APPENDIX K: ARCHAEOLOGY STUDY

Archaeological Baseline Survey & Mitigation

of

ML-140 Langer Heinrich

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QRS Job 101

Commissioned by Langer Heinrich Uranium (Pty) Ltd

Submitted: 18th June 2009

EXECUTIVE SUMMARY

A baseline archaeological survey of ML-140 was carried out to augment an earlier reconnaissance survey, and to contribute towards a land-use plan for Langer Heinrich Uranium (LHU). The combined results of the two surveys have yielded a total of 67 archaeological sites, mainly concentrated around granite outcrops at the eastern end of the mine lease area.

Most of the archaeological sites relate to the occupation of the Namib in the 2nd millennium AD, by hunter-gatherer communities who gathered wild grass seed from the underground caches of harvester ants. A range of other subsistence activities were carried out in the area, including communal hunting and honey harvesting, all subject to the availability of water from natural rainwater basins on rock outcrops. ML-140 and adjacent ground held by LHU also contains some sites relating to combat in March 1915, between the German colonial forces and the invading South African forces under General Louis Botha. The report presents specific mitigation measures for these sites which may be threatened by new pipeline and power-line developments.

The archaeological sensitivity of the area is not especially high, the most important sites being located a short distance outside the boundaries of the lease area. Test excavations were carried out at two rock shelter sites, QRS 58/17 and 58/20, and detailed survey was carried out on a group of stone alignment sites QRS 58/38-41. The results of the survey and excavations are presented here, including two radiocarbon dates for occupation of QRS 58/17 during and immediately after the Last Glacial Maximum (ca.18-11kyr).

The results of the Baseline Survey and Mitigation exercise have been presented verbally to LHU management, with a field excursion to visit examples of typical archaeological sites. The investigation results are also to be presented in the form of a small museum display at the LHU site offices.

COVER PICTURE: Clay vessel in rock niche, QRS 58/63. Site found and reported by staff of Langer Heinrich Uranium (Pty) Ltd.

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Appendix: Digital resources, including Report as MSWord; Report as pdf; Site database as Excel spreadsheet; Site database as ArcGIS shp file; ML-140 sensitivity zones as ArcGIS shp files.

Introduction:

Project background

Langer Heinrich Uranium (Pty) Ltd (LHU) is initiating a number of baseline studies for the Mining Lease area (ML-140). The aim of these studies is to aid the development of decision making tools for the mine to ensure that environmental considerations are taking into account during planning. Once the land use plan has been developed additional studies will be undertaken to allow for the development of a restoration plan.

Phase I of the baseline study programme will focus on the section of the ML-140 that is currently being utilised (approximately 2.5 km by 400m) to develop a land use map. The land use map will help the mine planners to site future facilities (e.g. waste rock dumps, stockpiles, topsoil stockpiles, haul roads etc), taking ecological considerations into account. Archaeological considerations are to be integrated with the proposed land use planning, and field surveys are to be carried out on ML-140. Phase II will include field surveys of the adjacent EPL 3500 and a pipeline servitude to the Swakop River.

Archaeological sites in Namibia are protected under the National Heritage Act (27 of 2004) which makes provision for archaeological assessment of large projects such as Langer Heinrich Uranium. The archaeological assessment process in Namibia involves three phases, commencing with a Phase 1 desk assessment. The assessment process followed by QRS is summarized in Figure 1, below.

An archaeological reconnaissance survey of ML-140 and some adjoining land in the Namib Naukluft Park was undertaken in 2004, as part of the Langer Heinrich Uranium environmental impact assessment. The results of that survey are integrated with the present study. Although the reconnaissance survey identified the main archaeological features of the area it was insufficiently detailed to serve as a basis for land use and sensitivity mapping as envisaged by current environmental management at Langer Heinrich Uranium.

Scope of work

The following tasks were listed in the scope of work for the Phase I archaeological survey:

1. Conduct an archaeological survey of the mine lease, ML-140
2. Develop a GIS database of archaeological sites, to be integrated with the various biodiversity maps.
3. Compile an archaeological sensitivity map of the mine lease.
4. Compile a report that describes the various archaeological findings, describes the basic dynamics and outlines why some areas should not be disturbed whilst others can be. Provide mitigation measures for the different sensitivity zones identified.
5. Participate in a workshop to develop the final land use plan.

6. Work with the LHU Biodiversity Planning Consultant and the GIS consultant to finalize the Phase I (current area) and Phase II (whole ML) Land use plans.

In addition to these tasks, a survey of the service corridor between LHU and Riet on the Swakop River was carried out in June 2009, specifically to assess the potential impact of new water and power-lines on sites relating to combat in March 1915 between the German colonial forces and the invading South African forces under General Louis Botha.

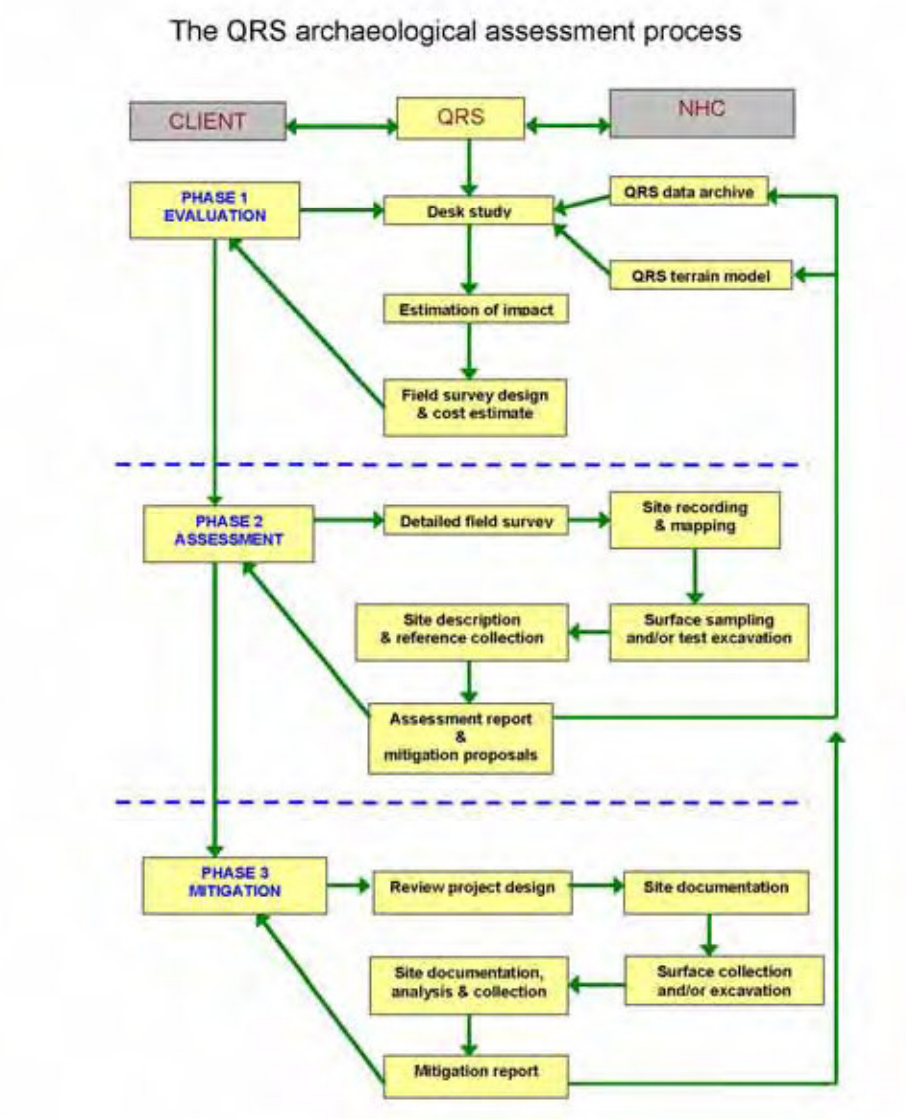

Figure 1: The QRS archaeological assessment process, based on standard international practice and approved as a framework by the National Heritage Council of Namibia.

Regional archaeology

The Namib Desert has a long and remarkably comprehensive archaeological record, with the earliest securely dated evidence at 800 000 years Before Present (BP). Late Pleistocene and Holocene occupation of the desert reflects a series of pulse-like human responses to climatic amelioration, interrupted by periods of little or no activity. This pattern is illustrated by the distribution of archaeological sites shown in Figure 1, where the dense concentration of sites in the longitudinal escarpment zone has resulted from repeated and prolonged occupation of areas with reliable water. The limits of human settlement expanded westward into the Namib, both on a semi-annual scale, and on the longer scale imposed by major climatic trends.

For purposes of background understanding, the main components of the mid-Pleistocene to Recent Holocene chrono-stratigraphy of the Namib are as follows:

Middle Stone Age: the mid- to end-Pleistocene period generally associated with the appearance of modern *Homo sapiens*, and characterized by a complex stone tool technology based on advanced techniques of flake production.

Later Stone Age: the final stage of the stone tool assemblage-based sequence, covering the last 40 000 years and generally associated with the invention of small (microlithic) artefacts used in weapons such as the composite arrow, and the florescence of ritual rock art.

Pastoralism: the adoption of domestic livestock, ceramics and metallurgy during the last 2 000 years, associated with the rise of chieftaincies and regional trading networks. Pastoral wealth was unevenly distributed and there is evidence of marginalized forager communities in the last 350 years.

Years BP (Before Present)	**Geo-chronological period & events**	**Archaeological period & assemblage**
0~250	Modern	Historic (first regular documentary sources appear)
2 000		Pastoralism (ceramics & ?livestock appear in Namib)
5 000	mid-Holocene (sea-level rise)	Complex hunting & gathering (florescence of rock art)
10 000	HOLOCENE	
12 000 ~16 000	end-PLEISTOCENE (sea-level drop)	
40 000		Later Stone Age (appearance of microlithic technology)
128 000	mid-Pleistocene	Middle Stone Age

Human exploitation of the Namib Desert greatly increased over the last 5 000 years. The mid-Holocene sea level rise, resulting from a significant global warming event at the time, was accompanied by increased rainfall in the arid western parts of the subcontinent. The archaeological evidence shows that intensive occupation of desert *inselbergen* such as the Brandberg, began at this time. As conditions reverted to the

prevailing Holocene climate regime, human settlement in the desert became highly specialized, especially in its use of food plants and other resources. The Namib environment is favourable for the preservation of archaeological remains, both in stratigraphically sealed contexts and on the ground surface.

Recent archaeological surveys in the Namib, mainly as part of environmental assessment programmes, have greatly increased the number of documented sites, also adding a significant number of new radiocarbon dates. These surveys have identified an important shift in the human settlement of the Namib during the 2nd millennium AD. The available evidence, summarized in Appendix II, suggests that the dominant pastoral economy lead to the occupation of marginal desert environments by hunter-gatherer communities who specialized in the exploitation of resources such as wild grass seed. The field evidence indicates that pastoralists who lost their livestock during the late 19th century *Rinderpest* epidemic also moved into the Namib. Finally, the recent archaeological surveys have contributed to the record of early colonial activities in the Namib, including military outposts, hunting camps and mining operations.

Available evidence from these surveys is summarized in Figure 2, below. The site distribution combines records of differing precision, some of which are only useful at the sub-regional level. In Figure 1 the records are combined mainly for the purposes of illustration, to indicate the areas of the Namib and the surrounding region that aveen surveyed in detail. The three site precision classes employed by QRS are as follows:

ARCHAEOLOGICAL SITE PRECISION CLASSES

Level 1 sites have a minimum precision of 30m, determined by hand-held GPS. These site records all post-date 1990 and generally form part of detailed local surveys. Sampling levels for these surveys vary, but the local standard for archaeological impact assessment is 25%. This means that the statistical variance of local site density estimates increases with scale, making extrapolation beyond the survey area generally unreliable.

Level 2 sites have a minimum precision of 500m, determined by field plotting on standard 1: 50 000 topographic maps. These site records generally post-date 1980, when local surveys commenced in Namibia. Sampling levels for these surveys are the same as those for Level 1 sites, and therefore have similar limitations when attempting to extrapolate beyond the actual survey area.

Level 3 sites have a minimum precision of 5km, determined by office plotting of site descriptions on 1: 250 000 topographic maps. These site records all predate 1980, and represent isolated and incidental finds, usually with poor location details (e.g. name of farm/ village). Sampling levels for these records are extremely low, and they are only considered useful at the sub-regional level. However, the regional pattern shown by these sites is generally confirmed by local survey.

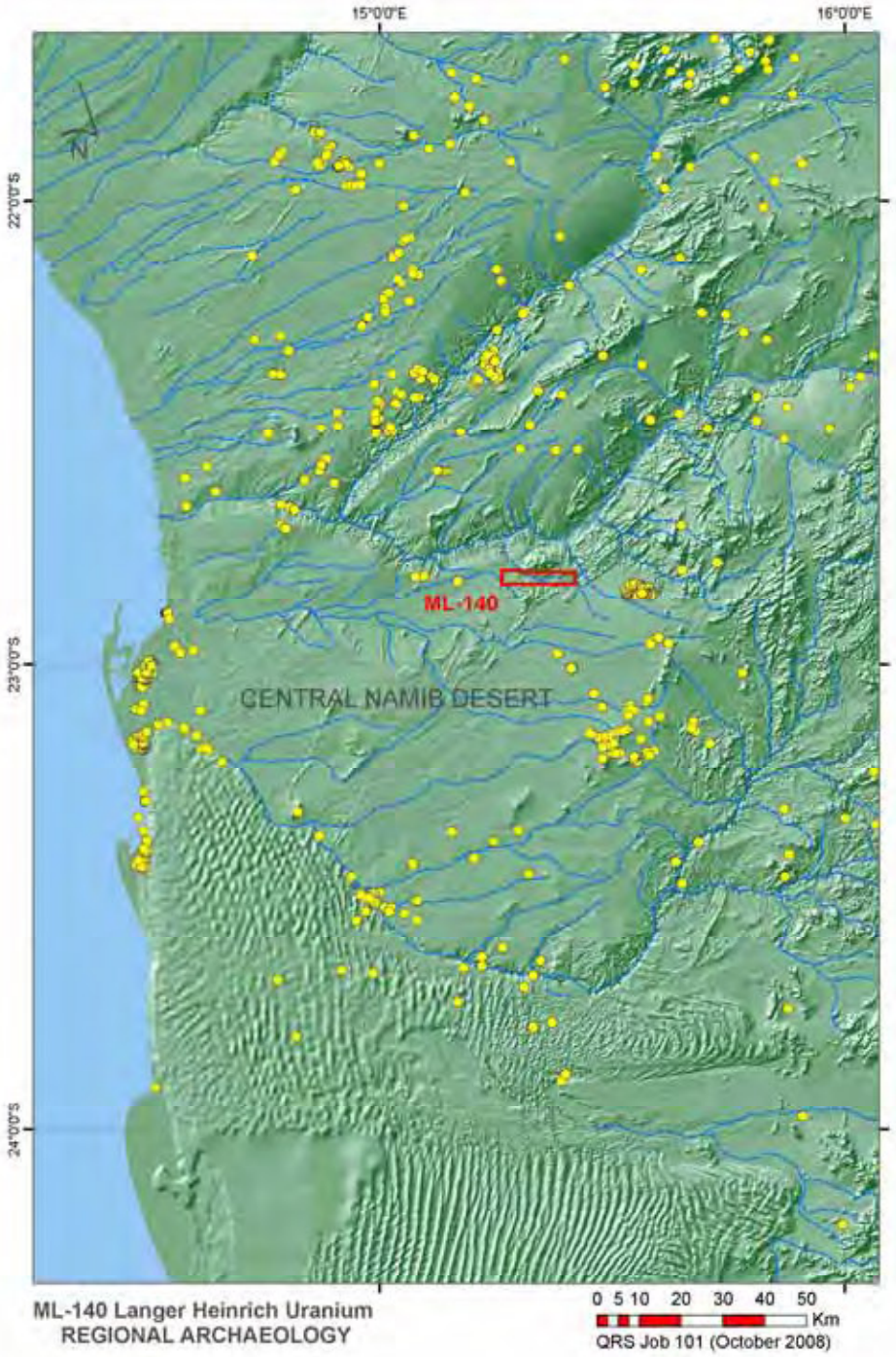

Figure 2: The regional archaeological setting of the Langer Heinrich Uranium site (ML-140) prior to the field survey presented in this report (completed June 2009). The distribution of archaeological sites reflects field survey coverage rather than the archaeological importance of different parts of the Central Namib Desert and represents the accumulation of archaeological finds over the last three decades.

Archaeological survey of ML-140:

Approach and methods

The survey was carried out as series of foot traverses crossing all major terrain types with the intention of establishing the association of archaeological sites with identifiable features such as rock outcrops and stream courses. Site positions were established by hand-held GPS and plotted in the field on 1: 50 000 topographic map sheet 2215Cd. The sites were described according to standard criteria, and photographs as well as sketches were added where necessary. The archaeological significance of the sites, and their vulnerability to disturbance in the course of exploration and mining activities, were evaluated according to separate 0-5 scales. These scales were devised by QRS to reflect Namibian conditions and are accepted as a basis of evaluation by the National Heritage Council.

Archaeological sites presented in this report are sequentially numbered QRS 58/1….*n*, following the site series recorded during the earlier reconnaissance survey, QRS 58.

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

The archaeological value (significance) and risk of damage (vulnerability) of the sites was estimated using ordinal scales of zero to five, as follows:

Significance ranking

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

Vulnerability ranking

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

All field observations are summarized in spreadsheet format (Excel) and converted to proprietory ArcGIS format to facilitate integration with other GIS data and to allow selection and comparison of the archaeological data fields. The general distribution data displayed in Figure 2 reflects the accumulation of archaeological survey results from the Namib over the last five years. QRS provides developer clients with digital data acquired in the course of field surveys, accompanied by a warning that uncontrolled distribution of digital data may threaten sensitive sites. QRS does not provide developer clients with digital data acquired in the course of other field surveys or data capture exercises; these are used in desk studies and provided in map layout form only.

Although the study reported here is focussed on ML-140, the archaeology of this area forms part of a much larger context in the Namib (see Figure 2). This means that while the sites documented in the lease area are specific points, and often very small, these are part of a greater archaeological landscape that provides meaning to the individual sites. As regards mining activities, these contribute to an accumulating deficit in the archaeological record. In simple terms, an archaeological site may be considered now as having low or limited significance, but as more of the archaeological landscape is destroyed the value of individual sites may be reconsidered.

Figure 3, below, shows the distribution of archaeological sites recorded in the present study. General observations on the ML-140 group of sites are presented in the next section. Detailed information on the sites is presented thereafter, in the Site Gazetteer, and the same data are found in summarized form in the accompanying GIS files.

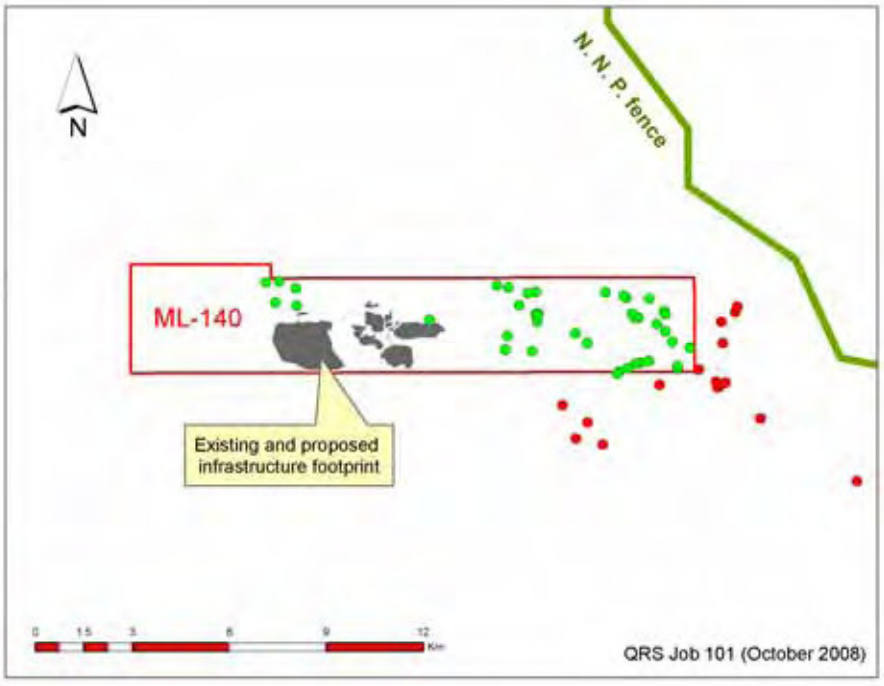

Figure 3: ML-140, showing the existing and proposed infrastructure footprint in relation to the recorded distribution of archaeological sites. Sites indicated by green dots lie within the tenement. Red dots indicate related archaeological sites lying outside the tenement.

General remarks

The greater part of ML-140 consists of a wide sandy valley developed on a paleochannel between the Schieferberg to the south and the Langer Heinrich Mountain to the north.

There are well exposed beds of colluvial valley fill, especially to the north, while the southern side of the valley lies adjacent to a deeply weathered granite pediment. Drainage from the east is mainly in the form of run-off from the granites, although the upper reaches of the Langer Heinrich valley may be traced beyond the Tinkas Plains. The downstream, or western, end of the valley turns sharply northward to drain into the Swakop River, via the Gawib and Riet drainage systems.

Water would have been the major constraint on human occupation of this area and the few natural seepages that exist are both weak and brackish. From the evidence of archaeological surveys elsewhere in the Namib, sources such as these would have been less important than the ephemeral ponds that collect after rain in natural basins, usually on granite outcrops. The same comparative evidence shows a close association between archaeological settlement and outcropping granite, suggesting that the eastern end of ML-140 would be the more important archaeologically.

The general terrain associations of the ML-140 archaeological sites are summarized in Figure 4, below, with regional data added for comparison. The histogram shows the high importance of outcrop which in the present case is mainly granite. On ML-140, granite outcrop occurs as large areas exposed by sheet erosion, as well as in the form of isolated core-stones. Where weathering and fracture has occurred perpendicular to jointing of the outcropping granite this has sometimes exposed large open shelters that were obviously suitable for human use.

Gravel plains surrounding granite outcrops are slightly under-represented on ML-140. This is mainly because areas of gravel and shallow soil on weathered granite were generally among outcrop and therefore recorded as such. Conversely, drainage lines are slightly over-represented on ML-140, as these were often poorly defined drainage areas on outwash fans that would elsewhere have been recorded as gravel. Rubble slopes, or hillsides, were of comparable importance on ML-140 and in the regional sample.

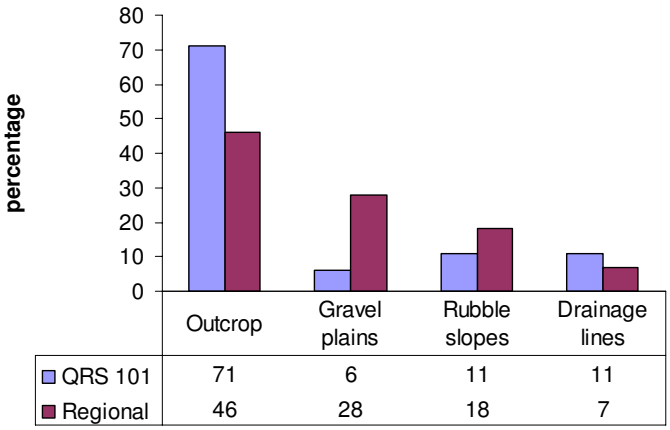

Figure 4. Terrain associations of Namib Desert archaeological sites

The array of site types found on ML-140, compared with data from regional surveys is summarized in Figure 5, below. The histogram clearly shows the numerical importance of seed diggings in the Langer Heinrich area is comparable to adjacent parts of the Namib. The ML-140 seed digging record is of interest because the productivity of seed digging declines on the east-west rainfall variability gradient, and this particular area lies close to the expected threshold where seed digging would become unviable (see Appendix II).

Seed digging sites are uniformly of 2nd millennium AD date, with the majority belonging to the last 500 years. The diggings are associated with a number of related sites, including rock shelters, surface scatters, stone features and seed grinding sites. The data from ML-140 are generally comparable with the regional picture shown in Figure 4, although there is a noticeable difference in the number of sites with stone features. The ML-140 series departs from the norm because it has a number of sites that could be communal game-drives, or *battués* (but see Field survey of sites QRS 58/38-41, below).

Among the stone feature sites on ML-140 are a number of huts, windbreaks, hunting blinds and granary cairns. The latter are an important part of the seed digging distribution, as are the seed grinding sites. The relatively small number of seed grinding sites on ML-140 might reflect the fact that this activity was also carried out at rock shelter sites.

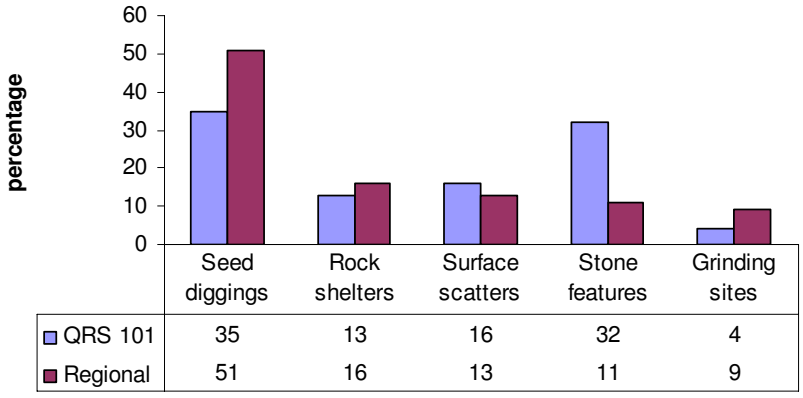

Figure 5: Simplified comparison of archaeological site types found in the interior parts of the Central Namib Desert.

Figure 6, below, illustrates the critical pattern of associations that occurs throughout the Namib in areas where seed digging was practiced. First of all, seed digging sites tend to lie within 4km of water, however ephemeral. Rock shelters that were occupied as base camps by seed diggers usually lie within less than 1km of water, and usually the base camp sites themselves are at least 5km apart. The actual seed diggings are quite densely concentrated near to the base camp sites and, depending on the frequency of visits, seed diggings may have a local density of more than 600/km^2. Groups of seed diggings located at more than 3km from the base camp site are often associated with granary cairns and may also be located near to grinding sites. The

grinding sites differ from base camp sites in that they usually have no evidence of stone artefact manufacture and no evidence of overnight occupation such as fragmented bone or ashy hearths. Evidence from a number of seed digging areas suggests that the diggings, the granary cairns and the grinding places were women's sites. There is evidence that in the Namib, pottery was almost exclusively associated with women's tasks and it is of interest that the intact pot found on ML-140 (QRS 58/063) was found near the group of seed diggings towards the western end of the lease area.

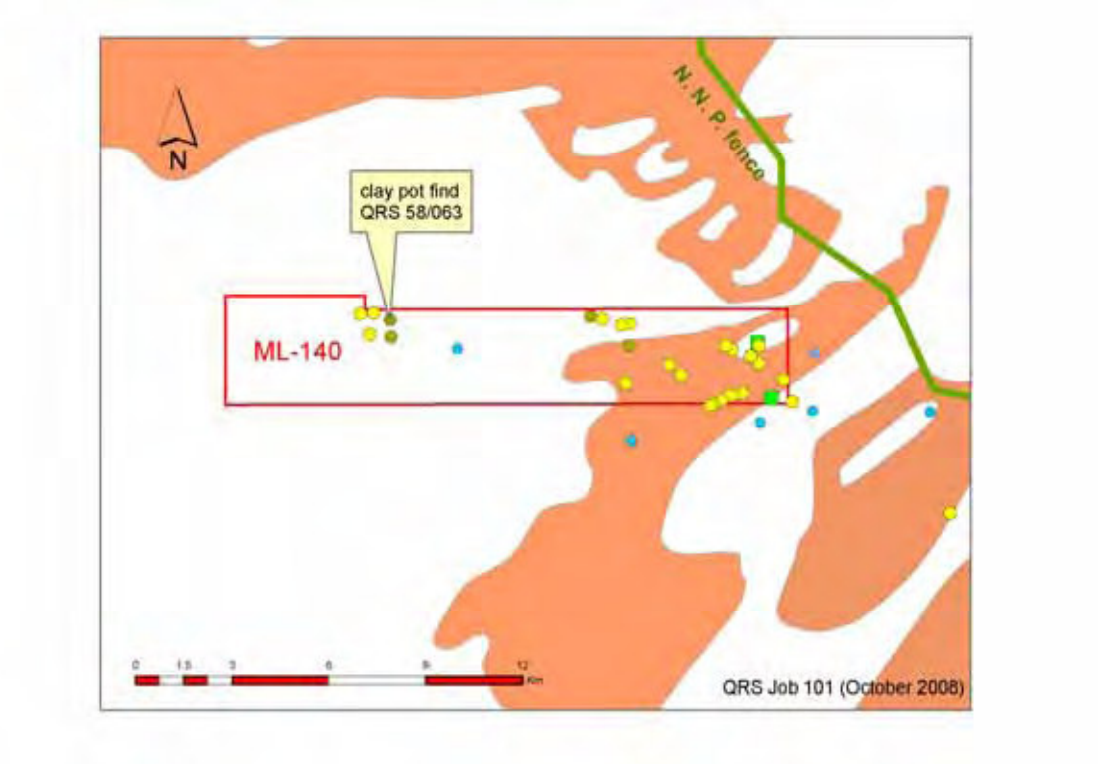

Figure 6: Distribution of 2nd millennium AD seed digging sites on ML-140. The yellow dots are seed diggings; the brown dots are granary cairns, and the green squares are seed processing sites. The blue dots are water seepage points inferred from remote sensing data collated by F. Eckhard (UCT). Note that the point near the middle of ML-140 probably represents water lying in the Langer Heinrich open pit.

The vessel found at QRS 58/063 is bag-shaped, with a bluntly nippled base, a band of blunt stylus decoration below the rim and two externally-applied lugs, with slightly flared apertures. The vessel measures 350mm in height and 232mm at the waist, giving a capacity of slightly over 2.5l. At the rim, the vessel wall is about 7mm in thickness, increasing to over 12mm at the base, The vessel was built using the coil method and lightly tempered with fine sand, resulting in a number of horizontal and radial shrinkage cracks. A small amount of fine mica is visible in the vessel fabric and it is unclear whether this was a natural constituent of the clay or added as decorative temper. A large fire-cloud on one side of the vessel indicates that it was fired in an open hearth, with one part slightly buried and therefore oxygen-deprived.

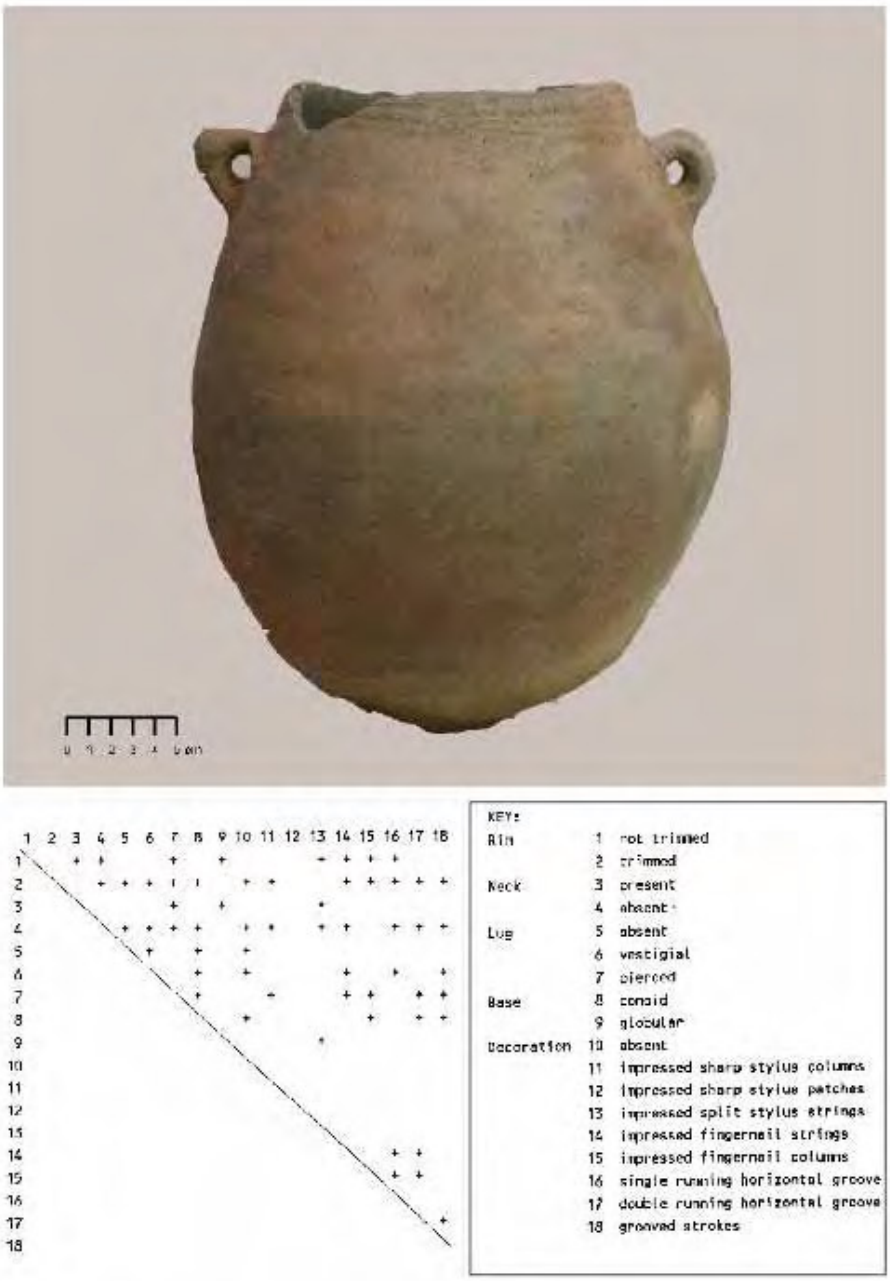

Figure 7: Clay vessel from QRS 58/063, shown in comparison with common style and decoration attributes for 2nd Millennium AD pottery in the Namib.

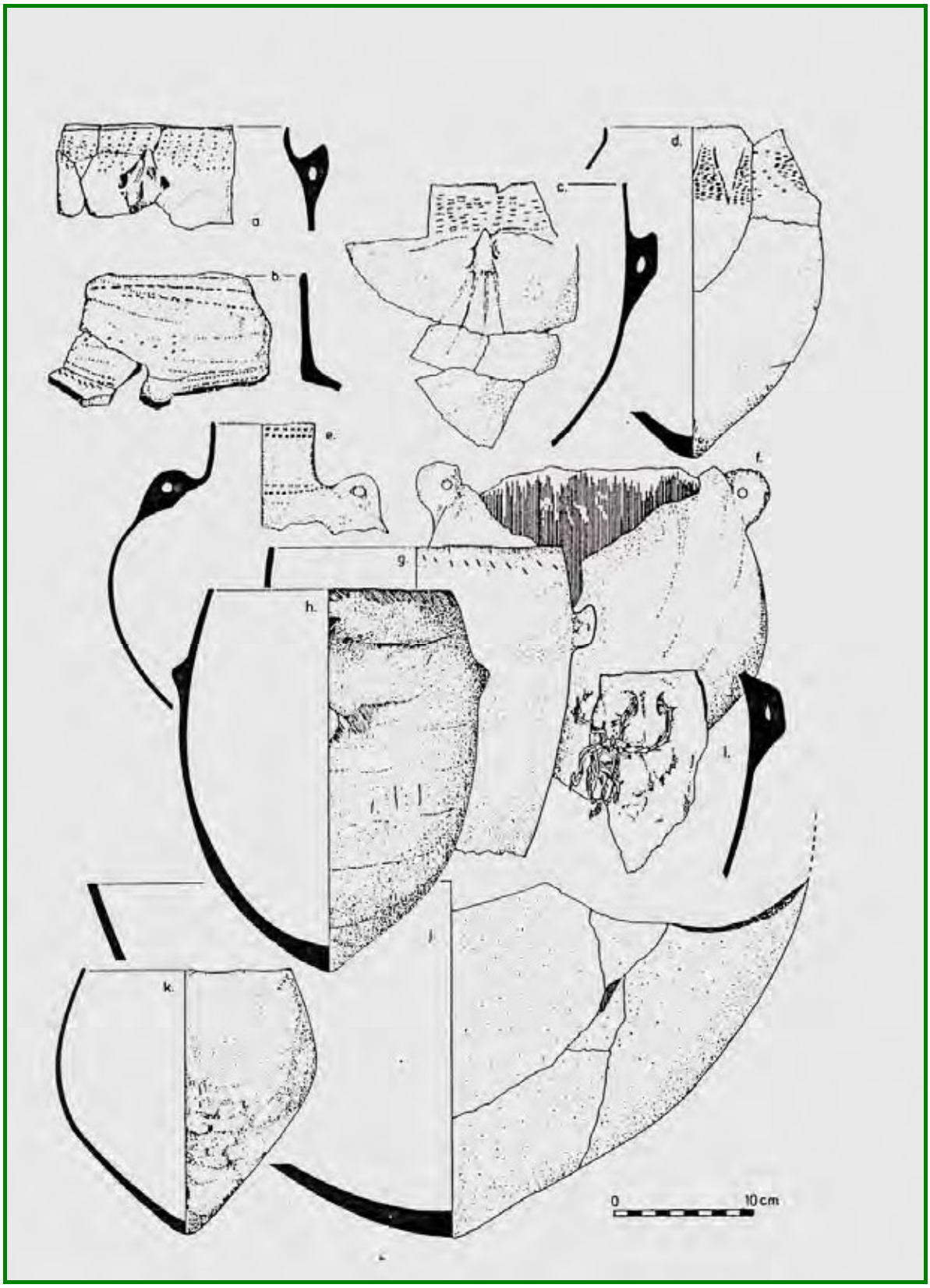

Figure 8: Characteristic shape, size and decoration features of 2nd millennium AD Namib pottery vessels (ex. Kinahan, J. 2001: 74, Fig 3.11).

The valley between Langer Heinrich Mountain and the Schieferberg lay on the route to the Namibian interior established in the mid-19th century as the "Bay Road". The same route was used by the occupying German forces until 1897, when the *Rinderpest* outbreak put an end to animal-drawn transport. The German military post at Klein Tinkas well would have been abandoned at this time. There is no surviving trace of the Tinkas road on ML-140, and the nearest section of the old route that is still preserved lies approximately 25km to the west. There are a number of 19th century graves in the Tinkas area, including those of German soldiers stationed at the outpost. It is possible that unmarked graves exist within the mine lease area and that these may be discovered in the course of mining operations.

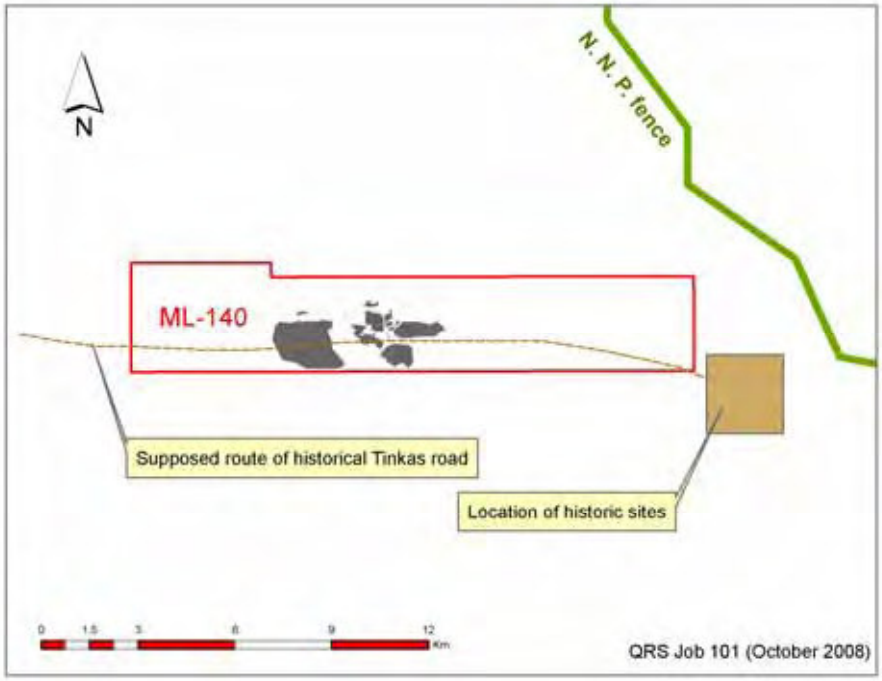

Figure 9: The supposed route of the historical Tinkas road, now obliterated within ML-140. The road is assumed to have passed between Langer Heinrich mountain and Schieferberg, en route to the historical sites at the Tinkas springs.

The western side of the Langer Heinrich mountain was the site of an important battle between the German colonial forces and the invading South African forces under general Louis Botha in March 1915. Although the decisive combat occurred at Pforte and Jakkalswater, north of the Swakop River, the German forces at Riet were securely entrenched and had to be attacked from the south. The approaches to Riet were guarded by German artillery, with infantry on the lower flanks of the mountain. The accounts of the battle[ø] relate that the Germans abandoned their defences on 20th March and retreated to Jakkalswater under cover of darkness.

ø General Staff 1924. *The Union of South Africa and the Great War 1914-1918 Official History.* Defence Headquarters, Pretoria.; L'Ange, G. 1991. *Urgent Imperial Service: South African forces in German South West Africa 1914-1915.* Ashanti.

Remains of the German infantry and artillery positions are clearly visible in the field, (QRS 58/074 and 58/075), and correspond to the sketch plan of the tactical operations reported in the official South African account of the battle. There is also a single South African grave on what would have been the south-western edge of the battlefield (see QRS 58/068).

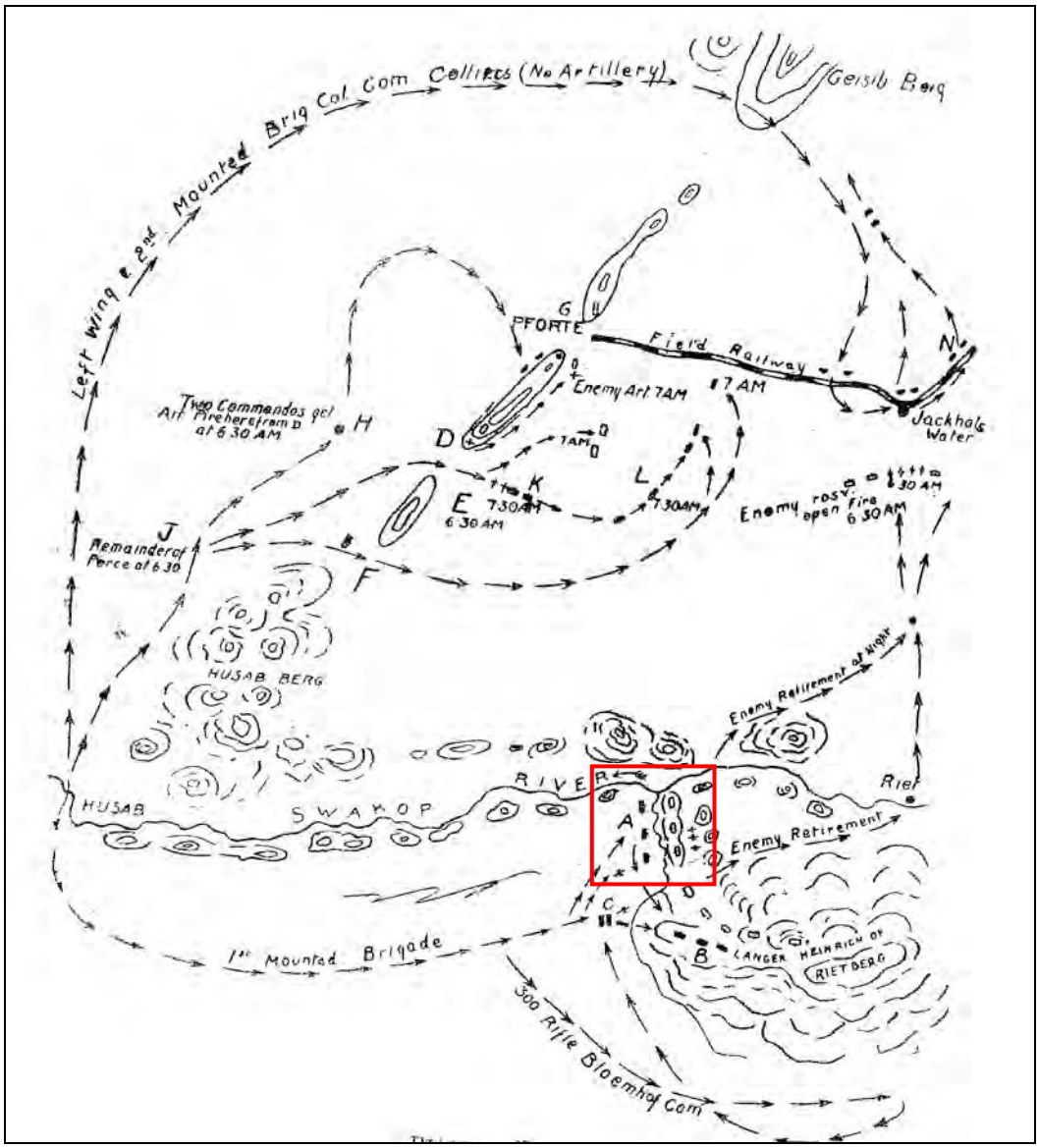

Figure 10**:** "Tactical operations at Pforte and Riet on 20th March 1915" (General Staff 1924. *The Union of South Africa and the Great War 1914-1918 Official History*. Defence Headquarters, Pretoria). The area described in this report is enclosed with the red square.

Figure 11: German artillery position (QRS 58/075) overlooking the approach to Riet from the south. The German artillery was dug in up to one meter below the natural surface and protected on either side of the cannon shield by a short length of dry-stone walling.

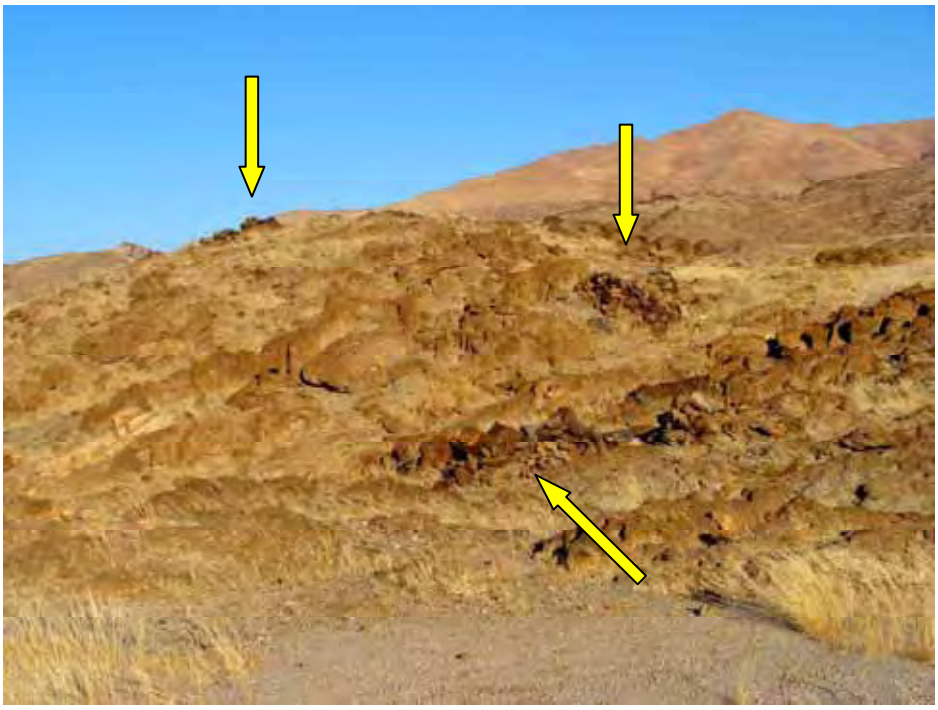

Figure 12: View of German artillery positions (QRS 58/075) from the south. On average, the German guns were oriented at 260º, indicating that the South African guns were probably positioned on the edges of the granite outcrops about 5km to the west.

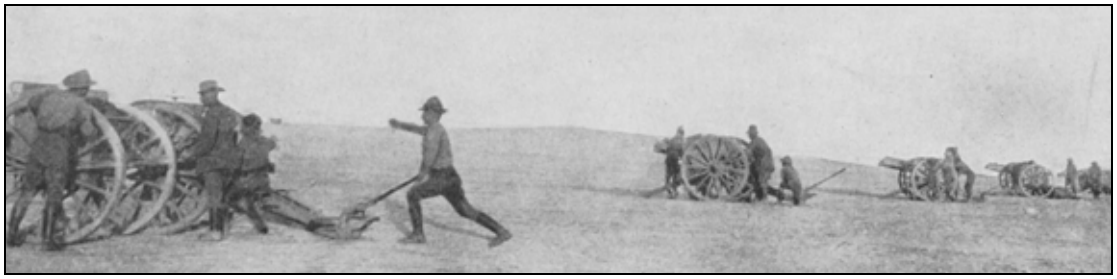

Figure 13: A contemporary photograph of General Botha's artillery in the1915 Namib Desert campaign, possibly during the action at Riet.

Figure 14: The grave of Lieut. J.N. Uys, killed at Riet on 19th March 1915 (QRS 58/068).

Figure 15: German infantry trenches (QRS 58/074) overlooking the approaches to the artillery defence on the approach to Riet.

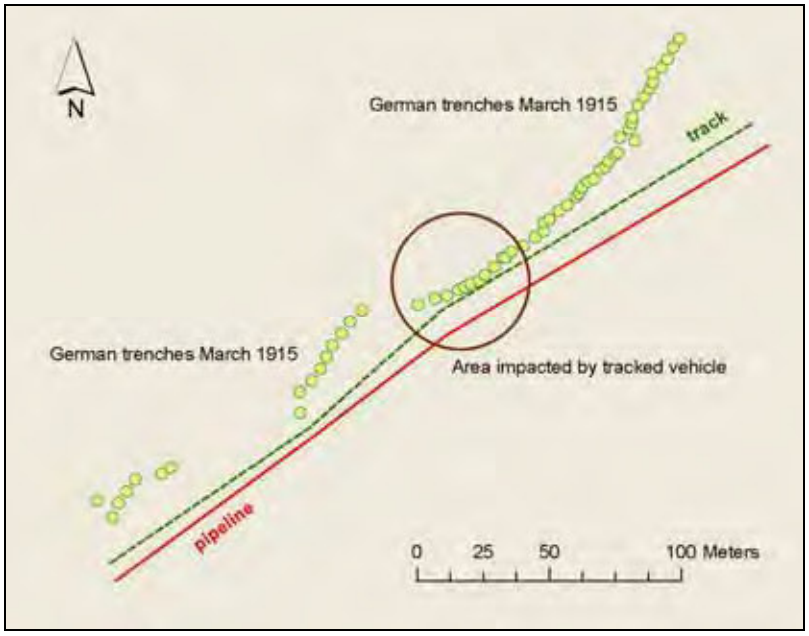

Figure 16: German infantry trenches (QRS 58/074), showing proximity of pipeline and track, as well as the area impacted by the use of a tracked vehicle during construction of the pipeline.

Gazetteer of sites
QRS 58/001

Site coordinates (WGS 84): Lat. -22.82975 Long. 15.426
Setting: In dry river course at Klein Tinkas spring.
Description: Rectangular, two-roomed dry-stone fortification built on weathered bedrock. On its longest axis the fortification measures 7.5m, with a maximum height of 1.9m. The doorway of the structure is oriented 75° magnetic, or towards the spring itself. The fortification appears to have been built in two phases, of which the first is the more robust and well finished. This component has a total of eight loopholes, covering the northern quadrant approaches. The structure is reasonably well preserved.
Records: Field notes, photographs, locality data.
Significance ranking: 4
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/002
Site coordinates (WGS 84): Lat. -22.82994 Long. 15.42553
Setting: Minor rock outcrop adjacent to QRS 58/001
Description: A dispersed midden of typical late 19th century bottle glass and iron packing case straps, apparently associated with QRS 58/001, above. The material is typical of German military dumps from the period.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/003
Site coordinates (WGS 84): Lat. -22.82833 Long.15.42522
Setting: Colluvial valley fill terrace adjacent to QRS 58/001 & 002.
Description: Two German colonial *Schutztruppen* graves, with cast iron plaques inscribed as follows:

Hier ruhet der Unterofficier (transl. "Here lies the non-commissioned officer")
Robert Kirschgatter
Gest (died) *am 27 Juni 1895…*

Hier ruhet der Reiter (transl "Here lies the trooper")
Ferdinand Zarp
Gest (died) *am 26 Juni 1895…*

The graves are covered by a large and evidently well maintained drystone structure filled with crushed quartz gravel. Although there is no notice to indicate this, the graves are probably tended by the *Deutsches Kriegsgefallenes Verein*. The graves and the fortification QRS 58/001 are a well known tourist site marked on most maps of the area.
Records: Field notes and locality data
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/004
Site coordinates (WGS 84): Lat. -22.82911 Long. 15.42647
Setting: A low granite outcrop situated approximately 80m northeast of the fortification at QRS 58/001
Description: The outcrop is covered in smashed glass of the same kind as that noted at the midden QRS 58/002. It appears that bottles were placed on the outcrop and used for target practice from the fortification loopholes.
Records: Field notes and locality data
Significance ranking: 1
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/005
Site coordinates (WGS 84): Lat. -22.82853 Long. 15.42778
Setting: North side of the streambed opposite QRS 58/001
Description: A rough drystone structure, sub-rectangular in plan and measuring 4 x 3m, with walls 1.5m high and an entrance on the east side. The function of the structure is unclear but it is probably associated with the fortification.
Records: Field notes and locality data
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/006
Site coordinates (WGS 84): Lat. -22.85436 Long. 15.48169
Setting: Groot Tinkas spring
Description: Surface scatter of 19th century glass, porcelain and barrel hoop iron. Some glass may be flaked.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/007
Site coordinates (WGS 84): Lat. -22.85297 Long. 15.47961
Setting: Groot Tinkas spring
Description: Drystone walling approximately 3m long and 1m high; looks like 19th century hunting blind.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/008
Site coordinates (WGS 84): Lat. -22.85128 Long. 15.48086
Setting: Groot Tinkas spring
Description: Drystone walling of loose granite and quartzite rubble 0.6m high, built into outcropping rocks, and overlooking waterhole/ spring, on bearing 230º magnetic. Enclosed area has internal diameter of approximately 1.2m. If used to fire on game at spring, the approximate range would be 100m, with angle of fire 6º below horizontal, so probably ideal for mid-19th century.

Records: Field notes, sketch and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/009
Site coordinates (WGS 84): Lat. -22.85092 Long. 15.48294
Setting: Groot Tinkas spring
Description: Two low arcuate hunting blinds (indigenous type), facing approach to waterhole at 360º magnetic. The blinds are about 1.2m in length, with a maximum height of 0.5m.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/010
Site coordinates (WGS 84): Lat. -22.853 Long.15.48456
Setting: no record
Description: Semi-circular stone feature approximately 2m in diameter; could be windbreak or hunting blind (no associations).
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/011
Site coordinates (WGS 84): Lat. -22.85475 Long.15.48564
Setting: no record
Description: Semi-circular stone feature approximately 2m in diameter, partly built into outcrop; could be windbreak or hunting blind (no associations).
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/012
Site coordinates (WGS 84): Lat. -22.85575 Long.15.48661
Setting: no record
Description: Circular stone feature approximately 2m in diameter, built onto outcrop; could be windbreak or hunting blind (no associations).
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/013
Site coordinates (WGS 84): Lat. -22.85594 Long.15.46436
Setting: Outwash fan gravel
Description: Two seed diggings
Records: Field notes and locality data.
Significance ranking: 1
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/014

Site coordinates (WGS 84): Lat. -22.83858 Long.15.43767
Setting: Outwash fan gravel
Description: Grave, in extended position and oriented E-W with upright headstone (no inscription) at W end.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/015
Site coordinates (WGS 84): Lat. -22.83853 Long. 15.43758
Setting: Outwash fan gravel
Description: Grave cairn, indigenous type, roughly circular plan and about 2m diameter.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/016
Site coordinates (WGS 84): Lat. -22.82922 Long. 15.40956
Setting: In lee of minor granite outcrop
Description: Surface scatter of stone artefacts and flaking debris, about 4m in diameter, with approximately 50 objects/m^2, mainly hydrothermal vein quartz, crystalline quartz and chert.
Records: Field notes and locality data
Significance ranking: 3
Vulnerability ranking: 4 (site is outside ML 140)

QRS 58/017
Site coordinates (WGS 84): Lat. -22.81561 Long. 15.36722
Setting: Western side of granite kopje behind old prospecting camp.
Description: Rock shelter, about 22m long following the dripline, and about 4m deep. The stratified deposit is mainly weathered granite spalls and no more than 0.5m deep. There is some disturbance due to animal burrowing. The talus slope in front of the shelter extends over approximately 500m^2, with object densities of between 50 and 100/m^2, mainly hydrothermal vein quartz, some crystalline quartz, cryptocrystalline silicates, fine-grained dolerite, and chipped ostrich eggshell. Some bone and charcoal is visible in the deposit, but no pottery was observed. The deposit has a hard saline crust, indicating occasional wetting and evaporation.
Records: Field notes and locality data. See test excavation results below.
Significance ranking: 3/4
Vulnerability ranking: 4/5

QRS 58/018
Site coordinates (WGS 84): Lat. -22.81117 Long. 15.3455
Setting: Rock shelter formed by erosion of colluvial valley fill.
Description: Stone base of honey scaffold below natural cavity forming the entrance of a bees' nest Cavity is about 2.0m above the cairn and shows

extensive soot encrustation. Broken sticks from the scaffold appear to be very old and weathered, so the cairn is considered to be historical.
Records: Field notes and locality data
Significance ranking: 2/3
Vulnerability ranking: 4/5

QRS 58/019
Site coordinates (WGS 84): Lat. -22.80936 Long.15.37572
Setting: Top of low granite outcrop.
Description: Surface scatter of stone artefacts and flaking debris, mainly hydrothermal vein quartz and some ostrich eggshell, with object densities of about 20/m^2.
Records: Field notes and locality data
Significance ranking: 3
Vulnerability ranking: 0

QRS 58/020
Site coordinates (WGS 84): Lat. -22.81161 Long.15.37553
Setting: Rock shelter on southern flank of same kopje as QRS 58/019
Description: Shelter orientated 150° magnetic and looking out over a gentle 7° slope. The rock within the shelter is heavily weathered as noted for QRS 58/017 and there is some evidence of surface water flow parallel to the backwall. The shelter measures 11m along the dripline and is approximately 4m deep. Small parts of the deposit may contain stratified material, but the deposit extends over a maximum of 6m^2, with an estimated depth of 0.3m. The talus scatter at the south end of the shelter contains hydrothermal vein quartz, crystalline quartz and some ostrich eggshell. No pottery was observed at the site.
Records: Field notes and locality data. See test excavation results below.
Significance ranking: 3/4
Vulnerability ranking: 0

QRS 58/021
Site coordinates (WGS 84): Lat. -22.84578 Long.15.39369
Setting: Outcropping granite
Description: Rock shelter with minor surface scatter artefact flaking debris <5 pieces/m^2.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/022
Site coordinates (WGS 84): Lat. -22.84408 Long.15.38625
Setting: Outcropping granite
Description: Rock shelter with deposit over 10m^2, to estimated depth 0.6m. Surface artefact flaking debris>50 pieces/m^2 comprising hydrothermal vein quartz, crystal quartz and chert, with one lower grindstone
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/023
Site coordinates (WGS 84): Lat. -22.83961 Long.15.38947
Setting: Outcropping granite
Description: Rock shelter with surface scatter artefact flaking debris >250 pieces/m^2 comprising hydrothermal vein quartz, crystal quartz and chert.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/024
Site coordinates (WGS 84): Lat. -22.81757 Long.15.4271
Setting: Granite outcrop
Description: Northwest-facing shelter; no deposit, but thin surface scatter hydrothermal vein quartz flaking debris, with some micaceous quartzite fragments probably from broken lower grindstone/s.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/025
Site coordinates (WGS 84): Lat. -22.81167 Long.15.42663
Setting: Outcropping granite in narrow ravine.
Description: Seepage/spring, slightly saline
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/026
Site coordinates (WGS 84): Lat. -22.80893 Long.15.43049
Setting: Outcropping granite
Description: Northwest-facing embayment, with 10 x 20m surface scatter hydrothermal vein quartz and basalt flaking debris. Overlooks presently dry seepage.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/027
Site coordinates (WGS 84): Lat. -22.80735 Long.15.43111
Setting: Outcropping granite
Description: Southwest-facing shelter with small locally dense surface scatter hydrothermal vein quartz, crystalline quartz, quartzite, schist and (yellow) chert flaking debris. Soil has minor traces charcoal and white ash.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/028

Site coordinates (WGS 84): Lat. -22.81888 Long.15.41802
Setting: Outcropping granite
Description: Seed diggings (n= 5 – 6) over approximately 100m. Visible caliche on overturned rock spalls.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/029
Site coordinates (WGS 84): Lat. -22.82469 Long.15.4145
Setting: Outcropping granite
Description: Small dense scatter hydrothermal vein quartz flaking debris.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/030
Site coordinates (WGS 84): Lat. -22.82499 Long.15.42042
Setting: Outcropping granite porphyry
Description: Seed digging.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/031
Site coordinates (WGS 84): Lat. -22.8239 Long.15.41452
Setting: Granite core-stone outcrop
Description: Shelter formed by two inward-leaning boulders; floor area is approximately 3 x 3m; surface items include one lower grindstone and two upper grindstones. This is probably a seed-processing site related to 58/29 and 58/30, above.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/032
Site coordinates (WGS 84): Lat. -22.81728 Long.15.41304
Setting: Outcropping granite
Description: Surface scatter hydrothermal vein quartz flaking debris, 5 x 5m with estimated 10 pieces/m^2.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/033
Site coordinates (WGS 84): Lat. -22.8144 Long.15.41113
Setting: Outcropping granite, weathered
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2

Vulnerability ranking: 2

QRS 58/034
Site coordinates (WGS 84): Lat. -22.81224 Long.15.40874
Setting: Outcropping granite porphyry, weathered
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/035
Site coordinates (WGS 84): Lat. -22.81054 Long.15.40365
Setting: Outcropping granite porphyry, weathered
Description: Two seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/036
Site coordinates (WGS 84): Lat. -22.81049 Long.15.4027
Setting: Granite core-stone outcrop on edge of drainage line
Description: Extensive surface scatter hydrothermal vein quartz, over approximately 100 x 100m, with estimated >5 pieces/m^2
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/037
Site coordinates (WGS 84): Lat. -22.80939 Long.15.40188
Setting: Weathered granite and colluvium
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/038
Site coordinates (WGS 84): Lat. -22.80494 Long.15.40034
Setting: High isolated hill
Description: Battue line of placed stones on northeast side of hill crest. The line extends over about 120m on bearing 107º magnetic. The battue does not include identifiable hunting blinds, and looks more like a closely space series of stone bases for battue stakes.
Records: Field notes and locality data. [Note: bearing on this and next three battue lines is taken from highest to lowest point]. See field survey results below.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/039
Site coordinates (WGS 84): Lat. -22.80338 Long.15.39443
Setting: High isolated hill

Description: As previous site, with battue line extending over about 105m on bearing 355º magnetic.
Records: Field notes and locality data. See field survey results below.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/040
Site coordinates (WGS 84): Lat. -22.80429 Long.15.39955
Setting: High isolated hill
Description: As previous site, with battue line extending over about 177m on bearing 275º magnetic.
Records: Field notes and locality data. See field survey results below.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/041
Site coordinates (WGS 84): Lat. -22.80511 Long.15.40665
Setting: High isolated hill
Description: As previous site, with battue line extending over about 116m and crossing brow of hill
Records: Field notes and locality data. See field survey results below.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/042
Site coordinates (WGS 84): Lat. -22.8086 Long.15.41081
Setting: Outcropping granite in valley bottom
Description: Small northwest-facing rock shelter, with three schist lower grindstones, probable seed processing site.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/043
Site coordinates (WGS 84): Lat. -22.80956 Long.15.41109
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/044
Site coordinates (WGS 84): Lat. -22.82255 Long.15.40657
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/045

Site coordinates (WGS 84): Lat. -22.82312 Long.15.40433
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/046
Site coordinates (WGS 84): Lat. -22.82322 Long.15.40299
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/047
Site coordinates (WGS 84): Lat. -22.82462 Long.15.40076
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/048
Site coordinates (WGS 84): Lat. -22.82549 Long.15.39829
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/049
Site coordinates (WGS 84): Lat. -22.82608 Long.15.39763
Setting: Weathered granite
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/050
Site coordinates (WGS 84): Lat. -22.83477 Long.15.38253
Setting: Outwash pediment adjacent to outcropping granite
Description: Conical granite rubble cairn, 3m diameter, 1.5m high, probable elite grave.
Records: Field notes and locality data.
Significance ranking: 4
Vulnerability ranking: 0 (site is outside ML 140)

QRS 58/051
Site coordinates (WGS 84): Lat. -22.81953 Long.15.3665

Setting: Outcropping granite
Description: Shallow embayment with hydrothermal vein quartz and crystal quartz flaking debris scatter 5 x 5m, c.10 pieces/m^2.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/052
Site coordinates (WGS 84): Lat. -22.8199 Long.15.37398
Setting: Weathered granite
Description: Seed digging with manuport
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/053
Site coordinates (WGS 84): Lat. -22.80948 Long.15.37497
Setting: Weathered granite
Description: Granary cairn with schist grindstone.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/054
Site coordinates (WGS 84): Lat. -22.80976 Long.15.37557
Setting: Outcropping granite
Description: Surface scatter of hydrothermal vein quartz flaking debris,<5 pieces/m^2.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/055
Site coordinates (WGS 84): Lat. -22.81488 Long.15.38605
Setting: Granite rubble outwash fan
Description: Approximately 8 seed diggings, one with dolerite manuport.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/056
Site coordinates (WGS 84): Lat. -22.81762 Long.15.38929
Setting: Weathered granite
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/057
Site coordinates (WGS 84): Lat. -22.80327 Long.15.37507

Setting: Weathered granite
Description: Three seed diggings, with some exposed caliche on overturned spalls.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/058
Site coordinates (WGS 84): Lat. -22.8037 Long.15.37279
Setting: Outcropping schist
Description: Seed diggings
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/059
Site coordinates (WGS 84): Lat. -22.8021 Long.15.36736
Setting: Granite porphyry
Description: Seed digging with manuport
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/060
Site coordinates (WGS 84): Lat. -22.80143 Long.15.36424
Setting: no record
Description: Collapsed stone cairn
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/061
Site coordinates (WGS 84): Lat. -22.80707 Long.15.37036
Setting: Granite porphyry outcrop
Description: Overhang with honey scaffold cairn
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/062
Site coordinates (WGS 84): Lat. -22.80713 Long.15.30848
Setting: no record
Description: suspected granary cairn
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/063
Site coordinates (WGS 84): Lat. -22.80226 Long.15.30827
Setting: Quartzite ridge above wide river valley
Description: Clay pot cached in rock niche

Records: Field notes, photographs and locality data. Pot collected for National Museum accession.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/064
Site coordinates (WGS 84): Lat. -22.80034 Long.15.30365
Setting: Quartzite ridge
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/065
Site coordinates (WGS 84): Lat. -22.80049 Long.15.29997
Setting: Quartzite ridge
Description: Seed digging with some caliche on exposed spalls
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/066
Site coordinates (WGS 84): Lat. -22.8063 Long.15.30259
Setting: Quartzite ridge
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/067
Site coordinates (WGS 84): Lat. -22.8063 Long.15.30258
Setting: Colluvial gravel
Description: Seed digging
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 2

QRS 58/068
Site coordinates (WGS 84): Lat. -22.75519 Long. 15.27890
Setting: Colluvial gravel on edge of granite outcrop
Description: South African military grave inscribed as follows:

For King and Country
RIP
Lieut J.N. Uys
aged 33
Killed at Riet
19.3.15
W.M. Staad Commando
Made by Alf Smith Rand Rifles B Coy

Records: Field notes, photograph and locality data.
Significance ranking: 3

Vulnerability ranking: 3

QRS 58/069
Site coordinates (WGS 84): Lat. - 22.75301 Long. 15.27681
Setting: Granite outcrop
Description: Shelter, with seed grinding equipment
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/070
Site coordinates (WGS 84): Lat. - 22.72660 Long. 15.37532
Setting: Granite pegmatitic outcrop
Description: Shelter, south facing, with dense LSA talus 20x25m >100 pcs/m2; no pottery, OES or seed grinding equipment; therefore probably men's hunting stand. Possible deposit 2.5x3m with some surface charcoal. No glass or metal, but possible European grinding wheel fragment ?coarse corundum, and very corroded copper fragment, could be percussion cap.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 2

QRS 58/071
Site coordinates (WGS 84): Lat. - 22.72617 Long. 15.37589
Setting: Granite outcrop
Description: Surface scatter of pottery; one vessel with internally reinforced lug and blunt stylus impressions in neck band.
Records: Field notes and locality data; full surface collection.
Significance ranking: 2
Vulnerability ranking: 1

QRS 58/072
Site coordinates (WGS 84): Lat. - 22.73310 Long. 15.37874
Setting: Stream terrace
Description: Stone hut circle approximately 3m diameter, with three other indeterminate structures and one sherd green glass. This might be related to the remains of livestock pens found nearby.
Records: Field notes and locality data.
Significance ranking: 3
Vulnerability ranking: 3

QRS 58/073
Site coordinates (WGS 84): Lat. - 22.75020 Long. 15.33256
Setting: Hill footslopes
Description: Stone artefact flaking scatter, all hydrothermal vein quartz.
Records: Field notes and locality data.
Significance ranking: 2
Vulnerability ranking: 3

QRS 58/074
Site coordinates (WGS 84): Lat. - 22.75024 Long. 15.33173
Setting: Gravel terrace
Description: German infantry trenches March 1915, approximately 70 in number, roughly west-facing shallow excavations 2x1m with backdirt pile on western end. The reference co-ordinates are for a small stone sangar situated to the rear of the trenches. The trenches have been slightly damaged by a tracked vehicle during construction of the temporary pipeline.
Records: Field notes, sketch, photographs and locality data.
Significance ranking: 3
Vulnerability ranking: 4

QRS 58/075
Site coordinates (WGS 84): Lat. - 22.74565 Long. 15.33751
Setting: Schist outcrops
Description: German artillery defences March 1915, approximately eight in number and aligned 260º. The best preserved examples consist of a shallow excavation approximately 2x3m with short defensive walls about 2m apart at the firing end of the trench. These were presumably meant to augment the shield of the gun.
Records: Field notes, sketches, photographs and locality data.
Significance ranking: 3
Vulnerability ranking: 2

Archaeological mitigation:

QRS 58/17
The rock shelter site QRS 58/17 is a north-facing overhang formed by lateral weathering on a section of sheet joint approximately 15m in length (Fig. 10). The shelter is approximately 5m deep and 2.5m high at the drip-line (Fig. 11). The talus of weathered material in front of the shelter includes a moderately dense scatter of stone artefact waste, predominantly hydrothermal vein quartz, but with some crystalline quartz and minute quantities of yellow-brown chert. Several upper grindstones were present in the talus scatter.

Within the rock shelter, the floor surface (Layer I) is mainly covered by fine spalls, pinkish grey in colour (Munsell 5YR 7/2), slightly banked towards the rear of the shelter. The deposit surface had several shallow pits up to 0.3m in diameter and roughly circular in shape. These pits have effectively disturbed to small area of deposit that was most suitable for excavation. A small probe over 0.25m^2 was made in the square indicated on the accompanying site plan.

At 0.1m beneath the surface of weathered spalls, a layer of reddish brown soil with twig charcoal was found (Layer II). The colour of the soil (5YR 4/3) was evidently the result of burning. Associated with this layer were a single ostrich eggshell bead, fragments of ostrich eggshell, chips of hydrothermal vein and crystalline quartz, flakes of large mammal bone, fragments of bird and reptile bone, and small pieces of

tortoise carapace. A charcoal sample from this layer was dated to 10 530 ± 70 years BP (Beta – 258613). Calibration data are presented below.

At 0.2m below surface, the deposit changed to a quartz sand and grit, (Layer III) weak red in colour (2.5YR 6/3) and containing fine rotted grass stems, possibly the remains of bedding material. This material was associated with ostrich eggshell, chips of hydrothermal vein and crystalline quartz, small quantities of post-cranial rodent bone (possibly from disaggregated owl pellets), and fragments of bovid tooth enamel. A charcoal sample from this layer was dated to 13 030 ± 60 years BP (Beta – 258614). Calibration data are presented below.

Fine roof spall material (Layer IV) encountered at 0.35m continued to 0.43m, pinkish grey (5YR 7/2) on rotten bedrock. The layer contained no archaeological material. From the stratigraphy of the deposit it appears that occupation commenced on sterile weathered rock and was followed by at least one subsequent occupation, before the deposit was covered by an archaeologically sterile surface layer. The two late Pleistocene occupation events were followed by what appears to be relatively recent use of the site represented by stone artefact debris on the talus slope.

Figure 17: QRS 58/17 viewed from the east.

Calibration data for radiocarbon dates QRS 58/17 (see also calibration plots below):

Provenance	Sample number	C14 Age years BP	13C:12C	2 ζ calibration
QRS 58/17 Layer: II	Beta-258613	10 530 ± 70	-22.5 %0	12 810 – 12 380 & 12 260 – 12 250yrs BP
QRS 58/17 Layer III	Beta-258614	13 030 ± 60	-24.2 %0	15 730 – 15 120yrs BP

QRS 58/20

The rock shelter site QRS 58/20 is a southeast-facing overhang formed by lateral weathering on a section of sheet joint approximately 10m long. The shelter is approximately 4m deep and 4m high at the drip-line (Figs 19 & 20). A talus of weathered material in front of the shelter on the southern side includes a moderately dense scatter of stone artefact waste, predominantly hydrothermal vein quartz, but with some crystalline quartz and minute quantities of yellow-brown chert. A single upper grindstones was present in the talus scatter.

Within the rock shelter, the floor surface (Layer I) is mainly covered by fine spalls, reddish grey in colour (Munsell 2.5YR 6/1), slightly banked towards the rear of the shelter. The deposit surface shows no indications of pitting or disturbance. A small probe over 0.25m^2 was made in the square indicated on the accompanying site plan.

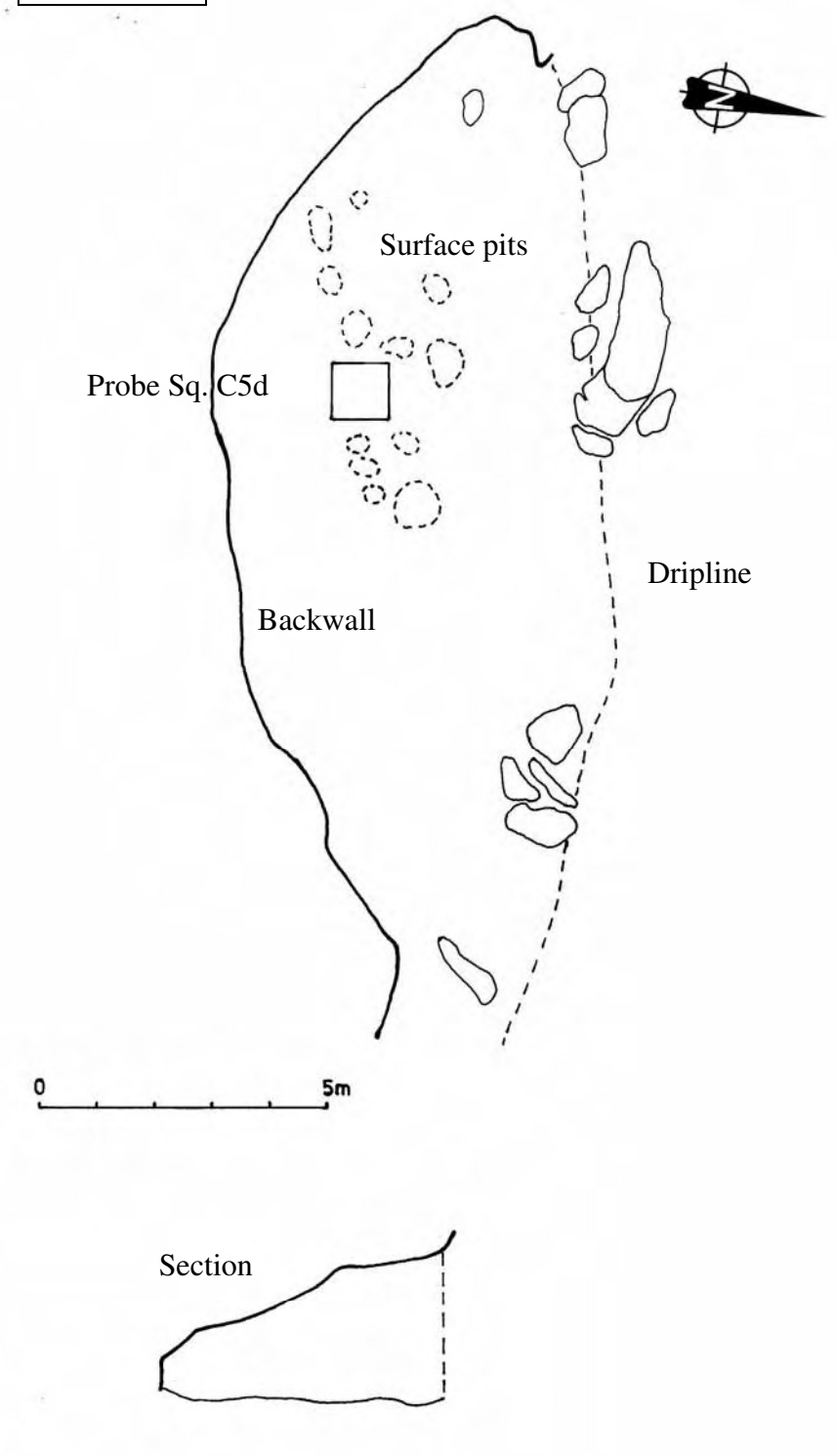

Figure 18: Plan and section of QRS 58/17

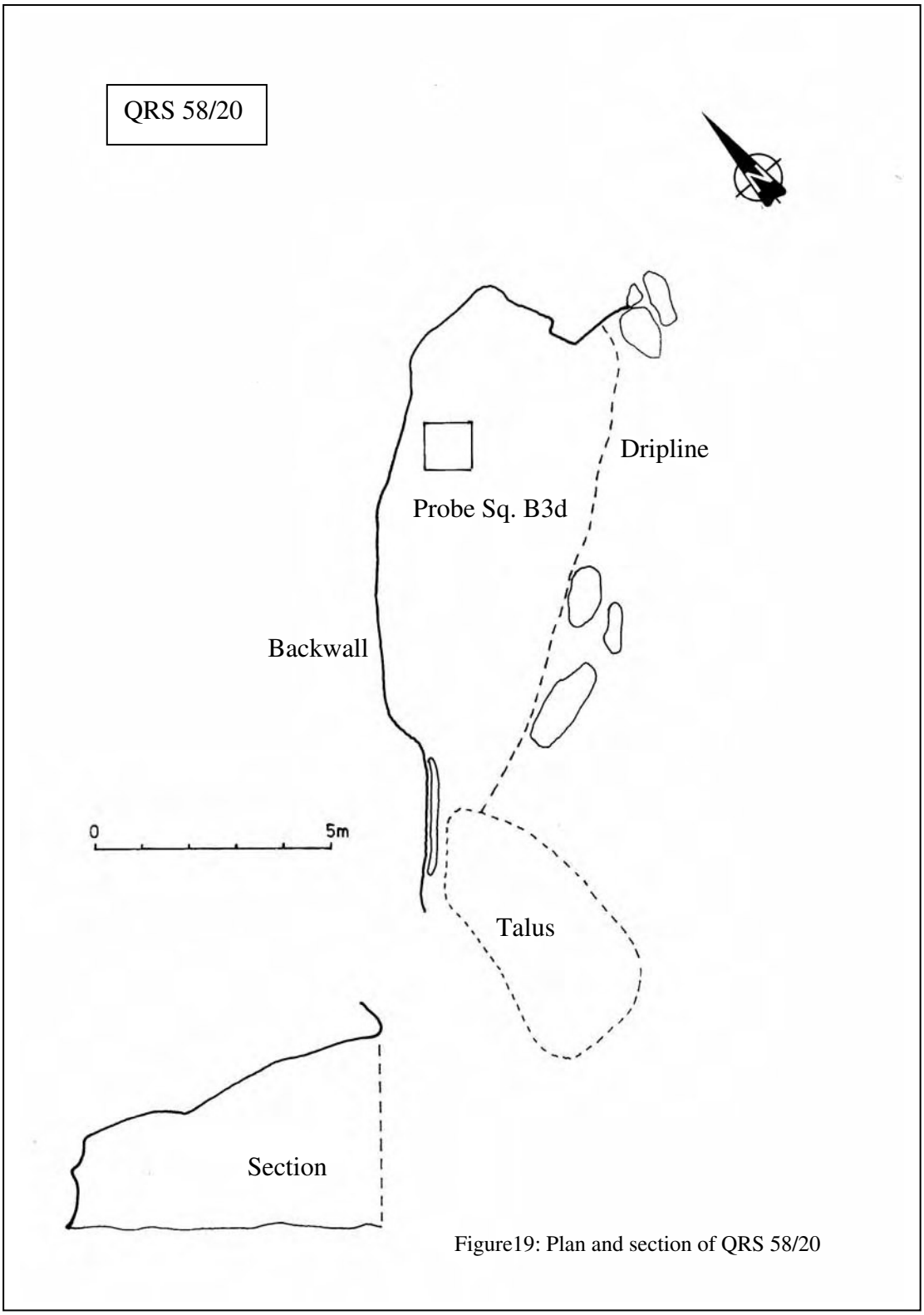

Figure19: Plan and section of QRS 58/20

Figure 20: QRS 58/20 viewed from the north

At 0.08m beneath the surface of weathered spalls, a layer of grey soil (5YR 5/2) was found (Layer II). The layer continued to 0.17m beneath the surface, reaching bedrock at this depth without yielding any archaeological material. The test excavation was abandoned at this point.

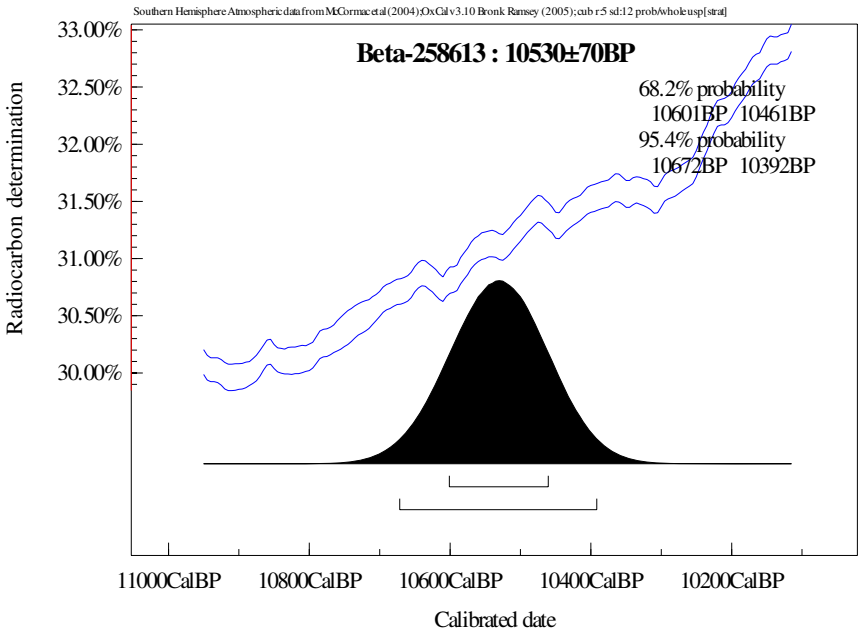

Figure 21: Radiocarbon calibration plot for QRS 58/17 Level II

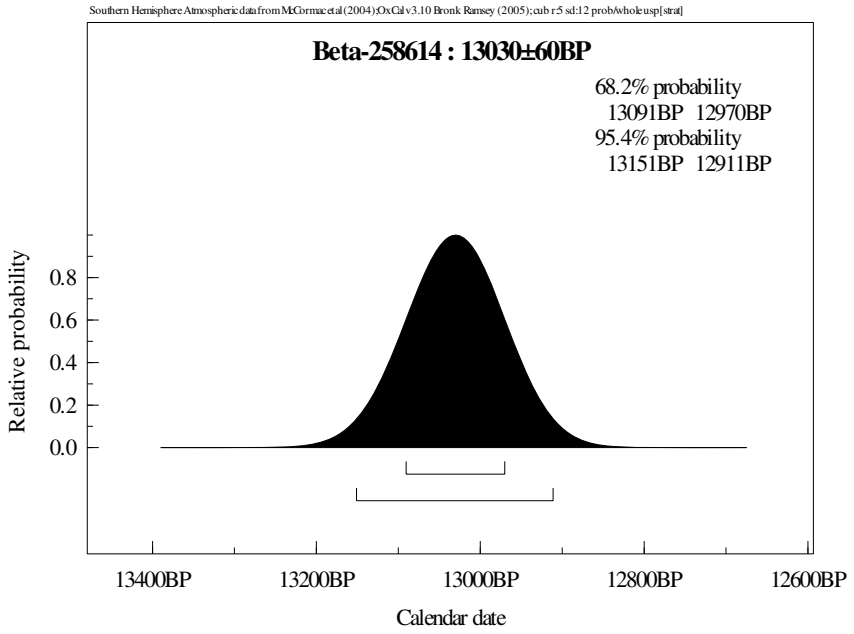

Figure 22: Radiocarbon calibration plot for QRS 58/17 Level III

QRS 58/38-41

The sites are located on a high, treeless ridge forming part of the eastern foothills of the Langer Heinrich range. There are three major stone alignments, each approximately 100m in length, and consisting of closely spaced clusters of stones that appear to have formed the footings of a barrier made from sticks. No trace of sticks or of any other archaeological material was found in association with the stone alignments. However, comparison with similar features elsewhere in the Namib strongly suggests that these were *battués*, simple linear obstructions used to drive game animals to a carefully selected ambush site.

Usually, an ambush site consists of a number of stone hunting blinds, in which case the purpose of the construction is quite unequivocal[α]. In the present case, no hunting blinds were found, and the interpretation of the sites as a group of *battués* must remain provisional. The alternative possibility that the sites formed a temporary defensive position used by the German colonial forces during World War I is not supported by any material evidence on the site, and the available documentary evidence is that the engagements between the South African and German forces in 1915 all took place on the western and south-western sides of the Langer Heinrich range[β]. However, the possibility that these were intended as military defences, but in the event unused, cannot be dismissed completely.

α Kinahan J. & Kinahan J. 2006. Preliminary report on the late Holocene archaeology of the Awasib-Gorrasis basin complex in the southern Namib Desert. *Studies in the African Past* 5: 1-14.

β General Staff 1924. *The Union of South Africa and the Great War 1914-1918 Official History*. Defence Headquarters, Pretoria.; L'Ange, G. 1991. *Urgent Imperial Service: South African forces in German South West Africa 1914-1915.* Ashanti.

The photographs below illustrate the generally low-key nature of the structures (Figs 23, 24 & 25). In the first photograph the alignment is barely visible in the grass cover as a fairly continuous line between the hilltop and the low saddle to the left. The second photograph shows some detail of construction, while the third photograph provides an oblique view along the alignment. In all three photographs it is clear that the alignments employed the absolute minimum of building material. This is in keeping with a pre-colonial battue line, and in contrast to colonial military constructions which generally have a series of substantial defensive positions, and not a continuous line built with only a few stones.

Figure 23: QRS 58/38-41 view of stone alignment from the west.

Figure 24: QRS 58/38-41 detail of stone alignment construction.

Figure 25: QRS 58/38-41oblique view of stone alignment.

In view of the difficulties of recording the stone alignments by photographic means, the site was surveyed feature by feature, using differential GPS based on a local control point. The layout of the main stone alignments is shown in the diagram below, where each feature is represented by a single triangle. The diagram clearly shows that the alignments on either side of the hilltop have a common orientation of roughly southeast-northwest. Similar radial alignments occur near the Tumas Mountains, but those are directly associated with archaeological remains of hunting blinds or dwellings, as well as stone artefacts.

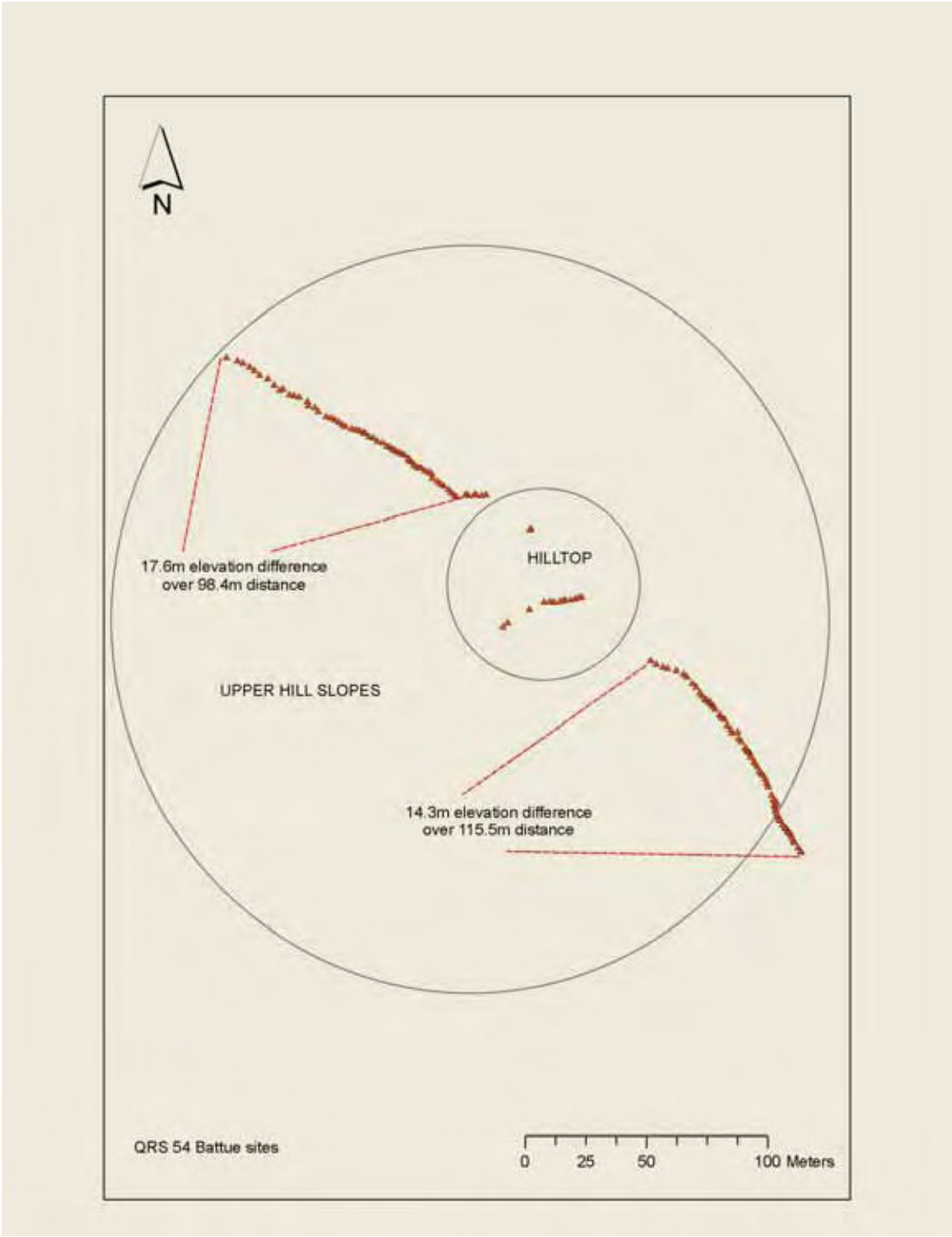

Figure 26: Annotated plan of Site QRS 58/38-41

Conclusions:

Assessment
Following the impact assessment criteria (table below) adopted for the LHU project, impact on archaeological sites can be summarized as follows:

Severity: **M** There will be a moderate and measurable deterioration through the loss of recorded archaeological sites and a degradation of the archaeological landscape setting. Direct impact or encroachment on archaeological sites requires permission from the National Heritage Council. Such impacts may lead to public complaint, especially due to the fact that the sites lie within the boundaries of the Namib Naukluft Park. Mitigation of impacts may be required when the final mining design is known. LHU may also consider archaeological offsets such as through site conservation outside the licence area.
Duration: **H** Archaeological impacts are in principle irreversible.
Spatial scale: **L** The archaeological impact of mining operation will be mainly confined within the site boundary. However, as mining and related activity increases in the Namib there will be cumulative effects, in the form of a reduced spatial extent of archaeological site distributions and visual degradation of the archaeological landscape.
Probability: **H** There is a high or even definite probability of impact where mining activity encroaches on areas that are known to contain archaeological sites.

Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. Nor observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term.
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localized – Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national.
PROBABILITY (of exposure to impacts	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

The distribution of archaeological sites on ML-140 is mainly clustered around the areas of outcropping granite. From the field evidence it appears that most of these sites relate to 2nd millennium AD use of the area by groups of hunter-gatherers exploiting the occasional availability of grass seed in ant nests, as well as possibilities to hunt and to harvest honey. As such, the archaeology of ML-140 fits closely with

the evidence available from the surrounding region. Although none of the sites within ML-140 is considered to be of outstanding significance, the archaeology of this area is a useful addition to the regional picture, and it also has the potential to add significantly to our understanding of the 2nd millennium AD in the Namib.

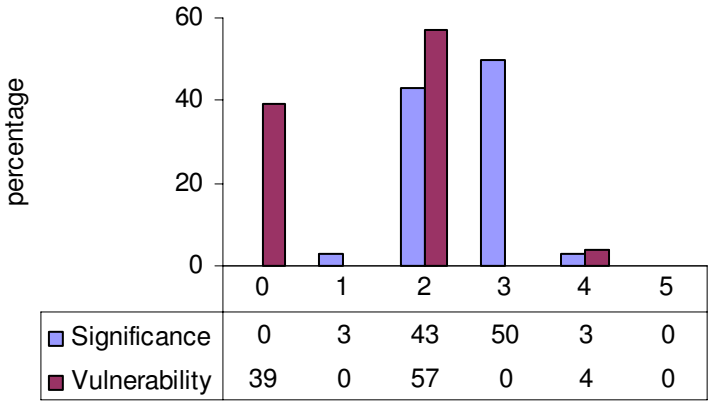

Figure 27: Archaeological significance and vulnerability rankings for ML-140 (QRS 58).

Most of the archaeological sites on ML-140 have a significance ranking of 2 and 3, meaning that these are relatively minor sites which form a meaningful local distribution. A small number of sites have a significance ranking of 4, which indicates a multi-component site with high local research potential. This combination is typical of the Namib and needs to be understood as reflecting the characteristics of an archaeological landscape, rather than a local archaeology that is represented and understood in terms of single significant sites. The landscape setting of the archaeology of areas such as this poses some challenges for archaeological management and mitigation.

Large scale impact is anticipated with the extension of mining operations towards the eastern end of ML-140. Field assessment of site vulnerability was based on proximity to recent exploration drilling and this is reflected in the ranking of the sites, with a small number of sites facing a high likelihood of adverse impact, more than half facing possible indirect impact and less than half considered as not vulnerable.

The results of the assessment are translated in Figure 28, below, as sensitivity zones. The whole of the present and intended pit development and infrastructure area (as indicated by data provided by LHU) is treated here as disturbed ground and therefore excluded from archaeological sensitivity zoning. The field survey observations show that the most significant sites, which are also considered the most sensitive, are located outside the boundaries of ML-140. The rest of the known and presumed archaeological site distribution is considered to be of medium sensitivity, based on the significance and vulnerability rankings discussed above. Sensitivity mapping of an isolated and relatively small area such as this requires a degree of subjectivity. It is based on a number of assumptions, including that the significance of the sites can be surmised from their external appearance, i.e. without excavation.

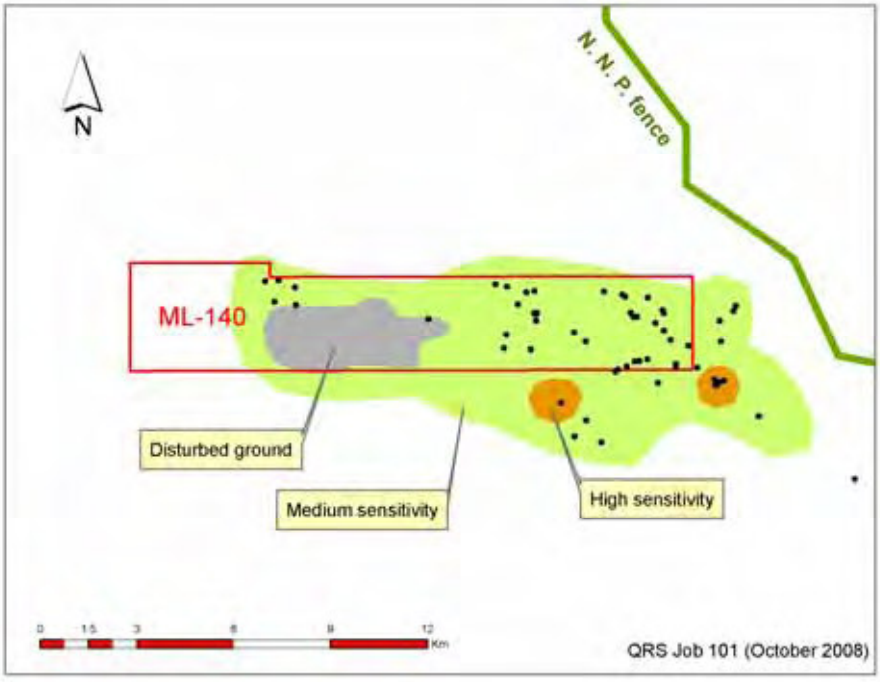

Figure 28: Sensitivity mapping of ML-140, with undifferentiated archaeological site distribution as empirical background. GIS layer files for the sensitivity zones are included with the digital resources in Appendix III.

In the light of the Phase 2 mitigation work reported here, the two rock shelter sites QRS 58/17 and 58/20 can be assessed as having only minor significance. QRS 58/17 has yielded two valuable radiocarbon dates which are of value for the understanding of the regional sequence. As yet, only two other sites have yielded dates in this time range, viz. Apollo 11, in the Huns Mountains of southern Namibia, and Oruwanje, near Opuwa in northern Namibia[σ]. However, the value of the QRS 58/17 site and its possibilities for further investigation are greatly reduced by the fact that the archaeological deposit has been extensively disturbed. It is assumed that this was an act of vandalism, but it probably occurred before the time of the present leaseholders, Langer Heinrich Uranium.

The remaining mitigation sites, QRS 58/38-41, are of unclear status. They may be precolonial *battués*, as originally interpreted, but there is a possibility that they were erected by German colonial forces as temporary defences during the South African invasion of 1915. They resemble radial stone alignments from the Tumas Mountains, but lack the associated archaeological evidence. On the other hand, they are oriented towards the direction of the South African approach and may have been prepared in advance of the action that took place at Pforte and Jakkalswater on 18th and 19th March 1915. The fact that they are not specifically mentioned in the campaign history may simply mean that the South African forces were not aware of them. More

σ Vogel, J.C. & Visser, E. 1981. Pretoria radiocarbon dates II. *Radiocarbon* 23 (1): 43-80; Albrecht, M.et al 2001. Oruwanje 95/1: a late Holocene stratigraphy in northwestern Namibia. *Cimbebasia* 17: 1-22.

detailed survey of the area to the north of ML-140 may one day provide a fuller picture of these events.

The survey of the pipeline and power-line route on the western side of Langer Heinrich mountain has located a number of additional sites that relate to the events of March 1915. The German infantry trenches (QRS 58/074), generally well preserved, have been slightly damaged by work on the temporary pipeline. The German artillery positions (QRS 58/075) will probably not be affected by the proposed pipeline and power-line route. However, the sites are an important relict of the period and their setting on the battlefield is of historical interest. The routing and construction of the pipeline and power-line should consider not only the physical impact on these sites, but also the visual impact on a previously undisturbed area.

Recommendations

The Phase 2 mitigation work at LHU has completed the four tasks identified at the conclusion of Phase 1, namely:

1. That environmental staff at Langer Heinrich should be given a short field induction to the archaeology of the area.
2. That results of the archaeological baseline survey should be integrated with the GIS-based land use management plan for the lease area.
3. That test excavations of 1-2m^2 to bedrock should be undertaken at two rock shelter sites, viz. QRS 58/17 and QRS 58/20.
4. That detailed recording of the four *battué* sites QRS 58/38-41 should be carried out as a proactive mitigation.

As a result of the additional survey of the pipeline and power-line route, a further recommendation is that the German infantry trenches at QRS 58/074 should be condoned off during construction. This should take the form of a line of steel posts with highly visible danger tape. Contractors should also be shown the site and instructed to avoid encroaching on them. If possible, work on this section should be served by a track on the eastern side of the pipeline. All soil disturbance except the minimum service track should be rehabilitated by hand after construction.

During the process of the Phase 1 and 2 investigations, LHU decided to commission an archaeological information display for the mine site office. This additional task is in hand and is scheduled for completion in mid-2009.

The display will focus on the archaeological evidence for wild grass seed gathering in the Namib during the last 1 000 years. Evidence of this activity is particularly abundant in the Langer Heinrich area. The display would make it possible to combine the archaeological evidence with some of the most interesting aspects of the Central Namib, such as environmental responses to episodic and unpredictable rainfall, the major environmental limiting factor for people and wildlife.

a. Display case contents: The display case as designed is large enough to contain the clay pot that was discovered by LHU environmental staff near the mine. We propose that the case should contain a simple reconstruction of the rock niche in which the pot was found. The pot is typical of the kind that was used by hunter-gatherer women to store wild grass seed. This would form the centrepiece of the information display.

b. Poster on wild grass seed gathering: The poster will summarize and illustrate the archaeology and ecology of wild grass seed gathering. It would present basic information on the ephemeral grasses of the Namib and their exploitation by harvester ants, combined with ethnographic photographs of seed gathering, and some information on the appearance of the archaeological evidence and its dating.
c. Poster on archaeological impact assessment of uranium exploration in the Namib: The poster will place the archaeological survey of LHU in the context of similar surveys in the Namib, and summarize the cumulative archaeological evidence these have produced. The idea would be to show how timely field surveys can rescue important evidence of past human settlement in the Namib.

APPENDIX L: VISUAL STUDY