all date to the last 2000 years.

Apart from the published material several unpublished reports serves to establish a basic chronology of the area and settlement behaviour, including Halkett (1998 and 1999) and Morris and Turkington (1997). It was not the aim of this desktop study to provide a background archaeological history of the study area and the Northern Cape, but rather to establish what has been done to date with specific reference to archaeological research and Cultural Resource Management (CRM) projects in order to contextualise the status quo of cultural heritage management in the Trans Hex mining area. From the above literature it was established that the study area contains a wide range of cultural resources ranging from Early, Middle and Later Stone Age sites that include sites with petroglyphs. The study area also includes graves, modern Nama/herder camps and structures from the colonial period.

According to Halkett (1999) most pastoralist sites tends to be located on the silty floodplain of the Orange River with sites that contain occupational debris next to dry watercourses. Graves are also more commonly found on the river floodplain.

The area is also well known for its fossil record and research conducted along the Orange River on the Namibian side highlighted that meanders of the proto Orange River is highly fossilferous. Bamford, (2003b) recorded fossilferous deposits from Baken, Bloeddrift, Daberas, Oena and Sendelingsdrift. Therefore a Palaeontological Assessment was also commissioned in active mining areas (Refer to Annexure A for the full report)

From the above it is clear that archaeological research was done on the Later Stone Age archaeology in this part of the Richtersveld and according to Orton & Halkett (2010) Pastoralist sites dating to the last 2000 years now have been well documented in the study area.

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2.2 PHYSICAL SURVEYING

Due to the nature of cultural remains, the majority that occurs below surface, a physical walk through of the study area was conducted. Only active mining areas were surveyed as a mine plan was not available due to confidentiality issues. Wits Heritage Contract Unit surveyed the study area by two professional archaeologists and a professional palaeontologist over a period of 8 days, by means of vehicle and extensive surveys on foot. In addition the author consulted several Stone Age specialists and recommendations were made based on these consultations. For the Middle Stone Age component Prof K. Kuman (University of the Witwatersrand) was consulted and Dr M. Lombard (University of Johannesburg) acted as specialist reviewer. Prof K Sadr (University of the Witwatersrand) was consulted regarding the terminology associated with the Pastoralist/ Herder/ LSA component.

Aerial photographs and 1:50 000 maps of the area were consulted and literature of the area was studied before undertaking the survey. The purpose of this was to identify topographical areas of possible historic and pre-historic activity. All sites discovered both inside and bordering the proposed development areas were plotted on 1:50 000 maps and their GPS co-ordinates, in WGS 84, recorded. Photographs on digital film were taken at significant sites.

3. ARCHAEOLOGICAL LEGISLATION AND BEST PRACTICE

Phase 1 Archaeological Impact Assessments (as a specialist component of a Heritage Impact Assessment) are a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of a heritage specialist input is to:

- Identify any heritage resources, which may be affected;
- Assess the nature and degree of significance of such resources;
- Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- Assess the negative and positive impact of the development on these resources;
- Make recommendations for the appropriate heritage management of these impacts.

The AIA or HIA, as a specialist sub-section of the Environmental Impact Assessment [EIA] is required under the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999)., Section 38(1), Section 38(8) the National Environmental Management Act (NEMA) and the Mineral and Petroleum Resources Development Act (MPRDA).

The AIA should be submitted, as part of the EIA, BIA or Environmental Management Plan [EMP], to the PHRA if established in the province or to SAHRA. SAHRA will ultimately be responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and required additional development information, as per the EIA, BIA / EMP, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA.

Minimum standards for reports, site documentation and descriptions are set by the Association of Southern African Professional Archaeologists [ASAPA] in collaboration with SAHRA. ASAPA is based in South Africa and represent professional archaeology in the Southern African Development Community [SADC] region. ASAPA is primarily involved in the overseeing of archaeological ethical practice and standards. Membership is based on proposal and secondment by other professional members.

Phase 1 AIA's are primarily concerned with the location and identification of sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidance in the developer's decision making process:

Phase 2 archaeological projects are primarily based on salvage / mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations should be done under a permit issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes as minimum requirements, reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation is conducted on a site, a destruction permit must be applied for from SAHRA before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation. If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

4. Baseline Study

4.1 Evaluation of Heritage sites

This chapter describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance:

- The unique nature of a site
- The integrity of the archaeological deposit
- The wider historic, archaeological and geographic context of the site
- The location of the site in relation to other similar sites or features
- The depth of the archaeological deposit (when it can be determined or is known)
- The preservation condition of the site
- Potential to answer present research questions.

4.1.1 Heritage Site Significance and Mitigation Measures

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report. Recommendations in the table and Section 6 of this report should be read and used in conjunction with the recommendations in Section 9 of this report.

FIELD RATING	***GRADE***	***SIGNIFICANCE***	***RECOMMENDED MITIGATION***
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.C)	-	Low Significance	Destruction

5.2 Archaeological Context of study area

South Africa has one of the longest archaeological sequences in the world. With a southern African palaeo-anthropological record that stretches back to 4Mya (millions of years ago), reconstruction of the unique, albeit slow-paced history of early hominin and human evolution that played itself of in the area from the Cape to Ethiopia remains of international importance. The majority of our archaeological history is characterized by a time when our ancestors relied, based on tangible evidence, heavily on stone as primary technological medium. Technological evolution, synonymous in part with physical, cultural and cognitive change, resulted in new primary identified technologies; today used to differentiate the basic archaeological periods in southern African archaeology: The Stone Age, the Iron Age and the Historical Period.

It is thus worthwhile to briefly review the southern African archaeological record and place significant known occurrences in context.

The archaeology of the area can be divided into the Stone Age, Iron Age and Historical timeframe.

Stone Age

The Stone Age is divided into the Earlier (ESA), Middle (MSA) and Later Stone Age (LSA) and refers to the earliest peoples of South Africa who mainly relied on stone for their tools. Below is a brief introduction to each of these periods. Continuous academic research results may sift interpretations and timelines slightly from what is presented here, it is therefore only considered an informal framework.

Earlier Stone Age: The period roughly between 2.5 million yrs and 250 000 yrs ago. Acheulean stone tools are dominant:

The ESA in southern Africa is defined by the Oldowan complex, primarily found at the sites Sterkfontein, Swartkrans and Kroomdraai, situated within the Cradle of Humankind, just outside Johannesburg (Kuman, 1998). Within this complex, tools are more casual and expediently made and tools consist of rough cobble cores and simple flakes. The flakes were used for such activities as skinning and cutting meat from scavenged animals. This industry is unlikely to occur in the study area.

The second complex is that of the more common Acheulean, defined by large handaxes and cleavers produced by hominids at about 1.4 million years ago (Deacon & Deacon, 1999). Among other things these Acheulean tools were probably used to butcher large animals such as elephants, rhinoceros and hippopotamus that had died from natural causes. Acheulean artefacts are usually found near the raw material from where they were quarried, at butchering sites, or as isolated finds. The favoured raw material for the production of Early Stone Age tools was quartzite. It is no coincidence therefore, that ESA sites are often found next to river beds where large quantities of water worn quartzite cobbles can be found. Several ESA sites are on recorded in the study area (Halkett 1999). Due to the mining of the paleo-gravels in the study area there is a high likely hood that the project can impact negatively on ESA material. The presence and significance of finds will be determined by a field investigation.

Middle Stone Age: Various lithic industries in SA dating from roughly 250 000 yrs to 30 000 yrs before present.

During the MSA, significant changes started occurring in the evolution of the human species. These changes manifest themselves in the complexity of the stone tools created, as seen in the diversity of tools, the standardisation of these tools over a wide- spread area, the introduction of blade technology, and the development of ornaments and art. What these concepts ultimately attest to is an increase or development of abstract thinking. By the beginning of the MSA, tool kits included prepared cores, parallel-sided blades and triangular points hafted to make spears (Volman, 1984). MSA people had become accomplished hunters by this time, especially of large grazing animals such as wildebeest, hartebeest and eland.

These hunters are classified as early modern humans, but by 100,000 years ago, they were anatomically fully modern. The oldest evidence for this change has been found in South Africa, and it is an important point in debates about the origins of modern humanity. In particular, the degree to which behaviour was fully modern is still a matter of debate. The repeated use of caves indicates that MSA people had developed the concept of a home base and that they could make fire. These were two important steps in cultural evolution (Deacon & Deacon, 1999). Large cave sites discovered in the Kalk Bay Mountains on the Cape Peninsula in the 1920s, contained deep deposits with large numbers of more refined stone artefacts in the lower parts of the sequences (Sampson 1974). Accordingly, if there are caves or shelters in the study area, they may be sites of archaeological significance.

MSA artefacts are common throughout southern Africa, but unless they occur in undisturbed deposits, they have little significance. Some MSA sites are on record in the study area (Halkett 1999).

Later Stone Age: The period from about 30 000 yrs before present to the period of contact with either Iron Age farmers or European colonists.

By the LSA, human beings are anatomically and culturally modern. Tools associated with this time period are specialised, and commonly associated with hunter-gatherer groups. It is also within this period that contacts with migrating groups occur throughout southern Africa. Initial contact was between hunter-gatherer groups and expanding Bantu farming societies, and secondly with the arrival of colonist along the coast.

Having a prodigious knowledge of the environment and the resources around them, their cultural repertoire included a complex belief system, aspects of which are represented in many rock painting and engraving sites in the northern and western Cape. San rock art has a well-earned reputation for aesthetic appeal and symbolic complexity (Lewis-Williams, 1981). In addition to art, LSA sites contain diagnostic artefacts, including micro lithic scrapers and segments made from very fine-grained rock (Wadley, 1987).

Spear hunting probably continued, but LSA people also hunted small game with bows and poisoned arrows. Sites in the open are usually poorly preserved and therefore have less value than sites in caves or rock shelters. If there are rock shelters or caves in the study area, they may contain LSA sites of significance.

Ceramics and sheep as live stock show that a pastoralist way of life was embraced, in this case with herds of fat-tailed sheep and later cattle (Smith 1987, Sealy and Yates 1994). With pastoralist way of life, or soon afterwards, ceramic technology was introduced. San people have been known to co-exist with pastoralists but it seems hunter gatherers moved on to live in areas where grazing opportunities were less attractive to pastoralists (Parkington et al. 1986). The origin of early stock keeping and ceramic technology in southern Africa is still unclear but current evidence shows that it was introduced from the north.

Several rock art sites, pastoralist and herder sites are on record in project area.

The Colonial/Historical Period

The Dutch colonists arrived in the Cape in 1652. They set up a replenishment station in the Cape. The Dutch encountered several Khoekhoen groups upon their arrival. The pastoralists moved for grazing for their flocks in and around the Cape Peninsula and the greater area around the Cape.

Earlier contact between Europeans and indigenous southern African pastoralist groups had occurred earlier when Portuguese mariners sailing down the coast in the 15th and 16th centuries had bartered supplies of meat from the Khoekhoen that they encountered at places such as Saldanha Bay (Smith 1985).

Writings of early travellers show that some San groups still existed in the Cape well into the colonial period. They pursued a largely hunting and gatherer lifestyle and in the more mountainous regions where they were able to avoid conflict with either the Khoekhoen or Dutch settlers (Parkington *et al* 1986).

The San suffered from repeated commando raids from the 1770s in the Karoo area, but some groups maintained a degree of independence for another century (Deacon and Dowson 1996).

Some of Khoekhoen and San continued aspects of their traditional way of life and cultural repertoire in the more arid areas of Namaqualand and the Karoo until they were displaced in the 19th century. Early travellers through Namaqualand and especially Robert Jacob Gordon in 1779 clearly indicate the presence of indigenous hunter-forager and pastoralist groups in these areas in their accounts of their experiences. One of the original Khoekhoen groups, the Nama, met by Gordon, still practices a form pastoralism in reservations in Namaqualand to this day.

5.3 Probability of occurrence of sites

From the above information it is clear that a medium possibility of the occurrence of cultural heritage sites could be expected in the study area.

A. PALAEONTOLOGICAL LANDSCAPE

CONTEXT

Fossil remains: Such resources are typically found in specific geographical areas, e.g. the Karoo and are embedded in ancient rock and limestone/calcrete formations. Exposed by road cuttings and quarry excavation: *High Probability*

B. ARCHAEOLOGICAL LANDSCAPE

CONTEXT

NOTE: *Archaeology is the study of human material and remains (by definition) and is not restricted in any formal way as being below the ground surface*.

*Archaeologica*l remains dating to the following periods can be expected with in the study area:

Stone Age finds

- ESA: *Medium - High Probability*
- MSA: *Medium - High Probability*
- LSA: *Medium - High Probability*
- LSA –Herder: *High Probability*

Iron Age Finds

- EIA: *Not applicable*
- MIA: *Not applicable*
- LIA: *Low Probability*

Historical finds

- Historical period: *Medium Probability*
- *Historical dumps*: *Medium Probability*
- *Structural remains*: *Medium Probability*

Military Finds

- *Battle and military sites*: *Low - Medium Probability*

Burial/Cemeteries

- *Burials over 100 years*: *High Probability*
- *Burials younger than 60 years: High Probability*

Subsurface excavations including ground levelling, landscaping, and foundation preparation can expose any number of these.

6. Archaeological Impact Assessment

In order to provide Trans Hex Mining with a comprehensive overview of cultural heritage resources in the study area and to assist them in managing these resources in a responsible manner the Archaeological Impact Assessment conducted by Halkett in 1999 was taken as a baseline. The current study was aimed at adding onto the existing information database therefore the same numbering format was used as well as the locality map used by Halkett for comparative purposes.

The Impact Assessment focussed on the active mining in 5 areas (Fig. 2) namely the Baken mining area called Koeskop in the Halkett report, Bloeddrift mining area, Nxodap Mining area, Mehl mining area called Jakkelsberg in Halkett report, and the Reuning mining area.

Some sites were recorded outside the active mining areas and are labelled as general sites. The following sections will consist of a brief description of each mining area and a short site description of sites found during the survey with a Heritage Site Significance for each site. A table summarising each area with all the known sites in that area will follow with recommendations and co-ordinates for the sites. The co-ordinates provide for sites recorded other than the sites recorded by the author must be regarded as estimates only since no co-ordinates are available for these sites in the reports. Sites indicated in Grey are previously recorded sites by other heritage specialists.

The following mine personnel accompanied the survey team and also pointed out sites known to them. Mr. Joshua Cloete, Mr Patric Saal and Mr. Deon Bower.

Please note that it was not the aim of the current study to visit previously recorded sites although there might be some that overlap.

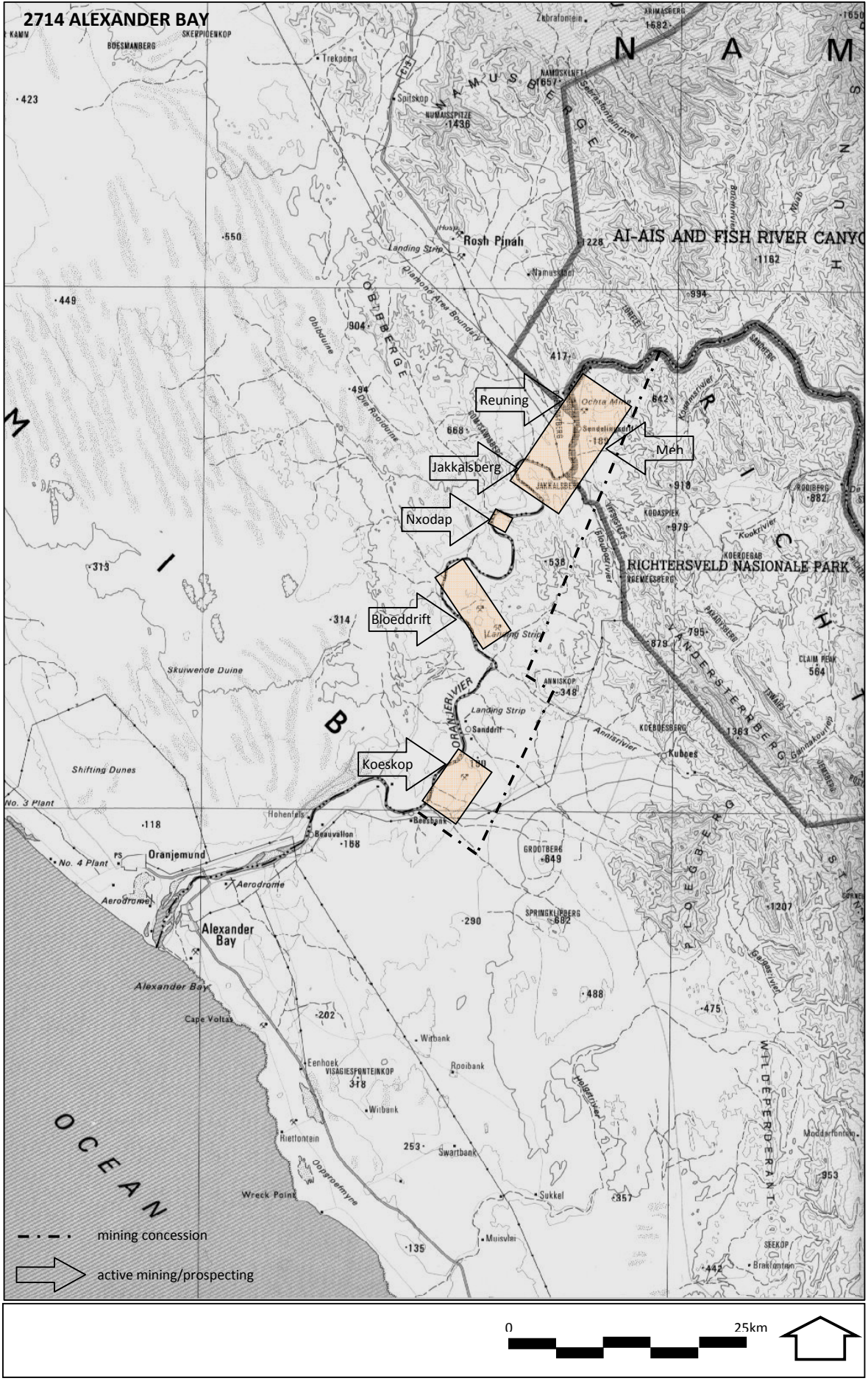

Figure 2: Map of Mining and survey areas (After Halkett 1999)

6.1 General Sites

6.1.1 Site 001 - S28°22'36.8"; E16°49'13.5"

The site was identified approximately 30m south of an existing gravel road from Sendelingsdrift towards Bloeddrift next to the Orange River. Site 001 constitutes a portion of an old wagon road, typified by monolithic stone markers erected in double alignment across the steep gradient of the landscape. The road is believed to have been used until fairly recently by the Nama (Pers Comm: Niklaas Bok).

Site Significance Assessment & Recommendations: Site 001 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. The site is not threatened by current mining activities.

Figure 3: General view of Site 001

6.1.2 Site 002 - S28°22'41.5"; E16°49'40.3"

The site is characterised by stone outcrops on a relatively prominent dune on the Orange River floodplain. This is a site with evidence of several cultural phases represented:

1. Relatively recent occupation is manifest in the contemporary remains of a shelter, characterised by stone outlines with dome-shaped beams still present on site. The remains of two associated contemporary stock enclosures attest to current Nama pastoralist lifeways. Niklaas Bok, from the nearby town of Kuboes, explained that he often uses the site when attending his goats sometimes for as long as three weeks to a month on end. Middens are not associated with more recent use of pastoralist sites; it was explained that herders now bury their refuse rather than just piling it, which created the very visible archaeological middens or earlier times. In addition, grass mats have been replaced by plastic and blanket coverings for the dome-shaped shelters. Graffiti on a quiver tree at Site 002 is interpreted as of recent origin.

2. Pastoralist deposits: The older component of the site is situated within the boundaries of the rocky outcrops (40x30m), comprising two stock enclosures, characterised by livestock dung deposits on slightly compressed sediments. Stone outlines are indicative of a former nomadic dome-shaped hut situated towards the south-east of the stock enclosures. Pastoralist shelters were constructed from dome-shaped beams, traditionally covered by grass mats. A small prominent mound probably represents a midden. Two panels with petroglyphs (pecked engravings) were recorded in close proximity to the site: to the north west of the central area of the site [2.1] (S28°22'40.1; E16°49'33.9) and to the south east [2.2] (S28°22'43.9; E16°49'41.7").

3. Stone tool deposits were found underlying the pastoralist site, extending far across the dune and neighbouring lower lying dunes, and covering an area of approximately 300x300m. The stone artefacts were primarily produced from quartzite but with a few samples made from dolerite. Artefact densities (artefact: m²) approach 3:1, but are typologically and technologically not of a high quality. Some of the pointed, retouched artefacts and large flakes indicate the presence of MSA societies. Several of the smaller pieces could also indicate LSA occupational phases.

Site Significance Assessment & Recommendations: Site 002 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is not impacted on by current mining activities.

Figure 4: A selection of Stone Age artefacts

Figure 5 : Pastoralist remains at Site 002

Figure 6: Rock art to the south east of the site

6.1.3 Site 003 - S28°22'37.9"; E16°49'49.1"

Site 003 is situated approximately 260m north east of Site 002. Herder remains are represented by at least 3 stock enclosures, characterised by dung and encampment remnants. In addition to this, the remains of at least 2 residential structures were identified. Three prominent middens indicate the continuous use of the site, possibly implying a fairly significant time depth, while modern artefacts in the form of cloth etc. confirm contemporary use. Easily identifiable surface artefacts comprised of rusted metal and glass. Older artefacts may well be confined to middens.

A low density of MSA or LSA quartzite flakes characterise the slightly higher dunes to the south east of the site.

Site Significance Assessment & Recommendations: Site 003 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. The site is not threatened by current mining activities.

Figure 7: A small midden in front of stock enclosure remains at Site 003

6.1.4 Site 004 - S28°22'17.7"; E16°49'31.7"

Site 004 is characterised by a dolomite outcrop situated immediately north of the main gravel access road to Bloeddrift. Petroglyphs or pecked engravings at the site vary from abstract designs to contemporary graffiti. Approximately 30m south of the outcrop a contemporary Nama camp is [Site 4.1] situated at S28°22'19.6"; E16°49'31.2, along a now dry streambed. The site may well also represent the locality of an archaeological site, based on the known reuse of such campsites. Contemporary graffiti diminish the significance of the rock art site, but possible archaeological deposits in the vicinity could provide additional cultural context, which will enhance the cultural significance and interpretive potential of the resource.

Site Significance Assessment & Recommendations: Site 004 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. The site is at present not directly threatened by mining impact, but formal conservation of remains, by means of a fence or walled demarcation around the outcrops, is recommend.

Figure 8: General view of the Site 004 outcrops

Figure 9: Engravings at Site 004 - 1

6.1.5 Site 005 - S28°25'07.6"; E16°53'18.3"

Site 005 is typified by a small shelter overhang on the way to the '*Wondergat*' tourist attraction near Cornellskop. A low rising stone wall has been built around the front of the overhang. Ashy deposits inside the enclosed area represent reuse of the hearth, perhaps over a long period of time. Artefacts were made from a variety of raw materials, and mostly comprise microlithic types, characteristic of the LSA. A fairly large piece of ostrich eggshell was found at the site, but no ostrich eggshell beads, engraved ostrich eggshell or ceramics were identified amongst surface deposits.

Site Significance Assessment & Recommendations: Site 005 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is not threatened by mining but tourism may impact negatively on the site. It is recommended that the site be formally conserved by means of a fence or walled demarcation.

Figure 10: View of the Site 005 shelter

6.1.6 Site 006 - S28°25'02.9"; E16°53'24.7"

Site 006 consists of the remains of at least three graves. A head- and footstone, and partial remains of the original stone grave dressing of are still discernable. Rough stone scatters are indicative of two more grave localities. Natural weathering can be expected to take its toll on the site, and could result in making the locale indistinguishable as a heritage resource in the future.

Site 006 is situated on a fairly large plain on route to the '*Wondergat*' tourist attraction – increasing tourism may threaten the site.

Site Significance Assessment & Recommendations: Site 006 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is not threatened by mining but tourism and natural weathering may impact negatively thereon. It is recommended that the site be formally conserved by means of a fence or walled demarcation. A plaque should be erected informing tourists that the site is formally protected.

Figure 11: General view of Site 006

6.1.7 Site 007 - S28°08'15.0"; E16°53'34.1"

Site 007 is situated along the gravel access road between the Reuning and Mehl mines. The site is typified by a low lying palaeo-river gravel terrace, the surface of which displayed a low quantity of MSA artefacts. Terrace dimensions approximate 400x200m. Artefact ratios (artefacts: m²) across the terrace surface were particularly low; in the region of 1:2-4, with typology and technology very similar to that recorded on other terrace surfaces and raw material having been sourced directly from the local gravels. The low density of artefacts, specifically in comparison with much higher densities recorded along the Orange River allocates the site a low archaeological significance. A bulk sample pit impacted negatively on the site – the low density archaeological deposit seems restricted to the more-o- less top 50cm of the stratigraphic section. Mining under the current EMP will not impact on the site, but exploration and future development may well impact on the sites.

Site Significance Assessment & Recommendations: Site 007 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Based on the particular low artefact densities at Site 007 it recommended that in the event of impact the site be destroyed under a SAHRA Site Destruction Permit.

Figure 12: General view of the Site 007 terrace

6.1.8 Site 008 - S28°08'28.8"; E16°53'32.7"

Site 008 is situated adjacent to a dry gully. It is primarily to the south of the gully but with a few stone packed features indicating use of the northern side of the stream as well. The site comprises the fairly recent remains of a contemporary herder settlement with compacted sediment indicative of a stock enclosure. A number of deflated middens yielded primarily quartzite flake tools, undecorated ceramics and ostrich eggshell, indicating older, LSA occupation. Structural remains are particularly scant, comprising ephemeral remains of a few stone features on both sides of the stream. A stone cairn [Site 8.1] is located upslope from the site remains at S28°08'29.2; E16°53'33.8". The oval shaped stone packed feature could be a grave and is aligned east to west. The site is not threatened by current mining activities.

Site Significance Assessment & Recommendations: Site 008 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. The stone cairn/possible grave at Site 8.1, inferred to be directly associated with later phases of site occupation should be conserved and fenced with an access gate unless it can be established that it is not a grave.

Figure 13: View of the Site 008 with the possible grave in the middle of the picture

Figure 14:Close-up of possible grave

Figure 15: Selected artefacts from Site 008

Figure 16: Compacted sediment indicative of stock enclosures

6.1.9 Site 009 - S28°10'54.0"; E16°53'11.1"

Site 009 consists of a single easily identifiable grave, oval in shape and stone covered without a head- or footstone orientated east to west. The site is located in close proximity to a small erosion gully that may have impacted on other graves. East of Site 009 at approximate co-ordinate S28°10'53.4"; E16°53'08.1" (Site 9.1) stone scatters were located adjacent to the gully. The haphazard composition of the stones may indicate the locality of former, eroded graves. Alternatively, natural erosion from gravel terraces may have resulted in the fairly large stones having been deposited in this area. Verification of the stone clusters, of natural or anthropogenic origin, would only be possible by means of test pitting. At present however current mining will not impact on the site and stone features.

Site Significance Assessment & Recommendations: Site 009 is assigned a SAHRA High Significance and a Generally Protected A Field Rating. It is recommended that the Site 009 is fenced with an access gate.

Figure 17: General view of the Site 009 grave

Figure 18: Clusters of stone in the vicinity of Site 009 that might be the remains of eroded grave dressings

6.1.10Site 010 - S28°10'52.2"; E16°53'10.3"

Site 010 constitutes a small informal cemetery comprising of three graves, including the graves of two adults and one child. Graves are demarcated by stone grave dressing with one adult grave displaying a stone slab headstone.

Site Significance Assessment & Recommendations: Site 010 is assigned a SAHRA High Significance and a Generally Protected A Field Rating. It is recommended that Site 010 be formally conserved by means of a fence and access gate.

Figure 19: General view of Site 010

Summary

Map code	Site	Type / Period	Description	Co-ordinates
1	Site 001	Pastoralist / Colonial	Wagon Road	S28°22'36.8"; E16°49'13.5"
2	Site 002	Palaeo-pastoralist / Pastoralist	Settlement	S28°22'41.5"; E16°49'40.3"
2.1			Rock Art	S28°22'40.1"; E16°49'33.9"
2.2			Rock Art	S28°22'43.9"; E16°49'41.7"
3	Site 003	Pastoralist	Settlement	S28°22'37.9"; E16°49'49.1"
4	Site 004	Pastoralist	Rock Art	S28°22'17.7"; E16°49'31.7"
4.1		Contemporary	Nama settlement / potential archaeological site	S28°22'19.6"; E16°49'31.2"
5	Site 005	LSA	Shelter	S28°25'07.6"; E16°53'18.3"
6	Site 006	Contemporary	Graves / Cemetery	S28°25'02.9"; E16°53'24.7"
7	Site 007	MSA	Knapping	S28°08'15.0"; E16°53'34.1"
8	Site 008	Pastoralist / Contemporary	Settlement	S28°08'28.8"; E16°53'32.7"
8.1			Graves / Cemetery	S28°08'29.2"; E16°53'33.8"
9	Site 009	Contemporary	Graves / Cemetery	S28°10'54.0"; E16°53'11.1"
9.1			Stone clusters	S28°10'53.4"; E16°53'08.1"
10	Site 10	Contemporary	Graves / Cemetery	S28°10'52.2"; E16°53'10.3"

6.2 Baken Mining area

This area is also referred to as Koeskop and is the most intensively mined area. No GPS or camera was allowed within the active mining areas and observations were made mostly on the currently unmined palaeo terraces and Orange River floodplain. Refer to Figure 20 - 21 for the extent of the survey and site distribution. The extent of the sites is indicated by purple polygons.

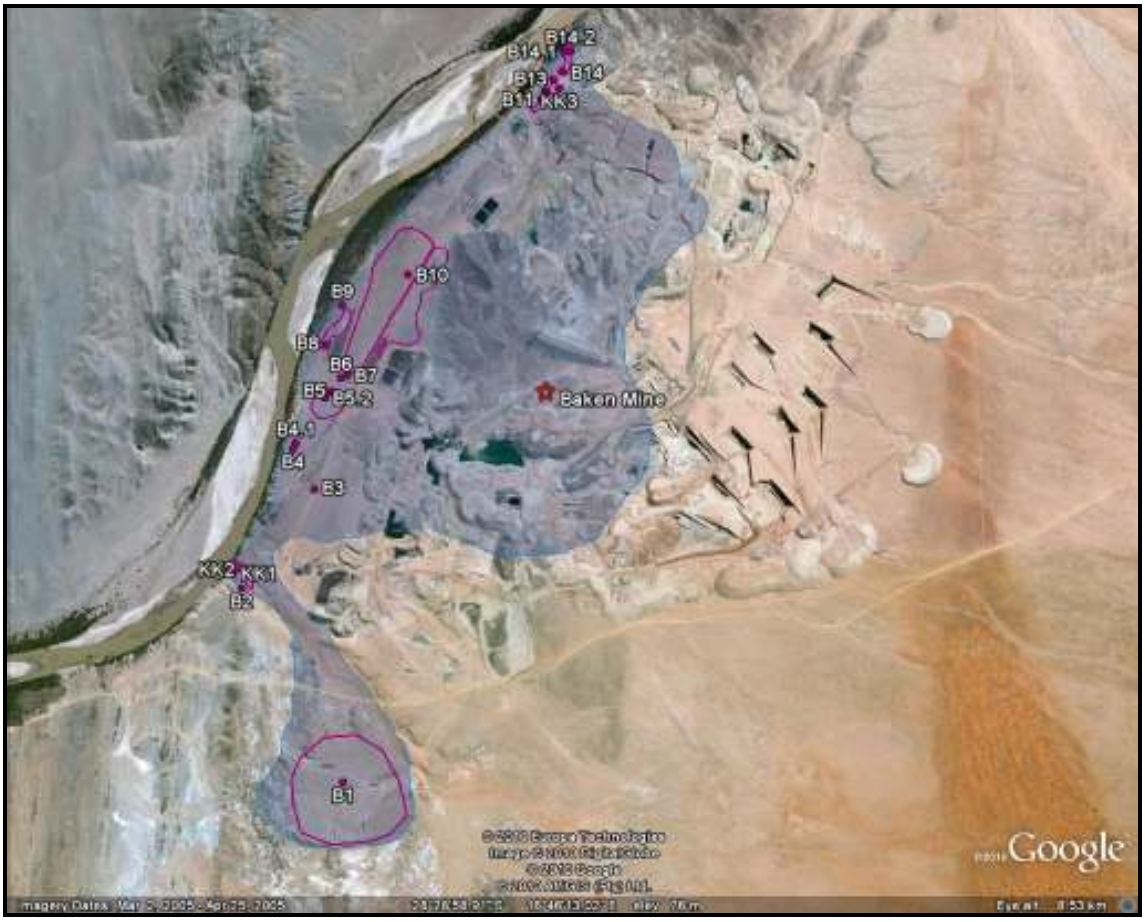

Figure 20: Extent of Baken south Surveyed area indicated in grey

Figure 21: Extent of Baken Surveyed area north indicated in grey

6.2.1 Site B1 - S28°30'40.8"; E16°44'30.4"

The site is situated on a palaeo river gravel terrace, with archaeological deposits confined to the approximate top 50cm of the gravels. It is relatively large, extending for almost a kilometre. Site B1 is a multi-component site containing stone artefacts of a variety of raw materials, considered characteristic of the ESA (primarily handaxe type tools), MSA (medium-sized flake and blade-like tools) and LSA (typical microliths, but also some larger pieces). It yielded a low artefact ratio (artefacts: m²) of approximately 2-4:4 for ESA and MSA type artefacts with a slightly higher ratio of about 4:1 recorded for LSA examples. Using the existing sections, exposed by box cuts from previous exploration, intact stratigraphic division between the temporally and technologically different stone tool types could not be established.

Site Significance Assessment & Recommendations: Site B1 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Better preserved sites with a higher frequency of artefacts are found in the study area and it is recommended that development across the site locale can proceed after a SAHRA Site Destruction Permit has been granted.

Figure 22: A collection of artefacts from Site B1

6.2.2 Site B2 - S28°29'45.6"; E16°44'24.5"

Site B2 is situated on a low rise along a dry gully. The site is characterized by the rectangular foundations of a structure with dimensions approximating 3x2m. Stone foundations and low rising mud brick walls are still discernable underneath the heavy cover of post depositional sand. Three stone cairns in the immediate vicinity of the site could represent graves; alternatively the features may represent former exploration activity in the area.

Site Significance Assessment & Recommendations: Site B2 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. The site is impacted on by the current mining development at Baken. However, should development including secondary development, such as access roads be required, destruction of the residential feature is not deemed worthy of Phase 2 Archaeological Mitigation. Further inspection to ascertain the significance of the stone cairns would be necessary.

Figure 23: Remains of the Site B2 rectangular feature

Figure 24: Two of the stone piled features at Site B2

6.2.3 Site B3 - S28°29'18.9"; E16°44'49.1"

Site B3 is situated immediately east of the gravel access road. The site comprises the ruins of a mud-brick rectangular structure. Portions of a shale feature are still visible at the back of the structure. Mound remains towards the west of the structure are the result of a current water project (excavations for pipelines) and would have impacted on any features in that area. The age of the structure is unknown, but it could be older than 60 years and therefore is protected by legislation.

Site Significance Assessment & Recommendations: Currently Site B3 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating because the age of the site is unknown. The site will not be impacted on by the current mining development at Baken but if impacted on in future the site will have to be assessed by a conservation architect.

Figure 25: General view of Site B3

Figure 26:Close-up of a portion of Site B3

6.2.4 Site B4 - S28°29'07.3"; E16°44'42.8"

Site B4 is characterized by the remains of an old donkey cart and industrial artefacts like wire, iron and glass, scattered over a large area. More or less 10m south of the cart is a stone cairn that could represent a grave that may or may not be directly associated with the fairly recent Site B4 remains. Approximately 60m to the north-east of the cart (B4.1 – S28°29'05.8; E16°44'43.8) the stone foundations of a seemingly circular or oval structure contains another stone cairn that may be interpreted as either a possible grave or merely as part of the oval structure. Based on site features and artefacts, the site is inferred to have a recent date although a degree of occupation continuity can be expected.

Site Significance Assessment & Recommendations: Site B4 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. It is recommended that if the site needs to be destroyed the purpose of the stone cairns must be established before a SAHRA Site Destruction Permit can be applied for.

Figure 27: The Site B4 donkey cart

Figure 28: Remains of a circular / oval structure at Site B4

Figure 29: A stone cairn at Site B4 may represent the locality of a grave

6.2.5 Site B5 - S28°28'51.9"; E16°44'56.5"

Site B5 covers an area of approximate 300x300m. The area is characterized by a number of residential remains, one where the partial collapsed remains of an original mud brick wall is still identifiable. In addition stone demarcations indicate the localities of at least 5 additional '*matjies*' or typical herder huts. Two middens were identified situated at B5.1: S28°28'51.9"; E16°44'55.9" and B5.2: S28°28'53.2"; E16°44'53.9" respectively, while a number of smaller more informal middens are present across the site. On-site artefacts indicate a colonial occupation, and include metal, ceramics, bone, bottle glass, but the presence of quartz stone tools could represent the presence of hunter-gatherer or hunter-herder societies. Rectangular stone features are indicative of former stock encampments. The diversity of cultural material on site indicates a multi-component site.

Site Significance Assessment & Recommendations: Site B5 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that the site be mitigated prior to mining impact. Alternatively the site should be formally conserved in accordance with a SAHRA approved Site Management Plan.

Figure 30: Circular and rectangular stone alignments indicative of herder type remains at Site B5

Figure 31: Circular stone arrangements indicative of typical herder features

Figure 32: Colonial period artefacts from Site B5

Figure 33: Rich midden remains at the Site B5 proper

6.2.6 Site B6 - S28°28'48.1"; E16°44'59.1"

The formal cemetery at Site B6 is at present fenced off with an access gate. The cemetery contains seven graves of which two are fairly formal, European graves; one being of an adult male, Mr Van Zyl, deceased in 1932, and the other of an infant. The additional 5 graves are stone packed with a cement grouting.

Site Significance Assessment & Recommendations: Site B6 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. Current site conservation measures comply with SAHRA Minimum Site Conservation Standards. It is recommended that proposed mining do not impact within 15m of the formally conserved site.

Figure 34: General view of the formal Site B6 cemetery

Figure 35: The double grave of Mr Van Zyl dating to 1932

6.2.7 Site B7 - S28°28'47.3"; E16°45'01.3"

Site B7 constitutes an informal cemetery comprising approximately 37 graves. The graves are east-west aligned in roughly four rows. Grave dressings consist of mostly of stone including some with upright, monolithic headstones, and some with both head- and footstones. Wooden crosses were also used to mark graves. The site is situated approximately 50m north-east of the Site B6 cemetery atop the palaeo-river gravel terrace which exhibited a fairly low density of surface visible ESA and MSA artefacts.

Site Significance Assessment & Recommendations: Site B7 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. It is recommended that the site be either formally conserved (formal fencing of the site with an access gate) prior to proposed mining in the vicinity of Site B7; alternatively the site should be mitigated under a SAHRA Excavation permit and in accordance with the prescribed SAHRA public consultation process prior to mining impact.

Figure 36: A selection of graves from Site B7

Figure 37: A child's grave with headstone and footstone still in place

6.2.8 Site B8 - S28°28'51.9"; E16°44'56.5"

Site B8 constitutes a particularly silty area of approximately 300m in length in which a number of circular churned stone deposits were found. The features are reminiscent of simple reversed stratigraphies and interpreted as old exploration pits that exposed some LSA artefacts that have been covered by sand. Several earlier mining exploration activities are present in the general area around Site B5, Site B6 and Site B7.

Site Significance Assessment & Recommendations: Site B8 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. It is recommended that the site can be destroyed with a SAHRA Site Destruction Permit.

Figure 38: Exploration drilling remains of Site B8

Figure 39: Exploration remains of Site B8

6.2.9 Site B9 - S28°28'27.7"; E16°45'00.7"

Site B9 consists of a small midden about 2x1m in size. The midden is located immediately adjacent to the vegetated dunes bordering the Orange River. It yielded a number of glass bottle pieces, bone and ostrich eggshell fragments. Based on the glass fragments this ephemeral site is of historic origin.

Site Significance Assessment & Recommendations: Site B9 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. It is recommended that the site be destroyed with a SAHRA Site Destruction Permit.

Figure 40: General view of Site B9

6.2.10 Site B10 - S28°28'20.0"; E16°45'22.1"

Site B10 consists of a palaeo-river gravel terrace, the surface of which yielded fairly high artefact presence with an average artefact ratio (artefact: m²) of 5-8:1 recorded. Identified artefacts included a number of ESA tools including rough handaxes and cleavers. MSA artefacts are typified by flake and blade technology. The fairly low presence of LSA tools can be interpreted as either cultural preference relating to the source of raw material, or the result of post-depositional processes where water may have been the major agent that resulted in smaller artefacts migrating through the deposit to lower levels. The road cutting to the east of the site indicated that the archaeological deposit is restricted to the top 50cm of the gravel deposit, but no clear stratigraphic layering could be established. Despite inferred stratigraphic complexities deposits at Site B10 remain typologically and technologically significant for comparative purposes.

Site Significance Assessment & Recommendations: Site B10 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. If the site is impacted on by mining the site must be mitigated before destruction.

Figure 41: Stone rich surface of Site B10

Figure 42: Selected artefacts from Site B10

Figure 43: Selected artefacts from Site B10

Figure 44: The road cutting along Site B10 with artefacts identified within the approximate top 50cm of the section

6.2.11 Site B11 - S28°27'32.7"; E16°46'07.1"

Site B11 also constitutes a portion of in-tact palaeo-river gravel terrace deposit. The terrace portion is approximately 200m long, and roughly parallel to the current course of the Orange River. Deposits are very similar to that of Site B10: MSA types dominate the surface collection, with fewer ESA examples. LSA types are inferred to be primarily out of context due to natural post-depositional processes, particularly water erosion that resulted in smaller artefacts migrating through the deposit to lower levels. Surface artefact ratios (artefact: m²) of approximately 5:1 were recorded.

Site Significance Assessment & Recommendations: Site B11 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that the site be destroyed under a SAHRA Site Destruction Permit. Sampling of the site is not deemed necessary; the value of mitigation and test pitting of gravel deposits lies in monitoring possible changes and assemblage composition at intervals along the Orange River only – mitigation or sampling at each identified type site will not necessarily add value to further basic understanding of these deposits.

Figure 45: General view of the Site B11 terrace slope

6.2.12 Site B12 - S28°27'30.6"; E16°46'08.5"

Site B12 comprises of a thin narrow 200x40m area primarily restricted to the silty river deposits but with the core of the site located at a small creek following the Site B11 gravel terrace. The site displayed the fairly scant, widespread remains of pastoralist settlement identified by lightly packed stone features that resemble the localities of '*matjies*' huts and stock enclosures. Small, poorly represented middens are indicative of quite recent, historical occupation. Identified midden material comprised primarily of ostrich eggshell pieces and rusted metal.

Site Significance Assessment & Recommendations: Site B12 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. If impacted on by mining no further mitigation is necessary and the developer can apply for a SAHRA Site Destruction Permit.

Figure 46: Pastoralist features along the Site 11 creek - 2

6.2.13 Site B13 - S28°27'30.6"; E16°46'08.5"

Site B13 is characterized by a single circular stone-packed grave. The size of the stone cairn is indicative of a child's grave. The site closely borders on Site B12 and stones used for the grave dressing were collected from a nearby 20x30m stock enclosure. The site is inferred to be of fairly recent origin.

Site Significance Assessment & Recommendations: Site B13 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. If mining will impact on the site the site should either be formally conserved (formal fencing with an access gate and a 15 meter buffer zone) or the site can be relocated in accordance with the applicable legislation.

Figure 47: The Site B13 grave

6.2.14 Site B14 - S28°27'25.4"; E16°46'14.4"

Site B14 constitutes a fairly large site with modern structures scattered over the site: The highest concentration of features is situated to the south of the site (B14 – S28°27'25.4"; E16°46'14.4"). Some square platforms, inferred to have been for residential purposes, were made of cement and stone. These were found in close association with typical recent herder 'matjies' hut stone outlines and larger rectangular stone alignments indicative of stock encampments. No clearly identifiable middens were found in association with the features but industrial artefacts, including metal and glass were strewn across the extent of the site. Approximately 160m to the north of the workers' village (B14.1 – S28°27'19.9; E16°46'15.1") is a large cement slab of approximately 15x9m with cement stairs leading onto the slab, next to this is the ruins of old ablution facilities. At least 16 stone outlined circular features interpreted as being flowerbeds are located more or less 60m east of the ablution remains (B14.2 – S28°27'19.7"; E16°46'17.2"). Further to the north of the described features are the ruins of a 4 roomed building constructed from cement and sun dried bricks. Window frames, roof and other fittings have already been removed with only portions of the walls still remaining. Water tank foundations can be found to the east of the structure (B14.3 – S28°27'16.0"; E16°46'16.6").

The exact age of the site is unknown but the remaining features are possibly younger than 60 years. The site is located next to the Orange River and falls within the 100 year flood line and no mining will occur in this area.

Site Significance Assessment & Recommendations: Site B14 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Destruction of all features pre-dating 60 years of age are subject to application and approval from the Northern Cape Provincial Heritage Resources Agency (NC PHRA).

Figure 48: Stone slab platform

Figure 49: Typical herder stone residential and stock enclosure remains at Site B14

6.2.15 Site B15 - S28°27'17.0"; E16°46'15.2"

Site B15 is situated immediately adjacent to the vegetated dunes of the Orange River and in direct proximity of Site B14; and could be associated with Site B14. Site B15 is characterised by the recent remains of a herder camp comprising at least two small rectangular stock enclosures outlined with wooden pegs, marking the entrances to the original structures. A cement slab measuring 4x4m may be associated with herder settlement or could be a remnant of Site B14. Although in the lack of identified hut remains the slab may have provided the floor of a residential structure. Three stone monoliths, associated with disturbed stone scatters, may demarcate the locality of associated graves. These grave-like features have a rough east west orientation. A midden with industrial rubble provides evidence for a recent occupation date for the site.

Site Significance Assessment & Recommendations: Site B15 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. This assessment can change if it is proved that the site does contain graves. The site is located within the 100 year flood line and will not be impacted on by mining.

Figure 50: General view of Site B15

Figure 51: A monolithic feature that may represent a grave headstone

6.2.16 Site B16 - S28°25'37.6"; E16°46'41.1"

This formal cemetery is situated in the Baken mining village. The cemetery has 14 graves, all with stone dressings and white-washed monolithic stone head- and footstones. The site is formally conserved by means of a low rising wall with access facilities, complying with SAHRA Minimum Site Conservation Standards.

Site Significance Assessment & Recommendations: Site B16 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is situated within the Baken mining village and will not be impacted on by any mining activities. Current site conservation measures comply with SAHRA Minimum Site Conservation Standards.

Figure 52: General view of Site B16

6.2.17 Site B17 - S28°25'22.1"; E16°46'55.2"

The memorial for Dewald Joshua-Her Domrogh (2004-2005) is situated immediately adjacent to the existing Baken gravel access road and on the slope of the palaeo-river gravel terrace that could be mined in future. The memorial stone does not demarcate a grave. The site is however of contemporary cultural significance and consultation with the family is recommended prior to mining impact on the gravel terrace.

Site Significance Assessment & Recommendations: It is recommended that the mine consults with the family regarding relocation / destruction of the memorial stone.

Figure 53: The Site B17 memorial

6.2.18 Site B18 - S28°25'08.18"; E16°46'47.2"

Site B18 is situated between the Baken mining village and Sanddfrift village. The site comprises a large approximately 1.5kmx500m palaeo-river gravel terrace with a rich surface artefact cover. Based on data gathered from other section exposures at gravel deposits, the artefact deposit at Site B18 is inferred to be approximately 50cm thick. Identified artefacts are primarily ascribed to the MSA and LSA. However this surface identification does not exclude the possibility that ESA samples may be present (an ESA artefact was collected from nearby silty deposits). If so, this site could represent one of the best conserved chronological gravel deposit stratigraphies identified.

The LSA at the Site B18 terrace may be representative of both macro- and micro-lithic technologies. An average artefact ratio (artefacts: m²) is estimated at 8-10:1. On average, however richer deposits displaying better technological characteristics were displayed towards the south of the site, with artefact densities decreasing towards the north in the general area east of Sanddrift and north of the access road. Deposits at the site are well conserved despite partial impact by access roads and a community development towards the south eastern portion of the site.

Site Significance Assessment & Recommendations: Site B18 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that the site is mitigated before destruction

Figure 54: View of the northern part of the Site B18 terrace

Figure 55: Selected artefacts from the southern part of Site B18

6.2.19 Site B19 - S28°25'16.3"; E16°46'37.1"

Site B19 is situated on the slope of a portion of the Site B18 terrace. The site comprises of approximately 13-15 modern herder stone feature remains. The majority of these is interpreted as remnants of residential structures or modern versions of the traditional '*matjies*' hut. Larger, still identifiable rough linear stone packed alignments may indicate the locality of small stock enclosures. However, scattered stone, at places resembling rough oval clusters may also be graves.

Midden remains indicated fairly ephemeral use of the site and the particularly recent origin thereof. Identified artefacts included primarily bone and rusted metal.

Site Significance Assessment & Recommendations: Site B19 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating until it is proven that the site do contain graves. If there are graves the site will be of High significance. It is recommended that the purposes of the oval packed stone structures are established before the site is impacted on.

Figure 56: General view of Site B19

Figure 57: A possible grave at Site B19

6.2.20 Site B20 - S28°23'39.2"; E16°47'09.3"

Site B20 is characterised by a paleo-river gravel terrace more-or-less parallel to the current course of the Orange River. The gravel terrace is roughly 1.4km long. Surface artefacts included ESA, MSA and LSA examples with artefact ratios (artefacts: m²) approximating 5:1. ESA artefacts have a low surface representation but may be confined to subsurface stratigraphic levels while MSA and both micro-c and macro-lithic LSA tools dominated surface exposures. The archaeological deposit is approximately 50cm deep.

Site Significance Assessment & Recommendations: Site B20 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that the site be destroyed under a SAHRA Site Destruction Permit after the recording of the site. Sampling of the site is not deemed necessary; the value of mitigation and test pitting of gravel deposits lies in monitoring possible changes and assemblage composition at intervals along the Orange River only – mitigation or sampling at each identified type site will not necessarily add value to further basic understanding of these deposits.

Figure 58: General view of the Site B20 terrace

Figure 59: An ESA artefact from Site B20

6.2. 21 Site KK1 - S28°29'41.2"; E16°44'21.9"

Site KK1 is a pre-colonial herder site that was first identified and described by Halkett (1999). In accordance with the findings of his fieldwork team locality of the kind of sites shows a definite preference for proximity to water; in the case of Site KK1 to the confluence of a small stream and the Orange River. The sites are eroding out from below silty deposits.

Clearly identified site features include a circular mound of one '*matjies*' hut and at least 2 more circular areas that may be representative of former residential structures. Towards the north-east of the '*matjies*' hut remains, and closer to the Orange River a number of fairly large middens proved to be rich archaeological material including ceramics (only undecorated pieces were found during the site inspection), ostrich eggshell and ostrich eggshell beads and quartz lithic artefacts.

Site KK1 is situated south of the proposed Baken mining area. In addition the site inspection confirmed very little impact on the site, although limited impact by contemporary pastoralists cannot be excluded.

Site Significance Assessment & Recommendations: Site KK1 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is located within the 100 year flood line and no mining impact is foreseen on the site.

Figure 60: Circular remains of a hut at Site KK1 with artefacts scattered around the hut mound

Figure 61: Selected artefacts from Site KK1

6.2.22 Site KK2 - S28°29'40.2"; E16°44'25.2"

Site KK2 was first identified and described by Halkett (1999) as situated close to a dry water course confluence with the Orange River and most probably post dating 2,000BP. The current access road cross-cuts the site with impact thereon having been continuous at least from the time of Halkett's assessment.

The site comprises of two components that may or may not be temporally related. To the north of the access road at a slight creek in the upper lying palaeo river gravel terrace the remains of what seems to be fairly recent ephemeral herder remains were present. Few artefacts and middens are directly associated with this area. The current access road however cuts across at least three fairly large middens, easily identifiable by intersecting ashy deposits. To the south of the access road, and running alongside the dry streambed, smaller middens yielded fairly high quantities of artefacts including primarily quartz lithic artefacts, ostrich eggshell fragments and beads, undecorated ceramic and Colonial Period bottle glass. These artefacts emphasize the fact that use of the site extended at least from Pre-colonial to colonial times. Two stone cairn features towards the south of the access road may be interpreted as graves.

Continuing impact on the site due to sheet erosion and use of the road, particularly on large middens remains a concern.

Site Significance Assessment & Recommendations: Site KK2 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is subject to continuous impact due to use of the road. It is recommended that the road is rerouted to avoid the archaeological site. If this is not possible the site must be mitigated during phase 2 excavations.

Figure 62: Selected artefacts from Site KK2

Figure 63: Selected artefacts from Site KK2

Figure 64: Two stone cairns that might be interpreted as graves

6.2.23 Site KK3 - S28°27'29.9"; E16°46'13.0"

Site KK3 was first recoded and reported on by Halkett (1999). The site is situated immediately adjacent to the current access road and bordered on the northern, eastern and western sides by the fenced mining area. The site contains approximately 30 graves, of both adults and children. Grave dressings consist of stone, and some graves are marked by head- and footstones. An erosion gully cuts through the south-western portion of the site, threatening the integrity of at least 3 graves. The cemetery is estimated to date to at least 100 BP.

Site Significance Assessment & Recommendations: Site KK3 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. The site is not threatened by mining but an erosion gully, cutting through the south-western portion of the site is threatening the integrity of graves. It is recommended that the gully should be rehabilitated and the sites fenced in.

Figure 65: General view of the Site KK3 cemetery

Figure 66: Stone covered graves with stone head and footstones

6.2.24 Site JKB E - S28°10'17.8"; E16°50'57.7"

Site JKB E was initially recorded and reported on by Halkett (1999) and described as a pastoralist encampment, characterized by a minimal artefact scatter with a relative date of 2000-1800 BP. An attempt to relocate the site proved unsuccessful; the Orange River floodplain east of the existing Mehl mine to Jakkalsberg, north of a steep relief bordering the Mhl3 gravel terrace deposit to the south were heavily affected by the 2002 floods, it is inferred that the site washed away or covered by silt.

Site Significance Assessment & Recommendations: Site JKB E has possibly been destroyed by natural agents (2002 flooding) and no assessment was possible

Figure 67: View of the floodplain between the Mehl mine and Jakkalsberg – 2002 floods impacted on the recorded sites situated on the floodplain

6.2.25 Site JKB F - S28°10'27.4"; E16°51'20.8"

Site JKB F, originally recorded and reported on by Halkett (1999), comprise a pastoralist encampment, preliminary dated to between 2000-1800 BP. It is evident from the Halkett summary that the fairly large site was rich in archaeological deposits, lithic artefacts and associated material; decorated ceramics and ostrich eggshell were documented across the surface of the general terrain. However, the 2002 floods had a profound impact on the site. Possible middens were identified by scant artefact concentrations on the floodplain, containing the odd piece of bone, lithic artefact and ostrich eggshell piece. No stock enclosure or hut remains could be identified, neither were there decorated artefacts or ostrich eggshell beads. Towards the east of the site JKB F area historical artefacts are scattered across the landscape, possibly indicating the general locality of an historical midden. The site is located in the 100 year floodplain and no mining impact is foreseen in this area.

Figure 68: Artefacts collected from the flooded plain at Site JKB F

Summary

Map code	Site	Type / Period	Description	Co-ordinates
B1	Site B1	ESA / MSA / LSA	Knapping	S28°30'40.8"; E16°44'54.1"
B2	Site B2	Colonial	Settlement	S28°29'45.6"; E16°44'24.5"
B3	Site B3	Colonial	Settlement	S28°29'18.9"; E16°44'49.1"
B4	Site B4	Colonial	Settlement	S28°29'07.3"; E16°44'42.8"
B5	Site B5	Colonial	Settlement	S28°28'51.9"; E16°44'56.5"
B6	Site B6	Contemporary	Graves / cemetery	S28°28'48.1"; E16°44'59.1"
B7	Site B7	Contemporary	Graves / cemetery	S28°28'47.3"; E16°45'01.3"
B8	Site B8	Colonial	Exploration pits	S28°28'38.5"; E16°44'55.0"
B9	Site B9	Pastoralist	Settlement	S28°28'27.7"; E16°45'00.7"
B10	Site B10	ESA / MSA / LSA	Knapping	S28°28'20.0"; E16°45'22.1"
B11	Site B11	ESA / MSA / LSA	Knapping	S28°27'32.7"; E16°46'07.1"
B12	Site B12	Pastoralist	Settlement	S28°27'30.6"; E16°46'08.5"
B13	Site B13	Pastoralist / Colonial	Graves / cemetery	S28°27'30.6"; E16°46'08.5"
B14	Site B14	Pastoralist / Colonial	Settlement	S28°27'25.4"; E16°46'14.4"
B15	Site B15	Pastoralist	Settlement	S28°27'17.0"; E16°46'15.2"
B16	Site B16	Contemporary	Graves / cemetery	S28°25'37.6"; E16°46'41.1"
B17	Site B17	Contemporary	Memorial	S28°25'22.1"; E16°46'55.2"
B18	Site B18	MSA / LSA	Knapping	S28°25'08.2"; E16°46'47.2"
B19	Site B19	Pastoralist	Settlement	S28°25'16.3"; E16°46'37.1"
B20	Site B20	ESA / MSA / LSA	Knapping	S28°23'39.2"; E16°47'09.3"
KK1	Site KK1	Pastoralist	Settlement	S28°29'41.2"; E16°44'21.9"
KK2	Site KK2	Pastoralist / Colonial	Settlement	S28°29'40.2"; E16°44'25.2"
KK3	Site KK3	Contemporary	Graves / cemetery	S28°27'29.9"; E16°46'13.0"

6.3 Bloeddrift Mining area

This area is well known for the numerous engravings on dolomite surfaces, while a number of herder and grave sites are also present on the floodplain along the river. Refer to Figures 69 - 70 for the extent of the survey and site distribution. The extent of the sites is indicated by yellow polygons.

Figure 69: Extent of the Bloeddrift Survey Area indicated in grey

Figure 70: Extent of the Bloeddrift Surveyed Area indicated in grey

6.3.1 Site BLD21-25 – BLD21: S28°21'12.8"; E16°48'30.8"

A high concentration of sites were recorded by Halkett (1999) situated on the silty floodplain between the BLD45 and BLD46 graves and the Orange River. All of the sites were described as artefact scatters of pastoralist or herder origin; with some remains interpreted as pre-dating and others post-dating 2000 years ago. Sites were recorded to have yielded lithic artefacts, ceramics (decorated and undecorated), ostrich eggshell pieces and beads. At the time of the assessment the total area, including original locales of Site BLD21 (S28°21'12.8"; E16°48'30.8"), BLD22 (S28°21'08.6"; E16°48'12.8"), BLD24 (S28°21'03.2"; E16°48'11.1") and BLD25 (S28°21'05.4"; E16°48'13.9") were completely destroyed by a community agricultural development, initiated by Trans Hex mining. The development was not preceded by an Environmental Impact Assessment and pre-recorded, and thus known sites were destroyed despite recommendations made in the report by Halkett, preceding the development by almost 10 years.

A high concentration of artefacts was visible along the disturbed southern fence of the agricultural development. Artefacts included lithics, ceramics, ostrich eggshell pieces and beads. Remnants of the original Site BLD21 have been disturbed to such an extent that further investigation among the now largely *ex situ* remnants of the deposit will yield only biased information. In addition Sites BLD22, BLD24 and BLD25 have been destroyed in totality.

Of the original Halkett (1999) archaeological herder recordings in the area some remnants of Site BLD23 (S28°21'07.9"; E16°48'28.3") is still in evidence; comprising of a number of midden remains, probably indicating the site periphery. Inspection of the middens yielded a number of lithics and ostrich eggshell pieces. These are of lesser quality than the disturbed remnants of Site BLD21 along the south of the development.

Site Significance Assessment & Recommendations: Sites BLD21, BLD22, BLD23, BLD24 and BLD25 have been destroyed by a recent community agricultural development. These pre-recorded sites have been either totally destroyed or impacted on to such an extent that additional mitigation is inferred to yield very little useful information. These sites were destroyed despite the known localities thereof and recommendation regarding their conservation made by Halkett in 1999.

Figure 71: View of the community agricultural development that destroyed pre-recorded Sites BLD21, BLD22, portions of BLD23, BLD24 and BLD25

Figure 72: Disturbed midden remains of Site BLD21 along the southern fence of the agricultural development

Figure 73: Selected artefacts from Site BLD21, destroyed by the community agricultural development

6.3.2 Site BLD26 - S28°21'04.9"; E16°48'33.9"

Site BLD26 was first recorded and reported on by Halkett (1999). The site is situated immediately east of the Site BLD46 graves on dolerite outcrops. Pecked engravings may have relative time depth, but subsequent modern graffiti reduces the heritage significance of the site. The majority of the engravings comprise of what is believed to be herder art, including primarily abstract designs.

Site Significance Assessment & Recommendations: Site BLD26 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating.

Figure 74: General view of the Site BLD26 outcrops

Figure 75: Abstract designs at Site BLD26

6.3.3 Site BLD27 - S28°19'48.9"; E16°47'57.8"

Site BLD27 was first recorded and reported on by Halkett (1999). The site is situated along the northern slopes of a prominent dolomite hill next to the Bloeddrift airstrip. Site BLD27 is easily identifiable by a large boulder displaying a panel of engravings. Primarily towards the north of the boulder a rich array of petroglyphs are found stretching from the foothills to approximately one third up the hill. Rock art comprise of singular art pieces as well as panels, exclusively made by means of the pecked engraving method, suggests a pastoralist origin of possibly both the Pre-colonial and Colonial Periods. Artwork mostly includes abstract designs. The site is situated within the Bloeddrift mining area, but will not be impacted on by further mining. As a result of impact on previously recorded sites it is however recommended that more than mere *in situ* conservation should be done in order to ensure the longevity of the fairly 'pristine' Site BLD27 petroglyphs.

Site Significance Assessment & Recommendations: Site BLD27 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating.

Figure 76: General view of Site BLD27

Figure 77: A highly decorated panel at Site BLD27

6.3.4 Site BLD28 - S28°19'38.4"; E16°47'09.6"

It is inferred that the site recorded and reported on by Halkett (1999) and labelled BLD28 refers to the approximate 400m long dolomite ridge close and more or less parallel to the Orange River. The ridge contains a fairly dense collection of pecked engravings, dominated by abstract designs that may be interpreted as produced during both Pre-colonial and Colonial times. More recent graffiti, the access road and power lines impacted on the site.

Site Significance Assessment & Recommendations: Site BLD28 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. Both the access road and power lines have already impacted on the site.

Figure 78: General view of the Site BLD28 dolomite ridge

Figure 79: Graffiti impacting on Site BLD28

6.3.5 Site BLD42 - S28°16'46.8"; E16°45'55.4"

Site BLD42 consist of a palaeo river gravel terrace roughly following the meander of the current Orange River to the south east. The terrace extends for more or less 3 km displaying a rich surface artefact cover. The archaeological deposit is approximately 50 cm in depth, as evident in a bulk sample section on the terrace with gravel deposits below being anthropogenically sterile. Identified artefacts are ascribed to the ESA, MSA and LSA. The majority of identified surface artefacts are probably associated with the MSA, and typified by rough flake and blade samples. An average artefact ratio (artefacts: m²) is estimated at 5:1. Site BLD42 is of significance with reference to monitoring of stone tool typology and technology.

Site Significance Assessment & Recommendations: Site BLD42 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that development in the vicinity of the site be preceded by Phase 2 Archaeological Mitigation comprising of test pitting for dating and comparative purposes with other ESA / MSA gravel terrace deposits.

Figure 80: General view of the Site BLD42 terrace

Figure 81: Exposed sections from a bulk sample at Site BLD42

6.3.6 Site BLD43 - S28°18'44.7"; E16°46'40.2"

The formal cemetery at Site BLD43 comprises of two adult graves; both are demarcated by stone, outlined with monolithic stone headstones. The site was identified by Trans Hex personnel and is at present formally fenced, with conservation measures complying with SAHRA Minimum Site Conservation Standards.

Site Significance Assessment & Recommendations: Site BLD43 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. Current site conservation measures comply with SAHRA Minimum Site Conservation Standards. It is recommended that proposed mining do not impact within 15m from the formally conserved site.

Figure 82: General view of Site BLD43

6.3.7 Site BLD44 - S28°17'44.8"; E16°46'33.2"

Site BLD44 is characterized by a dolomite ridge. Sections of the ridge were engraved (pecked engravings/petroglyphs). Engravings are, however sparsely scattered and display small, individual works at intervals. The site may have been used over an extensive period of time. The majority of the engravings comprise of abstract designs but at least one human figure was identified. A low density of quartzite lithic artefacts of general MSA or amorphous LSA origins was found along the ridge.

Site Significance Assessment & Recommendations: Site BLD44 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating.

Figure 83: General view of the BLD44 ridge

Figure 84: Human figurines from Site BLD44

6.3.8 Site BLD45 - S28°21'05.0"; E16°48'25.9"

The site was shown to the survey team by mine personnel who were informed that this is a grave site. Site BLD45 comprises of a single rough stone packed oval shaped feature, situated on the slope of a sand dune. Based on the surface features it is difficult to confirm whether it is indeed a grave.

Site Significance Assessment & Recommendations: Site BLD45 is assigned a SAHRA High Significance and a Generally Protected A Field Rating, until it is proven not to be a grave. It is recommended that the site be formally conserved by means of a fence and access gate.

Figure 85: General view of Site BLD45

6.3.9 Site BLD46 - S28°21'04.4"; E16°48'30.8"

Site BLD46 comprise of 2 stone cairned graves, one of which is marked by a monolithic stone headstone. The site is not formally fenced or conserved.

Site Significance Assessment & Recommendations: Site BLD46 is assigned a SAHRA High Significance and a Generally Protected A Field Rating. It is recommended that the site be formally conserved by means of a fence and access gate.

Figure 86: General view of Site BLD46

Map code	Site	Type / Period	Description	Co-ordinates
BD1	BLD 1	Engraving	Halkett 1999	S28°22’21.5”; E16°49’39.1”
BD2	BLD 2	Engraving	Halkett 1999	S28°22’44.8”; E16°49’42.2”
BD3	BLD 3	Engraving	Halkett 1999	S28°22’42.6”; E16°49’39.8”
BD4	BLD 4	Engraving	Halkett 1999	S28°22’40.9”; E16°49’39.2”
BD5	BLD 5	Engraving	Halkett 1999	S28°22’39.9”; E16°49’38.2”
BD6	BLD 6	Engraving	Halkett 1999	-
BD7	BLD 7	Engraving	Halkett 1999	S28°22’38.0”; E16°49’44.6”
BD8	BLD 8	Engraving	Halkett 1999	S28°22’38.0”; E16°49’47.4”
BD9	BLD 9	Engraving	Halkett 1999	S28°22’14.7”; E16°49’33.3”
BD10	BLD 10	Artefact scatter	Halkett 1999	S28°22’20.2”; E16°49’25.6”
BD11	BLD 11	Shelter / Artefacts	Halkett 1999	S28°22’17.7”; E16°49’28.9”
BD12	BLD 12	Engraving	Halkett 1999	S28°22’23.8”; E16°49’26.6”
BD13	BLD 13	Engraving	Halkett 1999	S28°22’25.1”; E16°49’28.7”
BD14	BLD 14	Engraving	Halkett 1999	S28°22’25.9”; E16°49’30.8”
BD15	BLD 15	Artefact scatter	Halkett 1999	S28°22’26.7”; E16°49’31.8”
BD16	BLD 16	Engraving	Halkett 1999	S28°22’27.4”; E16°49’30.5”
BD17	BLD 17	Engraving	Halkett 1999	S28°21’12.3”; E16°48’52.8”
BD18	BLD 18	Engraving	Halkett 1999	S28°21’09.3”; E16°48’49.3”
BD19	BLD 19	Engraving	Halkett 1999	S28°21’04.7”; E16°48’43.7”
BD20	BLD 20	Engraving	Halkett 1999	S28°21’10.9”; E16°48’34.5”
BD21	BLD 21	Pastoralist	Settlement	S28°21’12.8”; E16°48’21.8”
BD22	BLD 22	Pastoralist	Settlement	S28°21’08.6”; E16°48’12.8”
BD23	BLD 23	Pastoralist	Settlement	S28°21’07.9”; E16°48’28.3”
BD24	BLD 24	Pastoralist	Settlement	S28°21’03.2”; E16°48’11.1”
BD25	BLD 25	Pastoralist	Settlement	S28°21’05.4”; E16°48’13.9”
BD26	BLD 26	Pastoralist	Rock Art	S28°21’04.9”; E16°48’33.9”
BD27	BLD 27	Pastoralist	Rock Art	S28°19’48.9”; E16°47’57.8”
BD28	BLD 28	Pastoralist	Rock Art	S28°19’38.4”; E16°47’09.6”
BD29	BLD 29	Engraving	Halkett 1999	S28°18’54.6”; E16°47’13.9”
BD32	BLD 32	Artefact scatter	Halkett 1999	S28°16’12.5”; E16°47’13.1”
BD33	BLD 33	Artefact scatter	Halkett 1999	S28°21’19.5”; E16°48’29.7”
BD34	BLD 34	Engraving / Artefacts	Halkett 1999	S28°20’46.4”; E16°48’35.1”
BD35	BLD 35	Engraving	Halkett 1999	S28°20’55.9”; E16°48’36.5”
BD36	BLD 36	Engraving	Halkett 1999	S28°18’25.9”; E16°46’44.7”
BD37	BLD 37	Artefact scatter	Halkett 1999	-
BD38	BLD 38	Artefact scatter	Halkett 1999	-
BD39	BLD 39	Artefact scatter	Halkett 1999	-
BD40	BLD 40	Artefact scatter	Halkett 1999	S28°22’01.5”; E16°49’16.5”
BD41	BLD 41	Graves	Halkett 1999	-
BD42	BLD 42	ESA / MSA / LSA	Knapping	S28°16’46.8”; E16°45’55.4”
BD43	BLD 43	Pastoralist	Graves / Cemetery	S28°18’44.7”; E16°46’40.2”
BD44	BLD 44	Pastoralist	Rock Art	S28°17’44.8”; E16°46’33.2”
BD45	BLD 45	Pastoralist	Graves / Cemetery	S28°21’05.0”; E16°48’25.9”
BD46	BLD 46	Pastoralist	Graves / Cemetery	S28°21’04.4”; E16°48’30.8”

6.4 Nxodap Mining area

Refer to Figure 20 - 21 for the extent of the survey and site distribution. The extent of the sites is indicated by red polygons.

Figure 87: Nxodap surveyed area indicated by grey polygons

6.4.1 Site NXP3 - S28°12'34.9"; E16°51'40.1"

Site NXP3 was first recorded and reported on by Halkett (1999). The site comprises of a small formal cemetery containing five graves, one being a child's grave. Graves are traditionally oval shaped, with stone packed grave dressings. The site is formally fenced with an access gate complying with SAHRA Minimum Site Conservation Standards.

Site Significance Assessment & Recommendations: Site NXP3 is ascribed a SAHRA High Significance and a Generally Protected A Field Rating. Current site conservation measures comply with SAHRA Minimum Site Conservation Standards.

Figure 88: General view of Site NXP3

Figure 89: Stone packed grave dressing of grave at site NXP 3

6.4.2 Site NXP4 - S28°13'17.4"; E16°48'49.2"

Site NXP4 comprises of a palaeo-river gravel terrace of approximately 600x350m in size. The terrace is located within the proposed Nxodap mining area and earmarked for mining. Surface stone artefacts included samples from the ESA, MSA and LSA, with gravel being used as raw material for knapping. Ground work on a portion of the site removed the top sand and gravel layer, therefore the site is divided into a northern and southern area. In the northern area surface artefacts included primarily ESA and MSA type artefacts of fairly rich quantities, approximate artefact ratios (artefacts: m²) of 4-7:1. In the southern portion where topsoil was scraped, with associated impact on the archaeology, a rich LSA member was revealed, with recorded artefact ratios of approximately 15:1. The reversed stratigraphy is inferred to be the result of post-depositional processes where smaller artefacts (and knapping *debitage*) seeped through the deposit. Despite the known secondary context, to an extent expected at open air sites, the terrace is regarded as particularly significant with respect to stone tool technological and typological information. An exposed bulk sample section indicated that the archaeological deposit is located within the top 50-70cm of the gravel.

Site Significance Assessment & Recommendations: Site B20 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that development in the vicinity of the site be preceded by a Phase 2 Archaeological Mitigation project

Figure 90: View of the Site NXP4 terrace

Figure 91: Sections at Site NXP4 showing that archaeological deposit is limited to the top 50-70cm of the gravel deposits

Map code	Site	Type / Period	Description	Co-ordinates
NXP1	Site NXP 1	Engravings	Halkett 1999	S28°13'19.1"; E16°50'25.9"
NXP2	Site NXP 2	Artefact scatter	Halkett 1999	S28°13'19.2"; E16°50'32.3"
NXP3	Site NXP 3	Contemporary	Graves / Cemetery	S28°12'34.9"; E16°51'40.1"
NXP4	Site NXP 4	ESA / MSA / LSA	Knapping	S28°13'17.4"; E16°48'49.2"

6.5 Mehl Mining Area

Refer to Figure 20 - 21 for the extent of the survey and site distribution. The extent of the sites is indicated by turquoise polygons.

Figure 92: Mehl surveyed area indicated in grey

Figure 93: Mehl Survey area indicated in grey

6.5.1 Site Mhl3 - S28°10'33.5"; E16°51'21.2"

Site Mhl3 comprises of a typical ESA / MSA open air gravel terrace site. Typologically artefacts are reminiscent of the MSA with a few likely ESA types scattered in between; a focus on amorphous flake types, approaching blade samples more often than convergent or point types characterize the assemblage, supplemented by a few core type tools that may be interpreted as either ESA rough-outs or rough cores. A variety of raw materials, sourced from the gravel terrace were used in the production of lithic artefacts, with granite dominating the assemblage. On average a fairly low artefact ratio (artefacts: m²) was recorded; approximating 1-2:4, where present. The archaeological deposit seems to be restricted to the top, approximate 50-70cm, of the gravel stratigraphic section, easily discernable by its red Hutton sand context in the bulk sample section already indicated on the Halkett 1999 aerial photographs.

Site Significance Assessment & Recommendations: Based on particularly low artefact ratios recorded at Site Mhl3, the site is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating.

Figure 94: View of the bulk sample at Site Mhl3

6.5.2 Site Mhl4 - S28°10'33.5"; E16°51'21.2"

Site Mhl4 consists of an approximate 1kmx400m gravel terrace still intact and not yet affected by mining at the Mehl mine. Inspection of the terrace yielded a low density of surface Stone Age artefacts, including rough ESA samples, but in general it is dominated by MSA and LSA lithic samples. Artefact ratios (artefacts: m²) across the surface of the terrace proved to be quite low, approximating 1:2-4. Gravel from the surface was used as raw material throughout the Stone Age. A number of bulk samples as well as general mining already impacted heavily on what can be inferred to have been extensions of the remaining terrace. The low density presence of artefacts however designated the terrace as a low significance archaeological site. Mining across a large portion of the remaining terrace will be included under the current EMP.

Site Significance Assessment & Recommendations: Based on particularly low artefact ratios recorded at Site Mhl4, the site is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Mining has already impacted on portions of the terrace and will continue under the current EMP.

Map code	Site	Type / Period	Description	Co-ordinates
Mhl1	Site Mehl 1	Ruins	Halkett 1999	S28°10’12.7”; E16°53’26.5”
Mhl2	Site Mehl 2	Artefact scatter	Halkett 1999	S28°09’59.6”; E16°53’32.9”
A	JKB A	Artefact scatter	Halkett 1999	S28°10’43.7”; E16°53’10.7”
B	JKB B	Artefact scatter	Halkett 1999	S28°10’49.8”; E16°53’06.7”
C	JKB C	Artefact scatter	Halkett 1999	S28°10’29.0”; E16°53’18.7”
D	JKB D	Graves	Halkett 1999	S28°10’26.0”; E16°53’21.6”
E	JKB E	Pastoralist	Knapping (?)	S28°10’17.8”; E16°50’57.7”
F	JKB F	Pastoralist / Colonial	Settlement (?)	S28°10’27.4”; E16°51’20.8”
G	JKB G	Artefact scatter	Halkett 1999	S28°12’29.9”; E16°51’38.4”
H	JKB H	Artefact scatter	Halkett 1999	S28°11’18.1”; E16°50’26.5”
J	JKB J	Graves	Halkett 1999	S28°10’52.1”; E16°53’05.8”
K	JKB K	Artefact scatter	Halkett 1999	S28°11’00.2”; E16°52’51.7”
L	JKB L	Artefact scatter	Halkett 1999	S28°10’51.5”; E16°53’10.3”
M	JKB M	Artefact scatter	Halkett 1999	S28°10’52.3”; E16°53’13.3”
O	JKB O	Artefact scatter	Halkett 1999	S28°11’02.8”; E16°52’38.5”
P	JKB P	Artefact scatter	Halkett 1999	S28°11’04.6”; E16°52’43.9”
Q	JKB Q	Artefact scatter	Halkett 1999	S28°11’04.6”; E16°52’30.5”
R	JKB R	Artefact scatter	Halkett 1999	S28°11’04.6”; E16°52’11.7”
S	JKB S	Graves	Halkett 1999	S28°10’45.3”; E16°53’14.4”
Mhl3	Site Mehl 3	ESA / MSA	Knapping	S28°10’33.5”; E16°51’21.2”
Mhl4	Site Mhl 4	ESA / MSA / LSA	Knapping	S28°10’44.7”; E16°50’14.7”

6.6 Reuning Mining Area

This mining area is located in the Richtersveld Park. Refer to Figure 20 - 21 for the extent of the survey and site distribution. The extent of the sites is indicated by yellow lines.

Figure 95: Reuning north surveyed area indicated in grey

Figure 96: Reuning south surveyed area indicated in grey

6.6.1 Site RN1 - S28°07'14.4"; E16°53'26.0"

Site RN1 was first identified and reported on by Halkett (1999) who described the site as situated '*immediately north of Reuning on dolomite exposures and on slabs that have been dislodged from the main outcrop. While there are engravings that are of undoubted vintage, some recently executed graffiti is also present.*' The dolomite outcrops continue for approximately 200m parallel along the Orange River bank. Scantly distributed engravings are intersected with more contemporary graffiti as reported on by Halkett. An increase in graffiti at the site, since the time of the Halkett assessment, is not inferred; conservation of Site RN1 can thus be described as good.

Gravel terraces immediately east of the site proved to be anthropogenically sterile; the lack of Stone Age artefacts in these gravels may be ascribed to their age. Stone Age artefacts are commonly found within younger gravels.

Site Significance Assessment & Recommendations: Site RN1 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating.

Figure 97: General view of the Site RN1 outcrops

6.6.2 Site RN2 - S28°06'01.9"; E16°53'34.8"

The Site RN2 terrain is characterized by a number of low rising dolomite outcrops situated on the floodplain with a dry streambed meandering north of the site. We were able to identify pastoralist and Stone Age remains:

- Pastoralist deposits: Site components comprising of at least 4 recorded stock enclosure remains, characterised by dung deposits and encampment fences, two residential units, primarily discernable by means of stone structure stabilization foundation outlines and inferred midden mounds are scattered amongst the general vicinity of the dolomite outcrops. The general lack of artefacts; including ceramic, bone, ostrich eggshell pieces or artefacts, or even colonial remnants such as rusted metal are quite noticeable and implies a fairly recent origin of pastoralist use and occupation of the site.
- MSA and/or LSA deposits: Lithic deposits are centred amongst the dolomite outcrops. Stone Age artefacts, primarily produced from white quartzite, with a dominance of flake types, are ascribed to the MSA but also reminiscent of the fairly common unambiguous LSA type of assemblages that are sometimes associated with hunter-herders. Artefact distribution is particularly focussed, but with artefact ratios (artefacts: m²), where present, approximating 3-4:1. Typologically and technologically lithics are very similar to types at RN3 and without a prominent raw material source in the direct vicinity of the Site RN2 locality it is inferred that artefacts were imported from the nearby Site RN3 raw material source and knapping site, with the RN2 terrain by implication representing an 'activity' area.

Site Significance Assessment & Recommendations: Based on low artefact and occupation debris both MSA / Palaeo-pastoralist and Pastoralist assemblages at Site RN2 are ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. The developer can apply for a destruction permit for the sites.

Figure 98: General view of the Site RN2 locality

6.6.3 Site RN3 - S28°06'09.3"; E16°53'51.6"

Site RN3 is situated along the approximate 400m long foothills of a prominent white quartzite outcrop. A low density lithic artefact scatter, exclusively produced from the local quartzite raw material source characterized the assemblage. Artefacts are typologically ascribed to the MSA or LSA types, in general typified by flake types. Poor typology and technology, most possibly a result of the raw material used for artefact production, in association with the surface restricted context of the site serves to diminish the site's significance.

Site Significance Assessment & Recommendations: Site RN3 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. The developer can apply for a destruction permit for the sites.

Figure 99: General view of Site RN3

Figure 100: White quartzite lithic artefacts from Site RN3

6.6.4 Site AA1 - S28°05'59.4"; E16°53'11.8"

The Site AA1 (AACE1) locality was marked in the Halkett report as of cultural significance with assessment findings briefly summarized as a lithic artefact scatter most probably post-dating 2000 BP (Halkett 1999; 9). The site was not revisited: at the time of the assessment the locale was used as a temporary Nama camp, guard dogs in the absence of the owner prohibited assessment.

Site Significance Assessment & Recommendations: Site AA1 was not revisited at the time of the assessment; a SAHRA Site Significance Assessment is by implication not possible. It is recommended that the site be assessed prior to continuing mining impact at Reuning.

Figure 101: View of the contemporary Nama camp situated on the Site AA1 locality at the time of the assessment

6.6.5 Site AA2 - S28°06'19.0"; E16°53'55.8"

Site AA2 was first recorded and reported on by Halkett (1999), who described the site as an '*ESA / MSA stone scatter*' often typifying '*higher gravel terraces*'. The site, situated just south of Site RN3, comprises of an easily identifiable dolerite hill, which evidently provided the primary raw material for artefact production; with artefacts having been produced from both the local dolerite and to a lesser extent quartzite-like raw material types. Artefacts are generally quite large, potentially indicative of the early phases of the MSA. The collection is typologically dominated by flakes with a rough blade component. Artefact ratios (artefacts: m²) seem to be fairly high, approaching 5-7:1 on the hill itself and decreasing in density towards the foot of the hill. In addition typological and technological comparison of the assemblage with other Orange River terrace ESA / MSA assemblages may prove useful.

Site Significance Assessment & Recommendations: Site AA2 is ascribed a SAHRA Medium Significance and a Generally Protected B Field Rating. It is recommended that development in the vicinity of the site be preceded by Phase 2 Archaeological Mitigation

Figure 102: General view of Site AA2

Figure 103: Selection of artefacts from Site AA2

Map code	Site	Type / Period	Description	Co-ordinates
RN1	Site RN1	Pastoralist	Rock Art	S28°07'14.4"; E16°53'26.0"
AA1	Site AA1	Pastoralist	Lithic Scatter (?)	S28°05'59.4"; E16°53'11.8"
RN2	Site RN2	Palaeo-pastoralist / Pastoralist	Settlement	S28°06'01.9"; E16°53'34.8"
RN3	Site RN3	MSA / Palaeo-pastoralist	Knapping	S28°06'09.3"; E16°53'51.6"
AA2	Site AA2	ESA / MSA	Knapping	S28°06'19.0"; E16°53'55.8"

7. Palaeontological Impact Assessment

Professor Marion Bamford from the University of the Witwatersrand conducted a Palaeontological Impact Assessment of the active mining areas. During her field survey No fossils, neither silicified wood nor were bones identified. For the full report please refer to Annexure A.

8. ASSUMPTIONS AND LIMITATIONS

Due to the nature of cultural remains that occur, in most cases, below surface, the possibility remains that some cultural remains may not have been discovered during the survey. Due to sand cover low to medium archaeological visibility is present on site and therefore the possibility of the occurrence of informal and unmarked graves or archaeological remains cannot be excluded. Although Wits Heritage Contracts unit surveyed the area as thoroughly as possible, it is incumbent upon the developer to inform the relevant heritage agency should further cultural remains be unearthed or laid open during the process of development. It is important to note that the scope of work was to survey only the development area and not the entire prospecting area.

9. ASSESSMENT AND RECOMMENDATIONS

*A locality map is provided in **Annexure A***

Findings of the Assessment: 109 sites are on record for the Trans Hex area. Although site specific recommendations was made in Section 6 of this report it is recommended that a holistic approach is used in the Trans Hex heritage management and that sites are mitigated at a regional scale.

The following points were highlighted during the study and needs to be addressed:

UNESCO World Heritage Status

Assessment

The Trans Hex mining concession extends into the Richtersveld Park that was declared a World Heritage Site in 2007. Mining in the area occurred since 1995 and is the main economical driving force in the area. As part of the World Heritage Site declaration a buffer zone of 398.425 hectares is declared around the park and it is in this buffer zone that the Baken, Bloeddrift, Nxodap and Mehl mining operations occur. Inside the park is the Reuning mining area. These mining activities can have a negative impact on the current World Heritage status of the Richtersveld Cultural and Botanical Landscape.

The Richtersveld area sustains the semi-nomadic pastoral livelihood of the Nama people, reflecting seasonal patterns that may have persisted for as much as two millennia in southern Africa. It is the only area where the Nama still construct portable rush-mat houses (*haru om*) and includes seasonal migrations and grazing grounds, together with stock posts.

The pastoralists collect medicinal and other plants and have a strong oral tradition associated with different places and attributes of the landscape. The extensive communal grazed lands of the Richtersveld Cultural and Botanical Landscape are a testimony to land management processes which have ensured the protection of the succulent Karoo vegetation and thus demonstrate a harmonious interaction between people and nature.

World Heritage Status was awarded because the area has the following two criteria:

- The rich diverse botanical landscape of the Richtersveld, shaped by the pastoral grazing of the Nama, represents and demonstrates a way of life that persisted for

many millennia over a considerable part of southern Africa and was a significant stage in the history of this area.

- The Richtersveld is one of the few areas in southern Africa where transhumance pastoralism is still practised; as a cultural landscape it reflects time honoured and persistent traditions of the Nama, the indigenous community. Their seasonal pastoral grazing regimes, which sustain the extensive bio-diversity of the area, were once much more widespread and are now vulnerable.

The process of declaring the Richtersveld as a World Heritage Site was completed in early 2007. The traditional land-use system of the Nama should be seen as part of the protection system. According to UNESCO the two key areas for conservation measures are sustaining the grazing areas and sustaining the tradition of building portable mat-roofed houses. The Richtersveld Community Conservancy (RCC) is managed by a Communal Property Association (CPA) with a Management Committee (company without profit) and a participative Management Plan is in place to manage the identified Heritage Area.

The Management plan, addresses management structures, infrastructure development, awareness raising, tourism development and monitoring and evaluation.

Demarcated mining areas and the future expansion of mines limit the traditional land use system and movement of the semi-nomadic pastoral Nama people and this must be seen as red flag and must be addressed.

The Richtersveld Cultural and Botanical Landscape have full legal protection and two laws need to be noted the World Heritage Convention Act no 1999 and the National Environmental Management: Protected Areas Act. Act no 57 of 2003.These are the two main acts regarding the safeguarding of the integrity of World Heritage Sites in South Africa.

Recommendations

In order for the mine to comply with the legislation and to ensure that the mining activities do not endanger the World Heritage status of the Richtersveld Cultural and Botanical Landscape it is recommended that a legal expert is called in to advise on the issue where existing mining licences were awarded to companies before areas in close proximity were awarded World Heritage Status. The mine will also have to work closely together with the Richtersveld Community Conservancy (RCC) that is managed by a Communal Property Association (CPA), Unesco representatives and government officials on the way forward.

It is further recommended that a comprehensive social study is conducted in order to assess the impact of the proposed mining on the pastoral Nama's in the study area. This study must also include, as a minimum, the impact of mining on medicinal plants, grave sites and places of religious significance.

Early, Middle and Later Stone Age Sites

Assessment

Current mining and exploration operations are focused but not limited to the Pre-proto, Proto and Meso gravels of the palaeo Orange River. From the current assessment these gravels terraces contain to varying degrees of intensity Early, Middle and Later Stone Age artefacts and therefore these sites are in the biggest danger of being negatively impacted on by actual mining. Observations indicate artefacts are concentrated to the top 50 – 70cm of the gravel deposits. This artefact layer contains both ESA, MSA and possible LSA artefacts. There might be artificial layering present with LSA artefacts that have migrated down the stratigraphy to settle amongst ESA and MSA artefacts.

The dispersed and reworked nature of these sites means that these sites usually do not warrant mitigation. Similar gravel layers have been investigated with limited success in the 1930's by Dart along the Vaal. However with new technology, especially improved dating techniques, these sites might warrant further investigation.

Recommendations

Mitigation or sampling at each identified type site will not necessarily add value to further basic understanding of these deposits and mitigation must be done on a regional scale.

Therefore it is recommended that the area is examined by a dating specialist and Middle Stone Age specialist to determine if the layer containing artefacts can be dated by single grain OSL (or other dating technique) and if there is any value in phase 2 mitigation (sampling and test pitting of gravel deposits) to monitor possible changes and assemblage composition at intervals along the Orange River in the Mining lease area. Further management actions will be based on the findings.

Permits issued by the SAHRA will be needed for the mitigation and destruction of these sites.

Later Stone Age Sites associated with herding activities

Assessment

Terminology is an issue and for the purposes of this report LSA is the preferred term and refers to the last 2000 years with sites that include lithics and that might also include ceramics.

Cultural material on these sites as described by Webley 1997 and Halkett 2001 indicate that these sites contain large amounts of indigenous ceramics, informal quartz assemblages, large ostrich eggshell beads, bone (sheep, fish) and hearths and/or ash heaps. From this assessment and the work done by Halkett 1999, it is observed that sites from this period is located mainly on the silty flood plain and according to the EMP the floodplain cannot be mined due to the 100 year flood line. These sites therefore have a low likelihood of direct impact by mining activities but a secondary impact is foreseen on the sites from mining related activities like pump stations etc. Some of these sites have already been destroyed by activities outside of the mining activities like Site BD 21 - 25 that was demolished by the agricultural project initiated by the mine. A cultural management program would have prevented the destruction of this and possible other sites.

Recommendations

No mining or related activity should occur at or near areas where sites have been identified until mitigation has been undertaken. If mining or related activities are to take place in areas that have not yet been investigated, this area should be subjected to a Phase 1 Assessment.

Graves and informal cemeteries

Assessment

As Halkett 1999 observed most of the grave sites are located on the silty river terraces. Pre colonial and colonial sites have been identified throughout the study area marked by stone

mounds and more recent graves with headstones. Halkett recommended in 1999 that graves should be identified and demarcated in areas where mining or related activities are likely to occur. Although some graves have been fenced by the mine it is concerning to see that 11 years later several sites have still not been fenced in. Sites located on the floodplain are being covered by sand and surface indicators marking the graves are being obliterated.

Another problem identified at some grave sites is erosion gullies that are washing some graves away. The social study will in all likelihood also identify more grave sites that will also require mitigation actions.

Recommendations

If the graves or informal cemeteries are to be preserved *in situ*, it will have to be fenced of and provided with a gate for access by family members. A buffer zone of at least 15 meters will have to be kept around the site in order to facilitate the protection of the site during mining.

If it is not possible to incorporate the graves or informal cemeteries in the mine layout they will have to be relocated. This must be seen as a last resort. The relocation process must be done with adherence to all legal requirements as well as an extensive social consultation process required within the process. It is well advised that a company with a proven record of accomplishment should be used to manage and complete such a project

Erosion control measures should be employed at all the sites.

Petroglyphs

Assessment

The study area contains numerous engravings that occur on dolomite outcrops with the highest concentration of engravings at Bloeddrift and Reuning. Several sites have been impacted on by mining activity in the Bloeddrift area and graffiti can be found on several of the engraved panels. It is not the aim of this study to interpret the art or to date it, but it is widely accepted that the geometric designs found in the area represent entoptic hallucinations (Dowson 1992) and are understood as being closely linked with shamanistic ritual or belief (Lewis-Williams 1981. Other images in the form of animals, wagon and oxen also occur dating to the colonial period. Some engravings have been weathered and are clearly older than others.

Recommendations

Engraved sites must be fenced in areas where there is a lot of traffic to protect the sites against being vandalised. It is also useful to erect signs at the sites, indicating that it is protected heritage areas. In areas where sites have been impacted on by stock piles, as indicated in the Halkett report, these sites should be monitored during rehabilitation of these mining areas to minimise further impact on the sites. The in situ preservation of these sites would be recommended, but where this is not possible these engravings can be removed by a specialist under a permit from SAHRA. It is therefore recommended that a rock art specialist familiar with Northern Cape engravings asses the sites and make suitable recommendations.

Palaeontology

Assessment

The current Palaeontological Assessment did not locate any *in situ* fossil material but reported on fossil vertebrate bones and fossil woods that have been recorded from Baken, Bloeddrift, Daberas, Oena and Sendelingsdrift and concluded that it can be expected that there should be fossil woods and probably fossil bones in all the proto- and meso- Orange River Gravels and associate deposits. Refer to Annexure A for the full Palaeontological report.

Recommendation

All workers must be made aware of the importance of Palaeontological remains and be informed to look out for any isolated fossil material, note the location (depth and GPS reading) and retrieve the material. If large numbers of material is found, a palaeontologist should be called to excavate the material so that mining activities can continue.

General

It is clear that the area under control by Trans Hex mining has a diverse range of heritage sites and heritage related issues that need to be addressed in order to ensure that all activities by Trans Hex are compliant with legislation. The results of the survey have shown that there is a need for a system to be in place to ensure ongoing heritage management in the area based on an extensive heritage management plan. Such a management plan will ensure those relevant sites are correctly mitigated before sites are destroyed by an agricultural project by Trans Hex.

Such a management plan will have recorded sites on GIS and will be linked to mine and mining related activities so that the protection or mitigation of heritage sites can be included in the early planning stages of the mine. This will also serve to highlight sensitive areas earmarked for future mining for assessment at a later stage.

It is therefore recommended that a consolidated heritage management program is implemented not only focussing on certain aspects but on heritage as a whole including specialists in different fields, including amongst others Living Heritage Sites, Cultural Landscapes, that will include old trees, hills, mountains, rivers, etc related to cultural and/or historical experiences.

A good starting point will be to conduct a heritage audit that will be aimed at assessing all previously recorded heritage sites and to assess the degree of compliance and/or disturbance these sites have had in relation to activities by Trans Hex. The audit will form the baseline for further work within the mine lease area to ensure that correct procedures are followed as per various legislations.

The heritage management plan will also aim to accomplish the following:

- Set up a hierarchy of reporting of heritage issues, from ground level to the ECOs and the project archaeologist.
- Ensure that all grave sites that are not relocated are adequately protected
- Establish procedures for call out:
- Establish a process for documenting sites, damages and compliance

9. LIST OF PREPARERS

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ANNEXURE A: Palaeontological Impact Assessment

Palaeontology component for the EMPR for Trans Hex

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Introduction

Transhex has extensive mining operations along the Orange River in South Africa exploiting the Pre-proto, Proto and Meso gravels of the palaeo Orange River. Incorporated within the gravels are diamonds, varying considerably in quality and concentration. The mining company proposed to extend its mining operations and has been advised to obtain more archaeological and Palaeontological information to include in their Environmental Management Programme Report.

In my professional capacity as a Palaeontologist (PhD plus 28 years of field experience) I visited severel of the mines on 17-19 September 2010 to look for fossils with the assistance of Joshua Cloete (Rehabilitation and Environmental Co-ordinator) on the Baken and adjacent mines, and Deaon Bower (Senior Geologist) for the mines in the Sendelingsdrift area .

Palaeontological Record of the Area

The Orange River cuts down into the ancient rocks of the Gariep Complex (Late Proterozoic and Namaqua Metamorphic Complex (mid Proterozoic) (Pether et al., 2000). Much younger rocks of the Cretaceous and Miocene unconformably overlie the basement rocks. Boulders, cobbles, gravels and pebbles have been washed down the river over millennia and originate from the vast hinterland. The

Arries Drift Gravel Formation (Proto-Orange River) comprises these gravels of originally ancient origin but were deposited during the Early Miocene by a river that was much larger than today and that has changed its course over time. The abandoned river channels contain rocks, diamonds and fossils.

Fossil vertebrate bones and fossil woods have been recovered from two exploration pits at Auchas (Pickford et al., 1995) that are now mined for diamonds, about 50 km upstream from Oranjemund 30 km downstream from Sendelingsdrift. The age of these gravels is 17-19 Ma, Lower Miocene, based on the fauna which includes proboscidians, rhinocerotids, crocodilians and chelonians (Table 1; Corvinus and Hendey, 1978; Hendey, 1978; Pickford, 1995; Pickford et al., 1995; Bamford, 2000, 2003). Fig 1 shows the fossiliferous deposits on the Namibian side of the river but the same deposits occur on the South African side of the River.

Other fossiliferous deposits along the Orange River are recorded from Baken, Bloeddrift, Daberas, Oena and Sendelingsdrift. (Bamford, 2003b). From Baken ten pieces of silicified wood have been identified as the same genera as those from Auchas. The Bloeddrift wood is angiospermous and so Upper Cretaceous or younger. The Daberas and Sendelingsdrift woods are also the same as the Auchas woods but those from Bloeddrift are different (Bamford, 1994). Farther south along the coast the deposits are Upper Cretaceous in age (Kleinzee, Oubeep; Table 1.) It is, therefore, expected that there should be fossil woods and probably fossil bones in all the proto- and meso-Orange River Gravels and associate deposits.

Site	Stratigraphy and age	Fossils	References
Arrisdrift	Arries Drift Gravel Formation; 17-19 Ma	Vertebrates: amphibians, reptiles, birds and mammals. Wood: Anacardiaceae, Combretaceae	Corvinus and Hendey, 1978; Hendey, 1979; Pether et al., 2000; Bamford, 2003b
Auchas	Arries Drift Gravel Formation, 17-19 Ma	Vertebrates: reptiles, birds, mammals (less diverse than Arriesdrift)	Pickford et al., 1995; Pickford and Senut, 2003;

		Wood: Burseraceae, Combretaceae; Leguminosae, Anacardiaceae	Bamford, 2003a, b
Baken	Arries Drift Gravel Formation, 17-19 Ma	Wood: Burseraceae, Combretaceae Leaves:	Bamford, 2003b unpublished
Bloeddrift	Arries Drift Gravel Formation, 17-19 Ma	Wood: new species of Burseraceae, Euphorbiaceae	Bamford, 1994, 2003b
Daberas	Arries Drift Gravel Formation, 17-19 Ma	Wood: Burseraceae sp. 2	Bamford, 2003b
Kleinzee	Upper Cretaceous	*Podocarpoxylon* spp.	Bamford and Corbett, 1994, 1995 Cantrill et al., in prep.
Oubeep	Upper Jurassic – upper Cretaceous	*Podocarpoxylon* spp.	Bamford and Corbett, 1994, 1995
Sendelingsdrift	Arries Drift Gravel Formation, 17-19 Ma	Combretaceae/Anacardiaceae	Bamford, 2003b

Table 1: Record of fossils from the Early Miocene along the lower Orange River

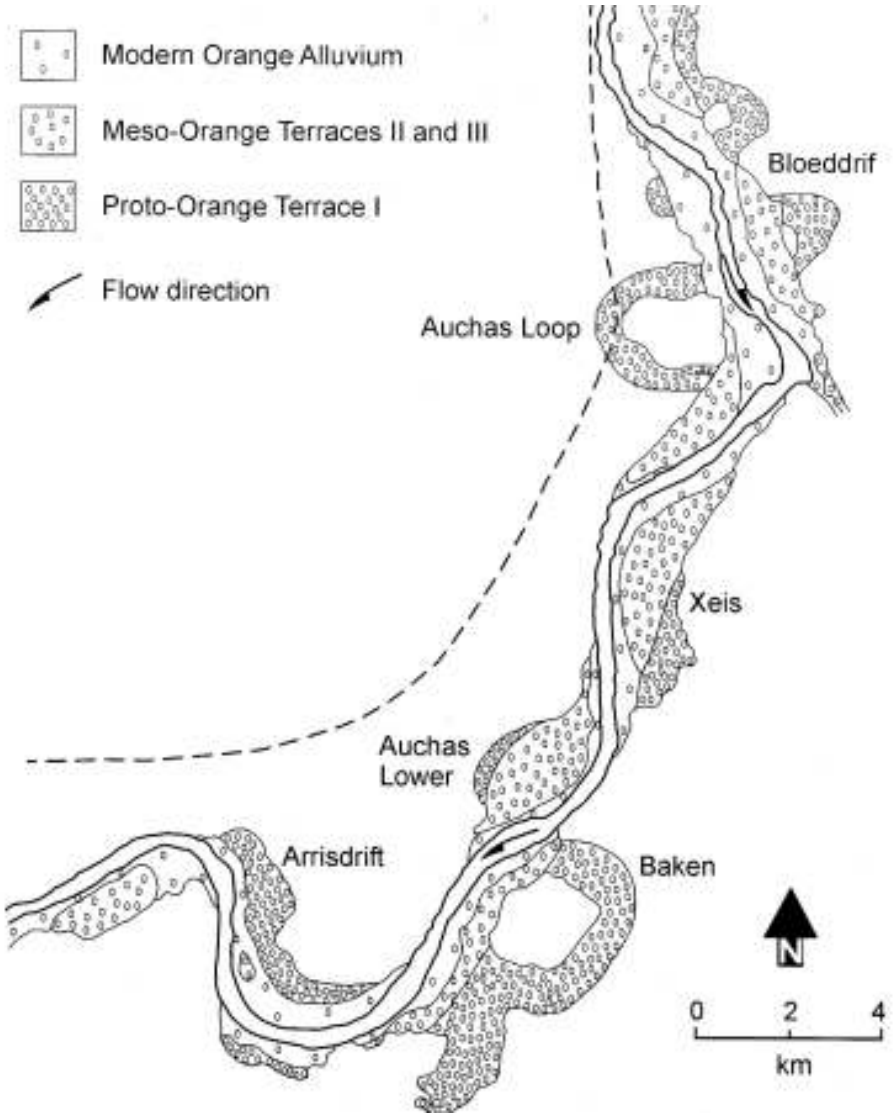

Figure 1: Fossiliferous gravels along the Orange River in the Arrisdrift-Baken-Bloeddfrift area (From Pickford and Senut, 2003).

Results of current survey.

Active mining, abandoned mining and test pits in the areas designated for mining were visited and surveyed for fossils and observations are given (Table 2).

Stop	GPS co-ordinates	Location	Observations
1	no GPS allowed	Baken mining area – deepest cut	about 90m of gravels separated by sand bands; imposible to detect fossils amongst the clasts
2		Baken – cut about 30m deep	gravels smaller with more sand and fine sand bands between
3		Baken – beginning of palaeochannel	schists or shales between gravel bands
4		Baken Terrace 1	Meso terrace gravels
5		Baken Terrace 1	Meso terrace gravels
6	S 28 30.722’ E 16 45.591’	Baken test pit	cemented boulders
7	S 28 30.735’ E 16 44.912’	Baken test pit	very coarse sandstone cementing the gravel and boulder clasts
8	S 28 30.860’ E 16 45.002’	Baken test pit	much smaller clasts, less well-cemented, end of trench goes down to thick sand layer
9	S 28 30.862’ E 16 44.997’	Baken test pit	less gravel, even coarser sand and sand dunes below(?)
10	S 28 30.904’ E 16 44.840’	Scour in palaeoriver, Baken, abandoned, broken slimes dam	well vegetated (*Phragmites australis*). Mostly sand layers visible
11	181	Sandrift terrace alongside airstrip	Pebbles and ventifacts on the deflation surface. No fossils noted during the short visit
12	182	Bloeddrift Mine petroglyphs	
13	183	Bloeddrift Quarry	granite-rich gravels; some huge boulders

14	S 28 16.656’ E 16 46.302’	Bloeddrift, end of palaeochannel	dolomite, fine sands and gravel bands and red sandstone lenses, top portion comprises braided channel sandstone lenses; well cemented
15	185	Bloeddrift exit of palaeochannel	gravels and well cemented sands
16	S 28 18.567’ E16 47.249’	Bloeddrift mid loop of channel	usual gravels but lower density. Mining stopped but may continue; well cemented
17	187	B1-South channel exit	usual gravels, Manganese staining, water-worn basal dolomite exposed.
18	S 28 13.800’ E 16 48.772	Nxodap N2	usual gravels but lots of manganese staining in one of the lower levels
19	190	Nxodap N10	possible pre-proto Orange river gravels here
20	S 28 07.185’ E 16 54.246’	Jakkalsberg	same gravels
21		Jakkalsberg exit of scour	same gravels
22	S 28 06.688’ E 16 53.440	Sendelingsdrift	same gravels
23		glory Hole	filled with water and backfill
24		Sendelingsdrift Meso gravel terrace, near landing strip	same gravels

Table 2: Sites visited and comments

No fossils, neither silicified wood nor bones, were seen in any of the cuttings during the short time that I had. The fossils listed in Table 1 were collected over a number of years by various researchers.

Recommendation

Although I was unable to locate any fossil sites they have been previously documented and collected. I have identified and published wood samples from the Arrsidrift Formation from Baken and Bloeddrift Mines. Fossil leaves have been collected from white clay-like sediments from Baken. Leaves of this age in southern Africa are extremely rare so this is a very important but unlocated site.

I strongly recommend that the geologists and miners make a concerted effort to look out for any isolated fossil material, note the location (depth and GPS reading) and retrieve the material. If large numbers are found then a palaeontologist should be called to excavate the material so that mining activities can continue. I personally am very interested in receiving or collecting fossils from this area and age and would be willing to assist.

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