DIGBY WELLS
ENVIRONMENTAL

Boikarabelo Coal Mine

Archaeological and Palaeontological Chance Find Protocols

Project Number:

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Prepared for:

Ledjadja Coal (Pty) Ltd

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DECLARATION OF INDEPENDENCE

This Chance Find Protocol (CFP) has been compiled by Johan Nel. A technical review was completed by Justin du Piesanie. Both author and reviewer are professional, qualified archaeologist and members of the Association of Southern African Professional Archaeologists (ASAPA). The author holds Field Director: Iron Age accreditation in ASAPA's Cultural Resources Management (CRM) section (Member No. 095). The reviewer holds Field Supervisor: Iron Age accreditation in the CRM section (Member No. 270).

The relationship of Digby Wells and its employees with Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd and Resgen South Africa (Pty) Ltd (Resgen) is solely one of professional association between client and independent consultant. All work undertaken was done in return for professional fees based upon agreed commercial rates paid to Digby Wells that were never in any manner contingent on the results of this report. As such, Digby Wells has no material interest in the Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd.

As salaried employees of Digby Wells, neither the author nor the reviewer receive any financial or other benefit from Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd.

The CFP was developed in association with the Boikarabelo Coal Mine who will ultimately implement it. The CFP was thus reviewed by Louise van den Berg-Nicolai to ensure technical details related to the Boikarabelo Coal Mine were correct.

I, Johan Nel, therefore declare that all work and results presented in this report are wholly independent and free from any undue influence from Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd, or any of their employees.

Signed in _____on the _____day of _____ 2015.

_____ _____

Johan Nel As Witness

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Introduction

Chance Find Protocols (CFP) aim to minimise damage and destruction to any heritage resource that might be accidentally exposed during the course of development activities. The CFP outlined here are based on the legal requirements and procedures contained in the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). A proactive Archaeological Monitoring Procedure (AMP) and Palaeontological Monitoring Procedure (PMP) compliment the procedures.

The aim of this document is to enable the on-site Environmental Manager (EM) at Boikarabelo Coal Mine to proactively identify and manage heritage with specific focus on archaeological and palaeontological resources. In addition, the procedures contained herein will aim to reduce operational downtime as far as possible if the accidental discovery of significant heritage occurs. The document is structured as follows.

First, relevant definitions are described. Then, the proactive AMP is presented, including examples of typical archaeological resources known to occur in the Boikarabelo Coal Mine properties. This is followed by the PMP, including a summary of potential palaeontology associated with the various rocks known to be present in the area. Finally, the presented CFP includes a generic reporting schedule based on the NHRA.

2 Definitions

The following definitions are summarised from Section 2 and Section 38(1) of the NHRA.

Alter	Any action affecting the structure, appearance or physical properties of a *place* whether by way of structural or other works, or any other means. Cross reference "d*evelopment*" below.
Archaeological	Any material remains that were produced or created by humans or that resulted from any human activity that are unused and older than 100 years. This includes artefacts, human and hominid remains and artificial features and structures (see "s*tructures*" below). Archaeology also refers to rock art that is defined as any form of painting, engraving or other graphic representation on fixed rock surfaces or loose rocks or stones that was made by humans and that are older than 100 years, including a 10 m area surrounding such site. Archaeology also includes: ■ Any wrecks or parts thereof that was wrecked in South Africa more than 60 years ago, including any cargo, debris or artefacts found or associated with it; and

	■ Any features, structures and artefacts older than 75 years that are associated with military history, including the sites on which they are found.
Conservation	The protection, maintenance, preservation and sustainable use of "*places"* to safeguard their "*cultural significance".*
Cultural significance	The possible aesthetic, historical, social, or spiritual value or significance attached to the "*site"* by people.
Development	Any physical intervention, excavation, or action that could cause changes to the nature, appearance, fabric of a place. In addition, development might also influence the stability or future well-being of a place. Development could include: ■ construction, alteration, demolition, removal or change of use of a place or a structure at a *place*; ■ carrying out any works on or over or under a *place*; ■ any change to the natural or existing condition or topography of land; and ■ any removal or destruction of trees, or removal of vegetation or topsoil. Cross reference "*Categories of Development*" below.
Grave	The place of interment (burial ground) and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such *place*.
Heritage resource	Any place of cultural significance.
Improvement	Includes the repair, restoration and rehabilitation of a place protected in terms of the NHRA.
Management	Includes the *conservation*, presentation and *improvement* of a *place* protected in terms of the NHRA.
Object	Any movable property of cultural significance that are protected in terms of the NHRA, including:

	■ All archaeological artefacts; ■ All palaeontological and rare geological specimens; ■ All meteorites; and ■ Any other object referred to in section 3 of the Act.
Owner	Includes the owner's (Boikarabelo Coal Mine) authorised agent and any person with a real interest in the property.
Palaeontological	Any fossil remains or traces of animals or plants that were alive in the geological past, and any site that contains such fossils. Fossil fuels such as coal, and fossiliferous rock intended for industrial use are, however, excluded.
Place	A place may include: ■ (a) the site; ■ (b) a structure such as a grainbin; ■ (c) a group of structures such as a group of grainbins; and ■ (e) in relation to the management of a place, includes the immediate surroundings of a place.
Site	Any area of land, including land covered by water, and including any *structures* thereon.
Structure	Any works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

Categories of development that are typically expected to be undertaken by the Boikarabelo Coal Mine are listed and described in TABLE below.

Linear development	Linear developments refer to the construction of roads, power lines, pipelines, canals or similar infrastructure longer than 300 m. In addition, bridges and similar infrastructure longer than 50 m can also be consider linear developments.
Development of areas	This refers to any development that will change the character of a site. This means *any* change to a site, for example using an open piece of veldt as a laydown yard. The threshold for this category is 5 000 m^2 or 0.5 ha.

	In addition, this development category also refers to any changes to three or more *existing* erven or subdivisions thereof or such erven that were consolidated within the past five years, irrespective of the size of such erven. This might not be relevant to the Boikarabelo Coal Mine.
Rezoning	Any site or piece of land larger than 10 000 m^2 or one hectare that will be rezoned.

3 Proactive Archaeological Monitoring Procedure

All archaeological artefacts, features, objects and sites are generally protected in terms of Section 35 of the NHRA. It is therefore an offence to alter, damage, destroy or otherwise change archaeological resources without permits issued by the South African Heritage Resources Agency (SAHRA). *Archaeological* resources are defined as (NHRA Section 2):

- The material remains of past human activity that are no longer used and that are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.
- Rock art – any form of painting, engraving or other graphic representation created by humans on a fixed rock surface such as cave wall, or loose rock or stone that is older than 100 years, including a surrounding 10 meter area.
- Any wrecks that may include any vessel or aircraft and any part thereof that was wrecked in South Africa more than 60 years ago or which SAHRA considers to be worthy of conservation, including any cargo, debris or artefacts found or associated with it.
- Any features, structures and artefacts older than 75 years that are associated with military history, including the sites on which they are found.

The following outlines a proactive archaeological monitoring procedure (AMP) to reduce or limit impacts on unidentified archaeological resources in mine development footprint areas. The purpose of this procedure is to record the* status quo *of a development site to identify any possible archaeological remains that may be exposed and / or accidently destroyed by intrusive activities.

The AMP comprises four primary steps that must be implemented prior to any large-scale development taking place. This section is structured as follows:

- Step 1 – delineate development footprint area
- Step 2 – complete a site walk down
- Step 3 – excavate and monitor test trench
- Step 4 – compile AMP report

3.1 Step 1 - delineate development footprint area

The first step required under the AMP is to delineate the impact footprint area. This will require close cooperation and communication between the EM and the persons responsible for carrying out work. The maximum known extent of the development must be communicated to the EM well in advance of any physical work taking place.

If possible, the development footprint should be demarcated using GIS and a survey grid established. This will enable the site walk down to follow a structured survey approach and accurate plotting of identified artefacts and features.

The EM must ensure that the responsible contractor or department demarcate the footprint area and implement a site walk down of the area.

Determining and delineating the development footprint area can be done according to the categories of development described under Definitions above.

3.2 Step 2 – site walk down

The purpose of a site walk down is to identify and record any possible archaeological and other heritage resources in the development footprint. A qualified archaeologist must ideally supervise the walk down. However, if an archaeologist cannot be present, the EM must assume the responsibility provided that the person has received basic training in archaeological techniques. Skills that will be required and that can be transferred through external training include amongst others:

- Identifying archaeological artefacts;
- Archaeological survey techniques;
- Recording and documenting archaeological material and sites; and
- Determining context of finds.

The archaeologist and / or EM must ensure that the following objectives are met during the walk down.

3.2.1 Photographic documentation

The development footprint must be photographically documented to provide a record of the pre-development landscape. Photographic documentation must include:

- Photo records of the general landscape of the development footprint taken from different angles;
- Photo records of any identified artefacts and deposit. The photographs must include an appropriate photographic scale;
- Photo records of any intrusions into the soil, e.g. animal burrows, road cuttings, old excavations, etc.;

- Photo records of any material distinct from and / or specific to the natural landscape, e.g. rubble or rocky outcrops; and
- Photo records of distinctly atypical vegetation, e.g. a group of aloes in an area where aloes are uncommon, bare soil in otherwise well-vegetated area or denser vegetation in otherwise under-vegetated area.

3.2.2 Determining context

The purpose of the site walk down is to identify any material culture visible on the surface, such as pottery fragments, as well as any changes in the natural soil that may indicate archaeological deposit. Identified artefacts, features and deposits should be flagged and recorded using a hand-held GPS.

An archaeologist should ideally determine context. However, the following may be noted to assist the EM in identifying artefacts and sites and determining context and consequent significance of material found in a development footprint.

3.2.2.1 Stone Age

Stone artefacts (see Figure 4 to Figure 16) that may include formal lithics generally represent Stone Age sites, ranging from 2.5 million years ago to at least 1000 CE in the region. A rough rule of thumb is that earlier tools are larger and associated with the Early Stone Age (ESA), approximately 1.8 million to 280 000 years ago. Tool size decreases during in the Middle Stone Age (MSA), approximately 280 000 to 25 000 years ago, to a microlithic technology associated with the Later Stone Age (LSA), from around 25 000 to nearly 1000 years ago.

Where such finds are found imbedded in rock such as calcrete or ferricrete, the significance of the site increases. This is due to the finds probably being part of an *in situ* deposit. *In situ* Stone Age deposits are rare, especially 'open air sites', and significantly contributes to research. In addition, calcrete can be dated through radiometric dating techniques, and finds embedded in calcrete can therefore provide an absolute date of deposit.

If there is evidence that the flakes are of the same or similar raw material found in the general vicinity, the site may represent a manufacturing site with high potential of *in situ* deposit.

In general, a density ratio of >10:1 (10 lithics per square meter) may be considered high, and the site should be assessed by a qualified archaeologist. Figure 3 below is an example of how Stone Age material may be plotted to enable spatial analysis and artefact density to be determined. A more simplified manner to achieve this is to determine the number of tools in randomly placed square meter grids. High concentrations, i.e. >10:1, should be investigated by a qualified archaeologist.

The key indicators for Stone Age sites are the presence of stone tools (also called *lithics*) on the surface. Examples of Stone Age tools are depicted in Figure 4 to Figure 16. Although

stone tools are not easy to identify by non-specialists, the list below provides some identifying characteristics.

Flakes are probably the most common type of stone tool found. They are characterised by relative sharp edges and percussion bulbs. Stone tools are usually produced using fine-grained material such as quarts, banded iron stone, silicate, chert and feldspar.

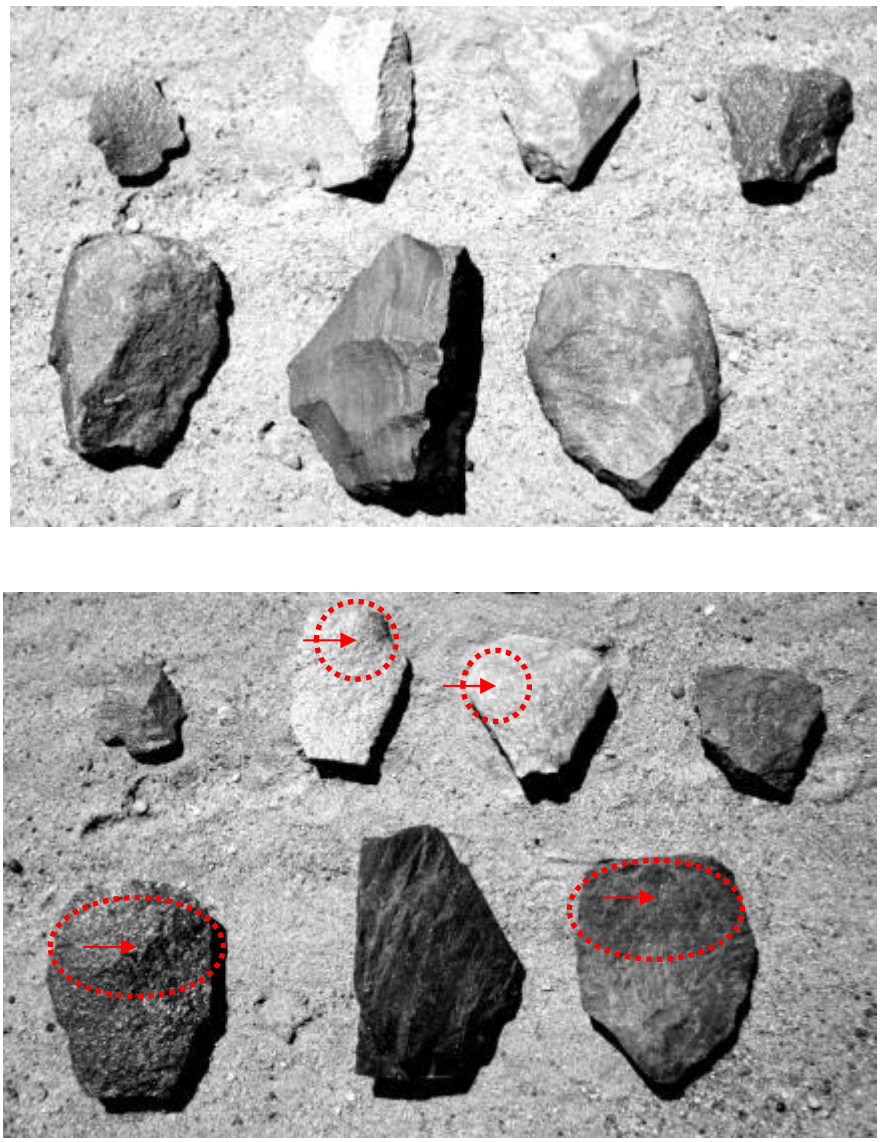


Figure 1: Examples of Stone Age tools found at Boikarabelo Coal Mine.

The images to the left depict typical stone flakes found at Boikarabelo. The top image shows the dorsal surfaces, i.e. the 'top', and the bottom image the ventral surfaces, i.e. 'bottom' aspects. Note the sharp edges clearly visible on all flakes.

The red circles in the bottom image show the area where percussion bulbs are clearly visible. The arrows indicate the approximate centres of the bulbs. The image below indicates some identifying characteristics in schematic form.

Most simple stone tools and nearly all flakes have a striking platform on the proximal end. This is typically a small surface area from where the flake is struck off the core or parent material. Immediately below the striking platform is the percussion bulb. This feature is the result of the striking force that flakes the tool from the core. The percussion bulb is always positive – that means it creates little raised parts on the flake. If the core has not been reduced more, as indicated in Figure 2 below, then a negative percussion bowl and flake area can be seen.

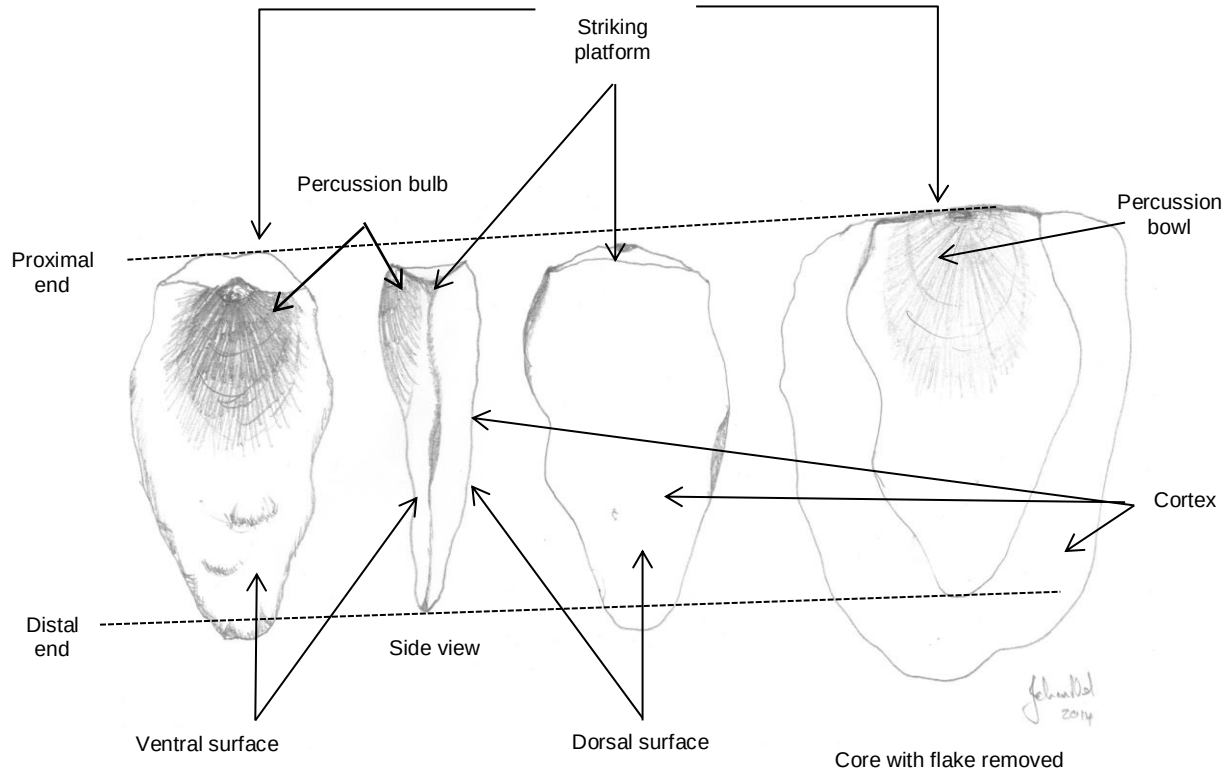


Figure 2: Schematic drawing indicting identifying feature on a stone flake or tool (drawing © Johan Nel 20140

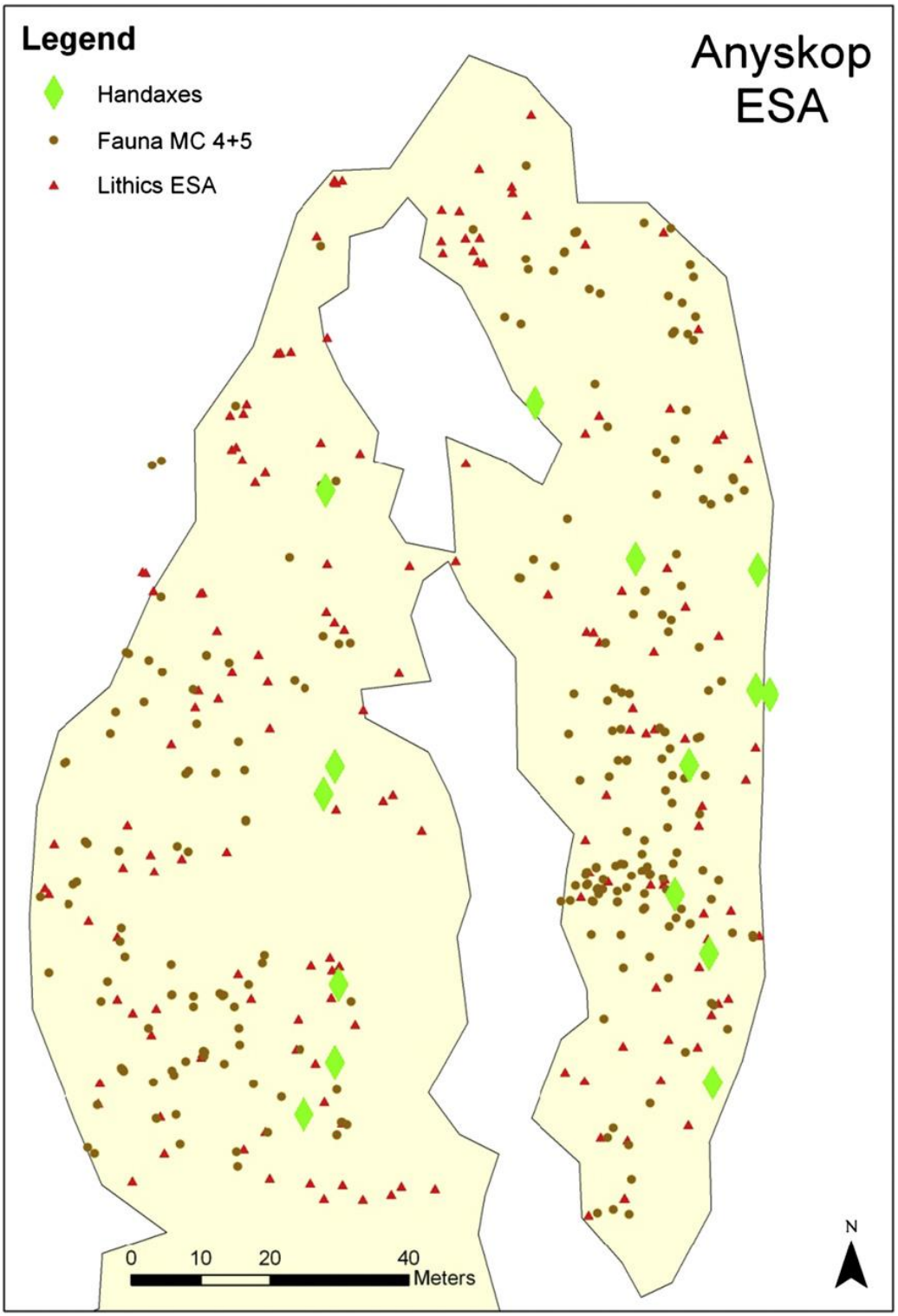


Figure 3: Example of an Early Stone Age spatial map showing artefact distribution and densities (© Kandel & Conard 2012).

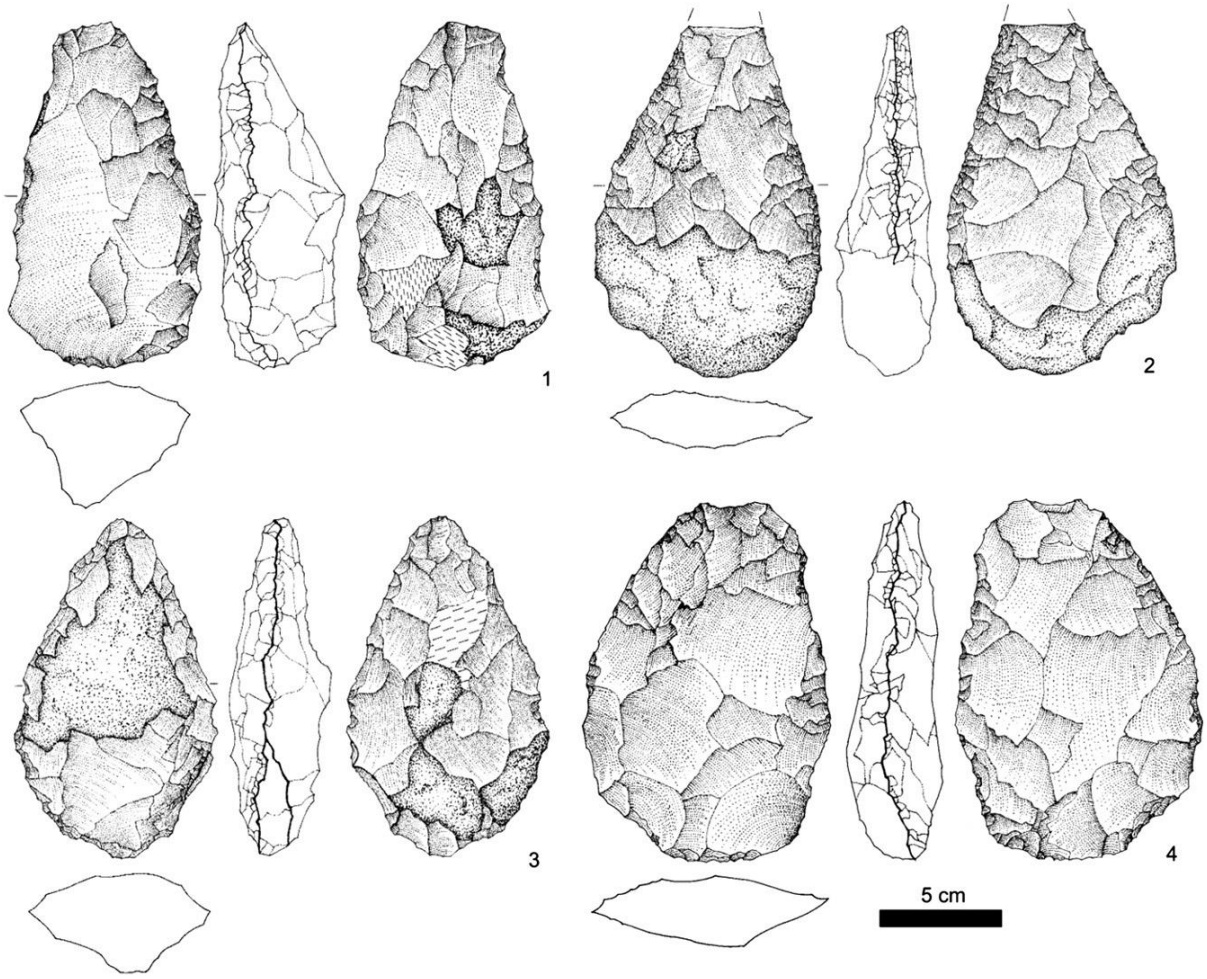


Figure 4: Examples of ESA Late Acheulean handaxes from Anyskop Blowout (© Kandel & Conard 2012)

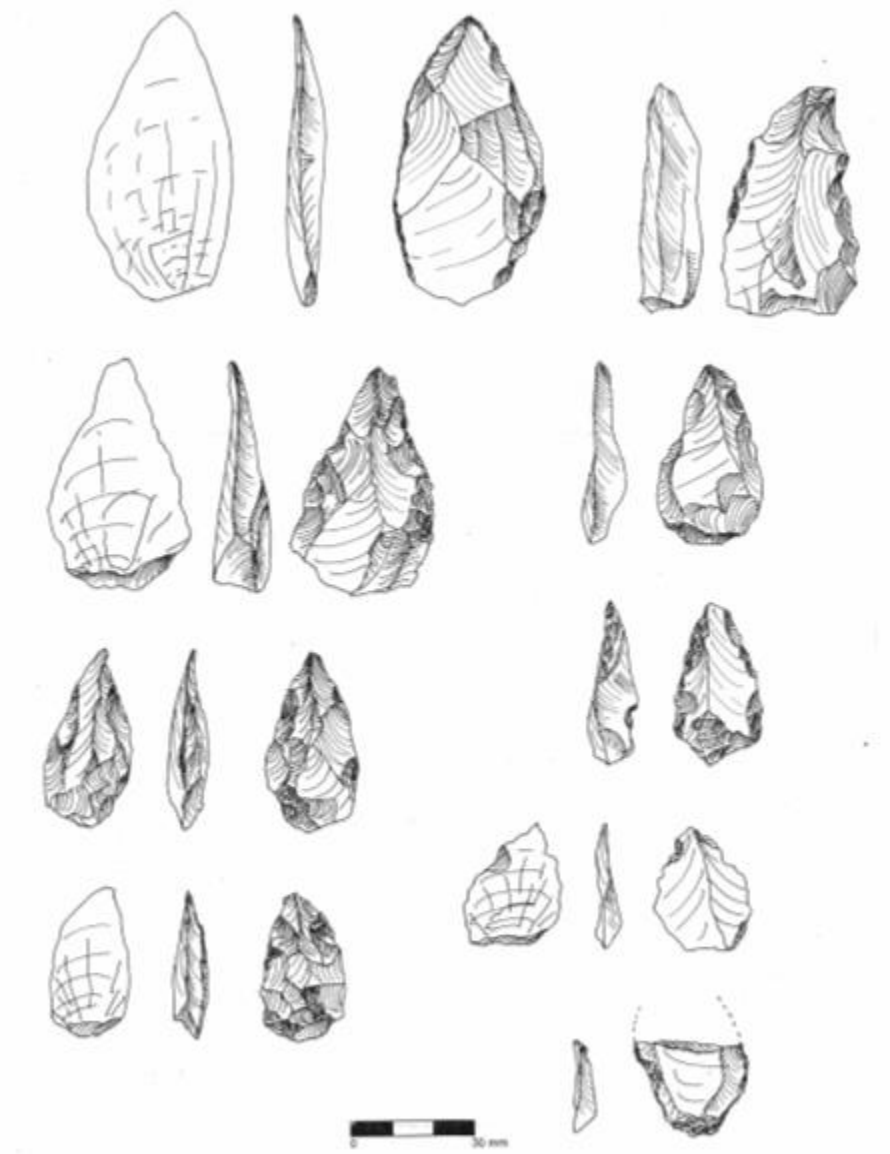


Figure 5: Examples of MSA tools from Olieboompoort (© van der Ryst 2007)

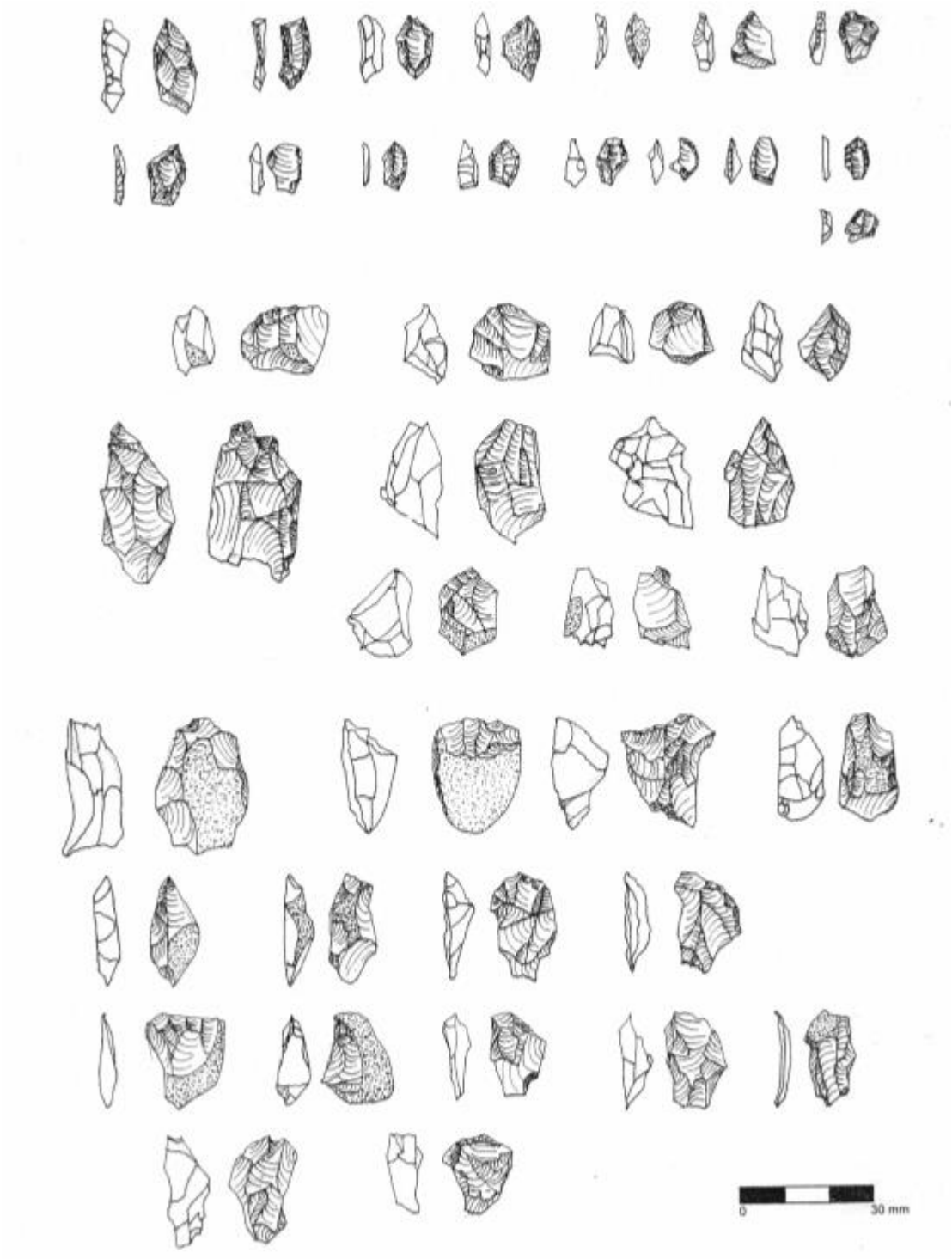


Figure 6: Examples of stone tools from Olieboompoort[1] (© van der Ryst 2007)

[1] Rows 1-2: backed scrapers; Rows 3-9: cores

Figure 7: Examples of microliths from Olieboompoort[2] (© van der Ryst 2007)

[2] Row 1: segments; Row 2 & 9: side scrapers; Row 3: circular scraper; Row 4: end scrapers; Rows 5-6 & 10: backed scrapers; Row 7: cortical end scrapers; Row 8: side-and-end scrapers.

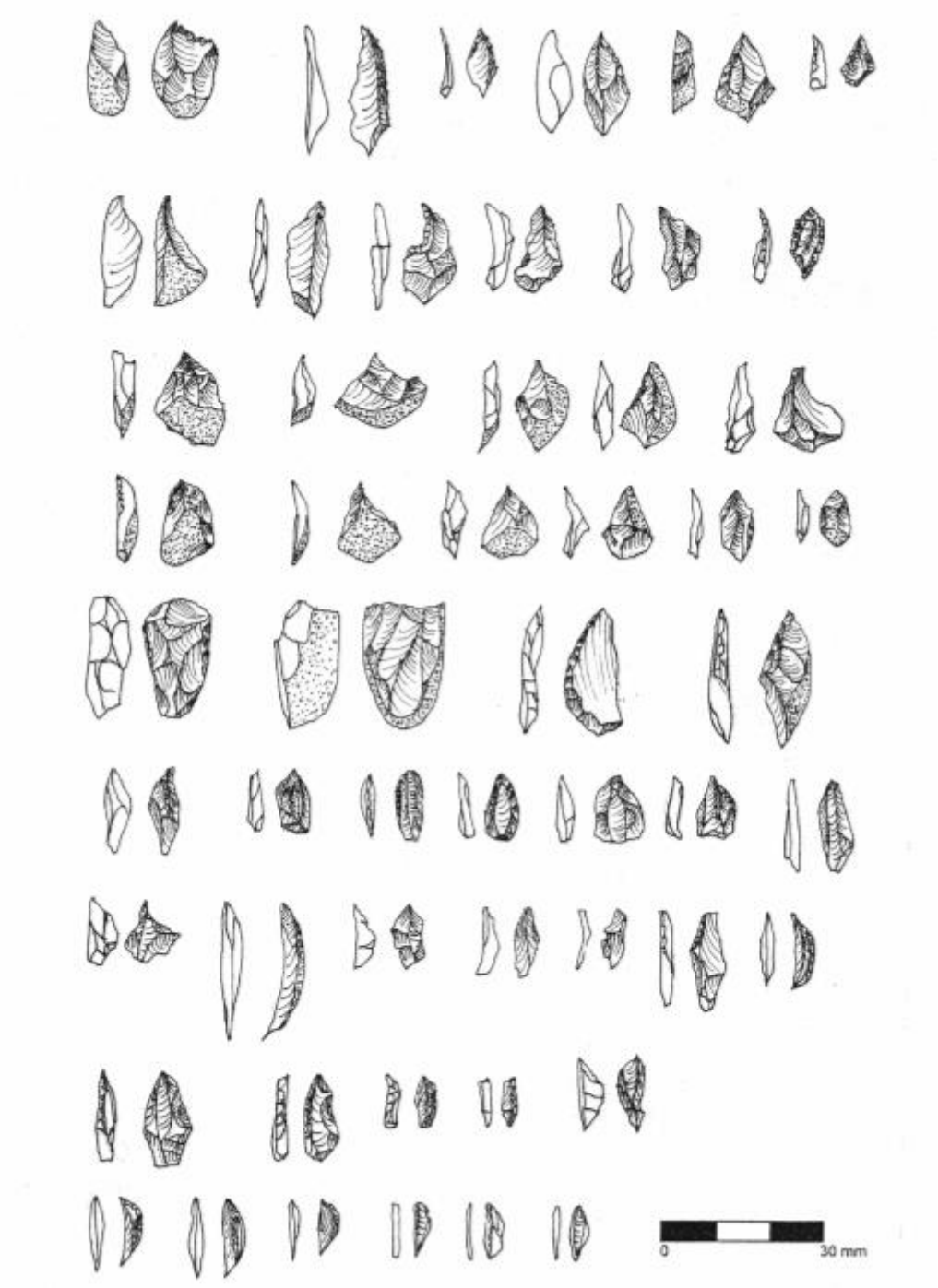


Figure 8: Examples of LSA microliths from Olieboompoort[3] (© van der Ryst 2007)

[3] Rows numbered top to bottom. Rows 1-4: borers; Row 5: medium side scraper, cortical medium end scraper, backed scraper; Row 6: bladelet core; Row 7: borer; Row 8: backed scraper; Row 9: segments

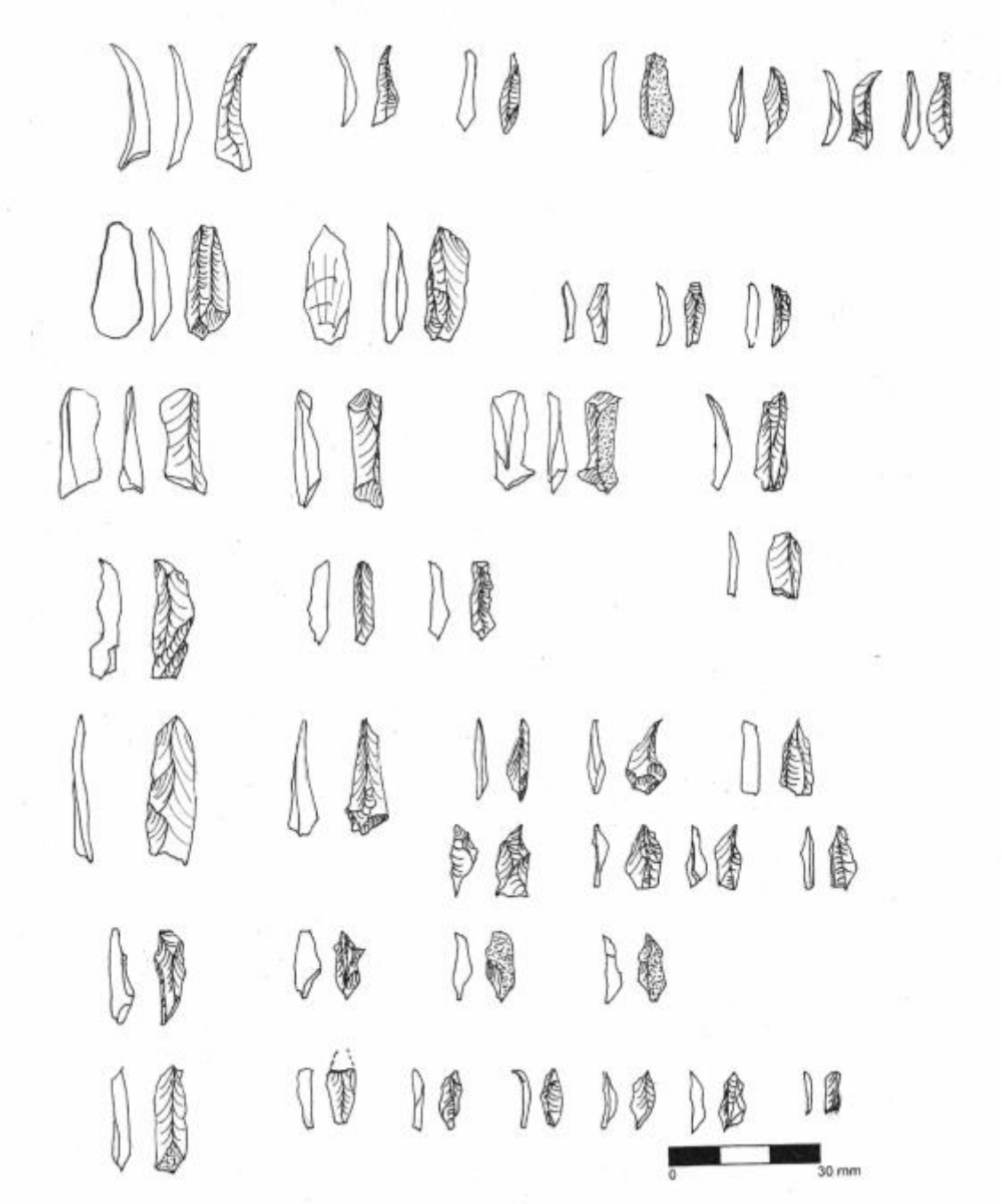


Figure 9: Examples of LSA bladelets from Olieboompoort[4] (© van der Ryst 2007)

[4] Rows 1-2 & 5-6: pointed bladelets; Row 3: parallel-sided bladelets; Row 4: thick triangular bladelets; Rows 7-8: backed bladelet.

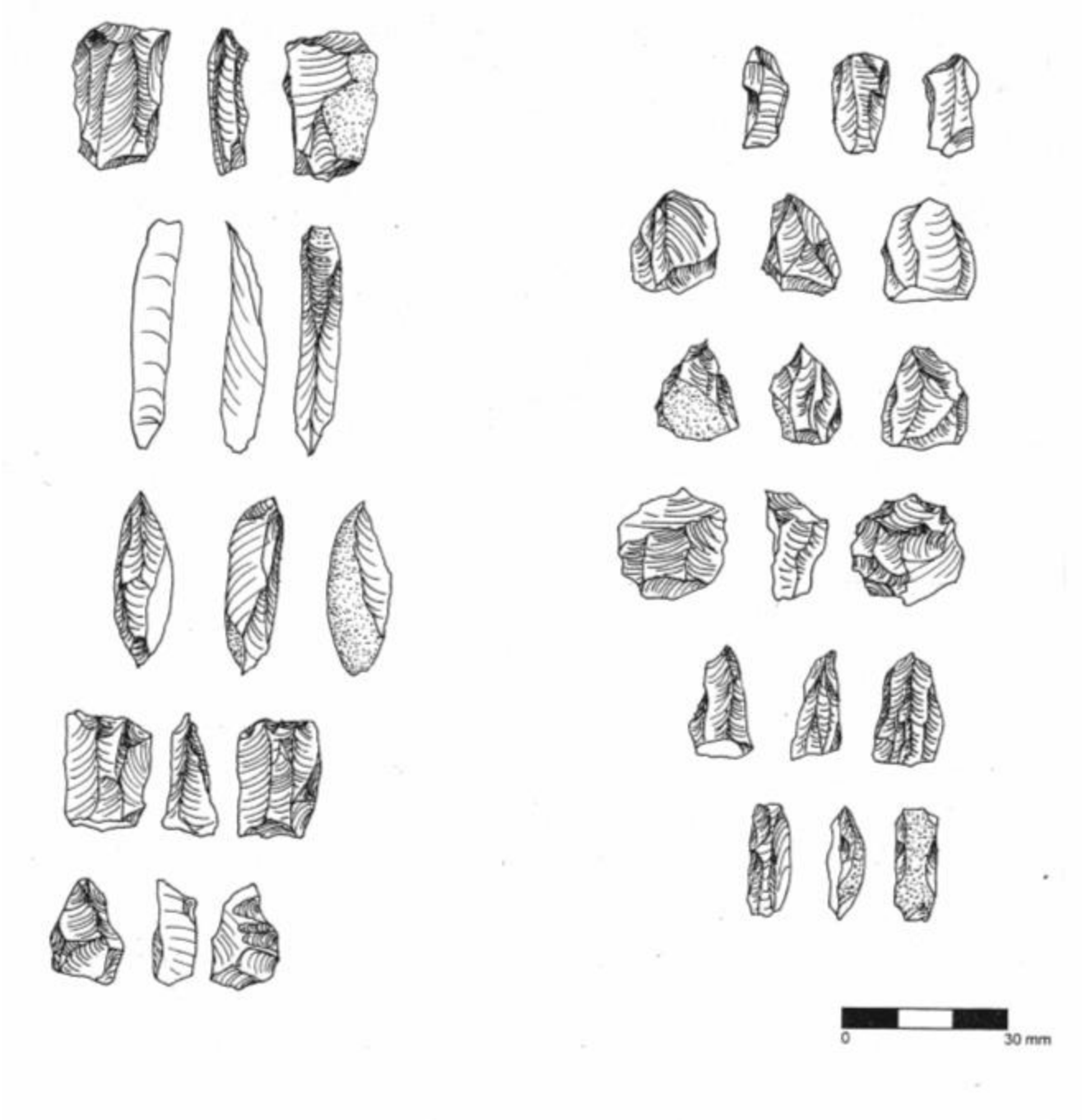


Figure 10: Examples of LSA bladelet cores from Olieboompoort (© van der Ryst 2007)

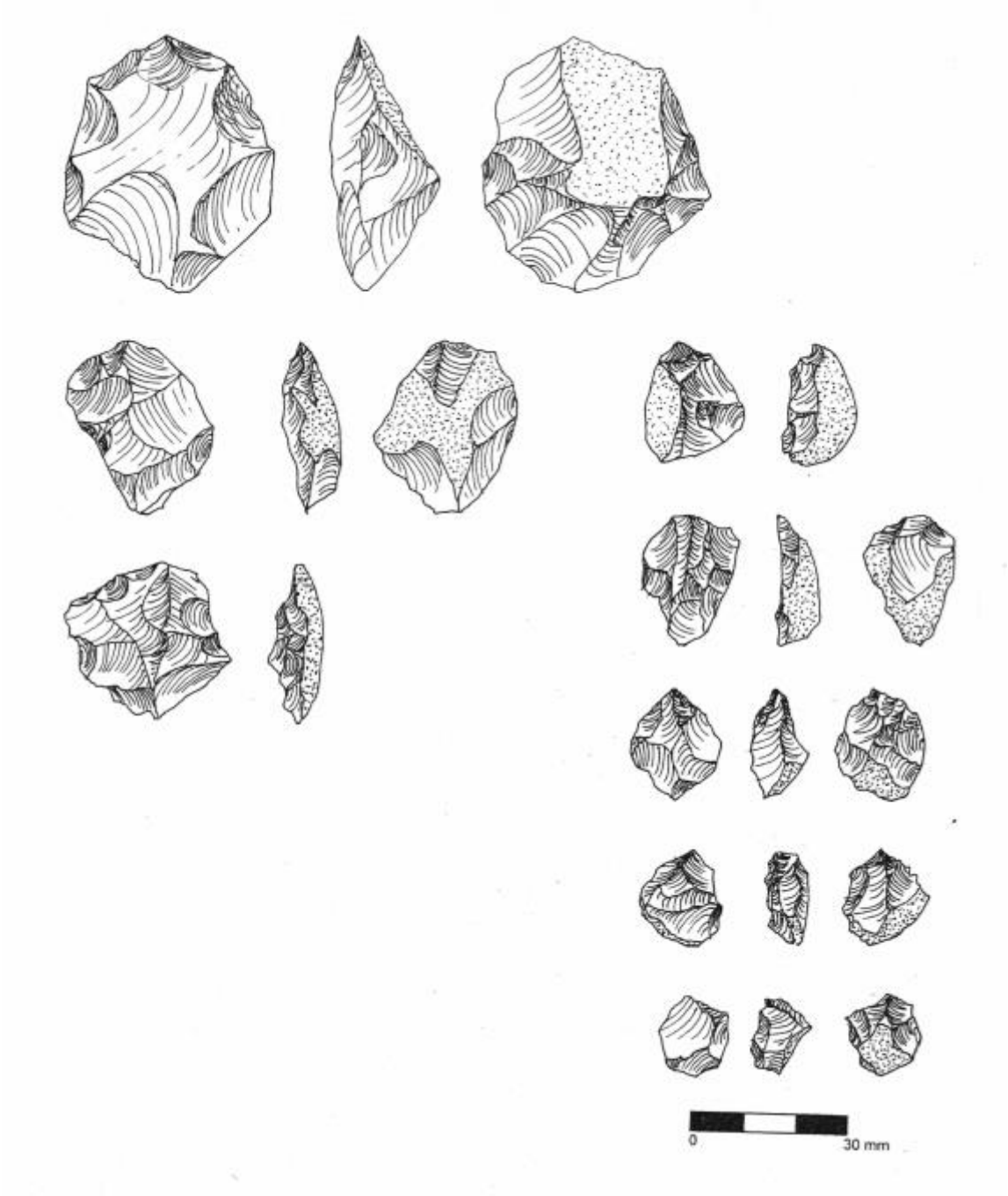


Figure 11: Examples of LSA cores with cortex from Olieboompoort (© van der Ryst 2007)

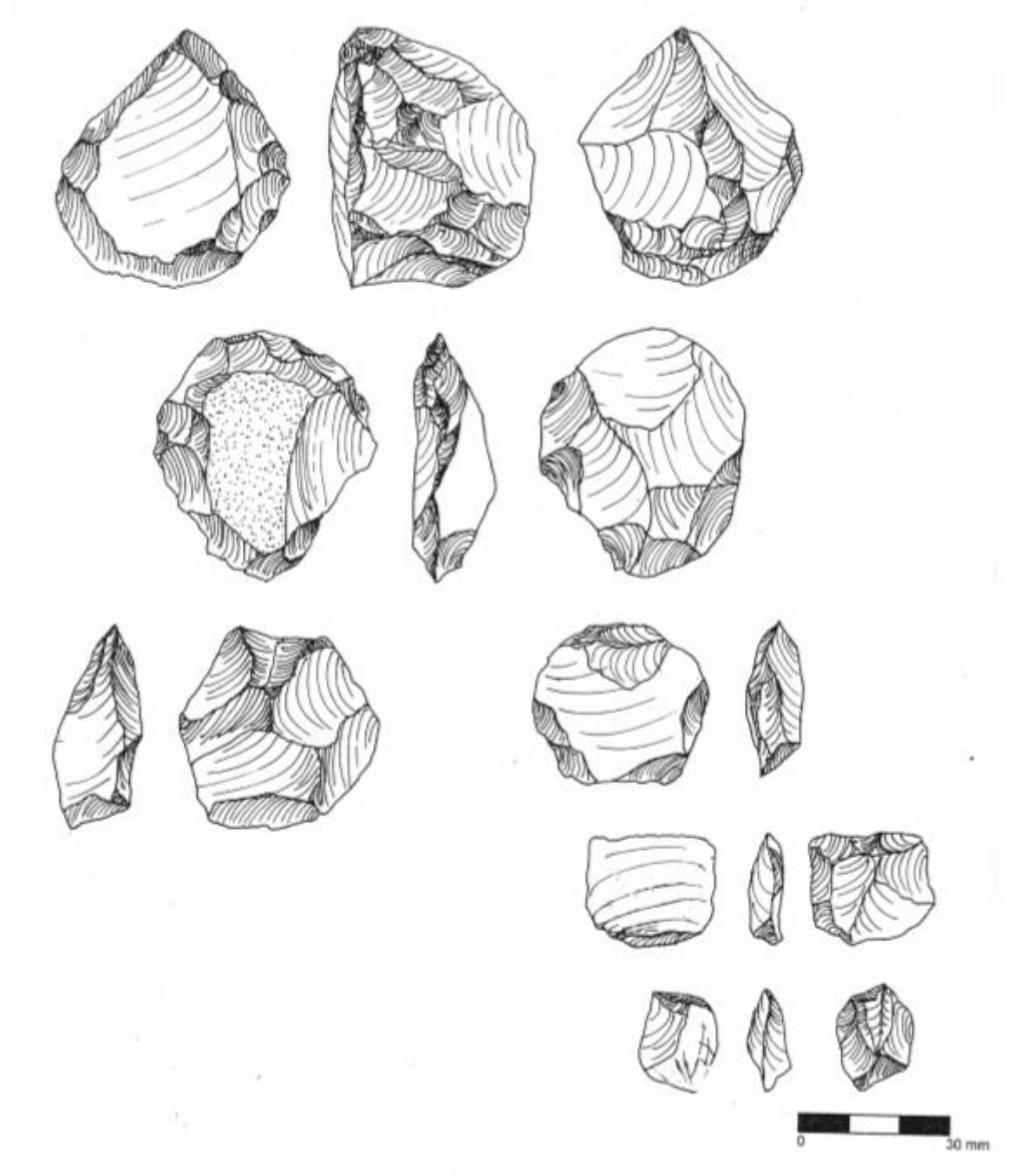


Figure 12: Examples of LSA cores[5] from Olieboompoort (© van der Ryst 2007)

[5] Rows 1-2: irregular cores; Row 3: pebble cores; Rows 4-5: core-reduced

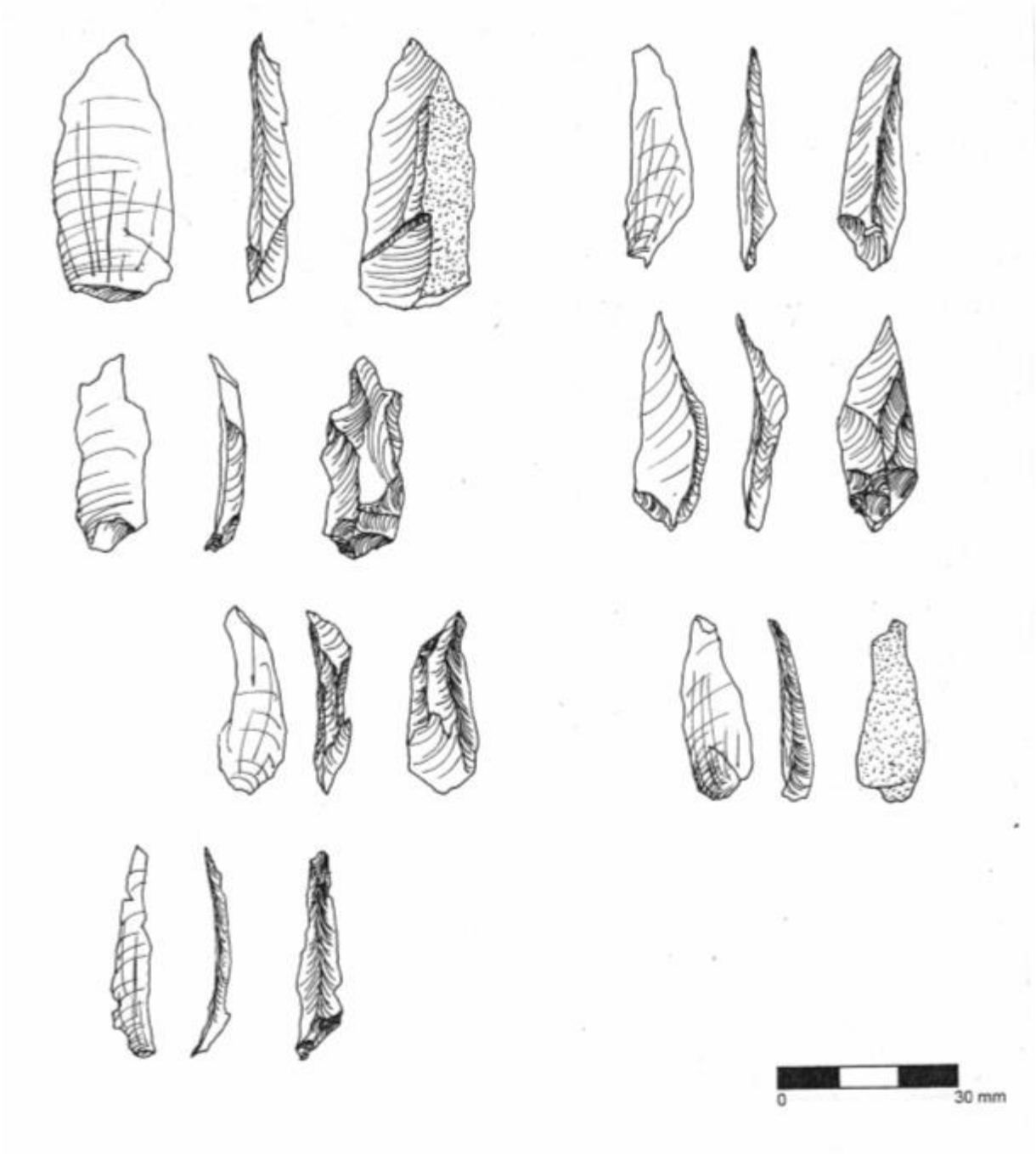


Figure 13: Examples of LSA blades from Olieboompoort (© van der Ryst 2007)

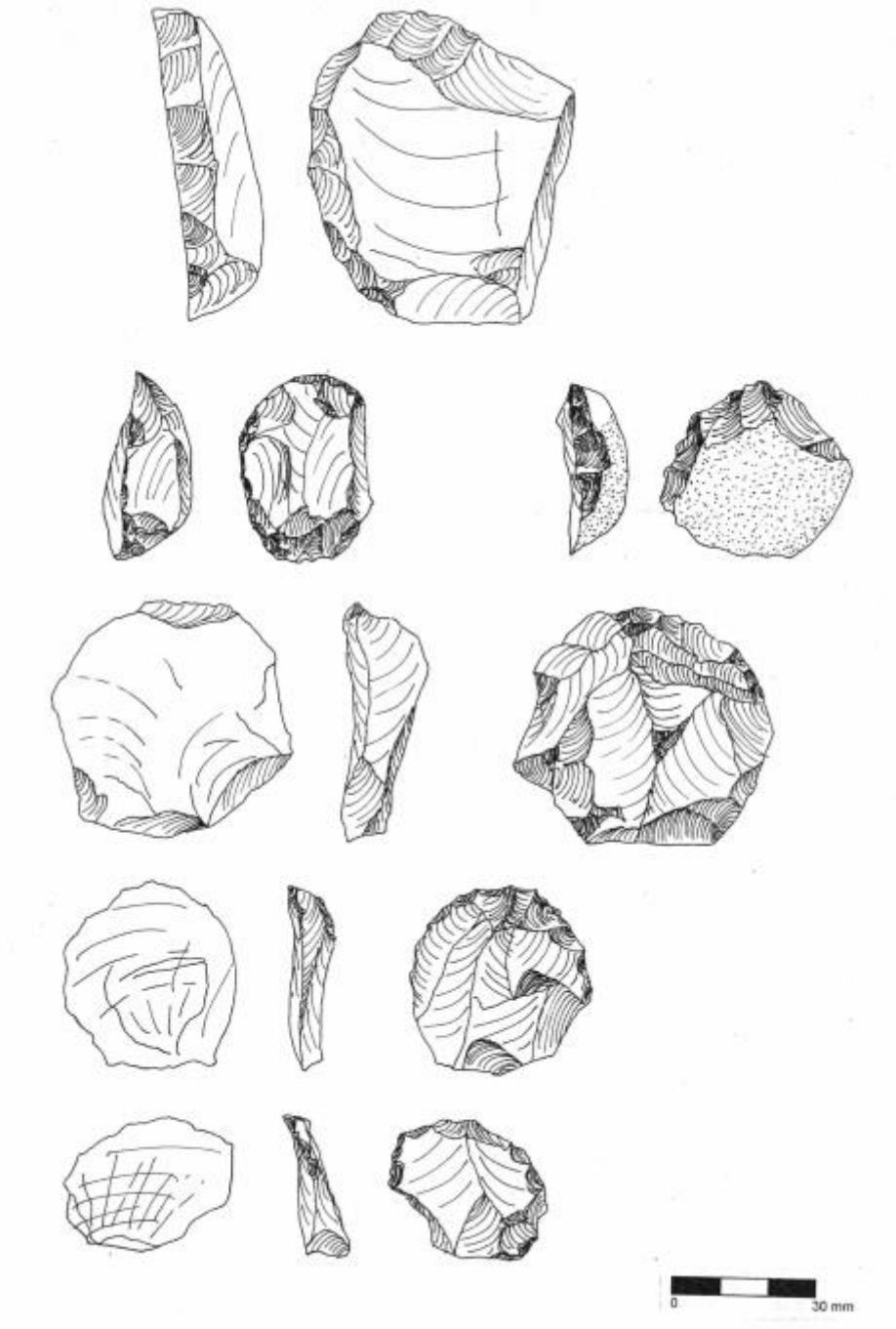


Figure 14: Examples of large LSA scrapers from Olieboompoort[6] (© van der Ryst 2007)

[6] Rows 1-2: large end-and-side scrapers; Row 3: core scraper: Row 4: circular and large end-and-side scraper.

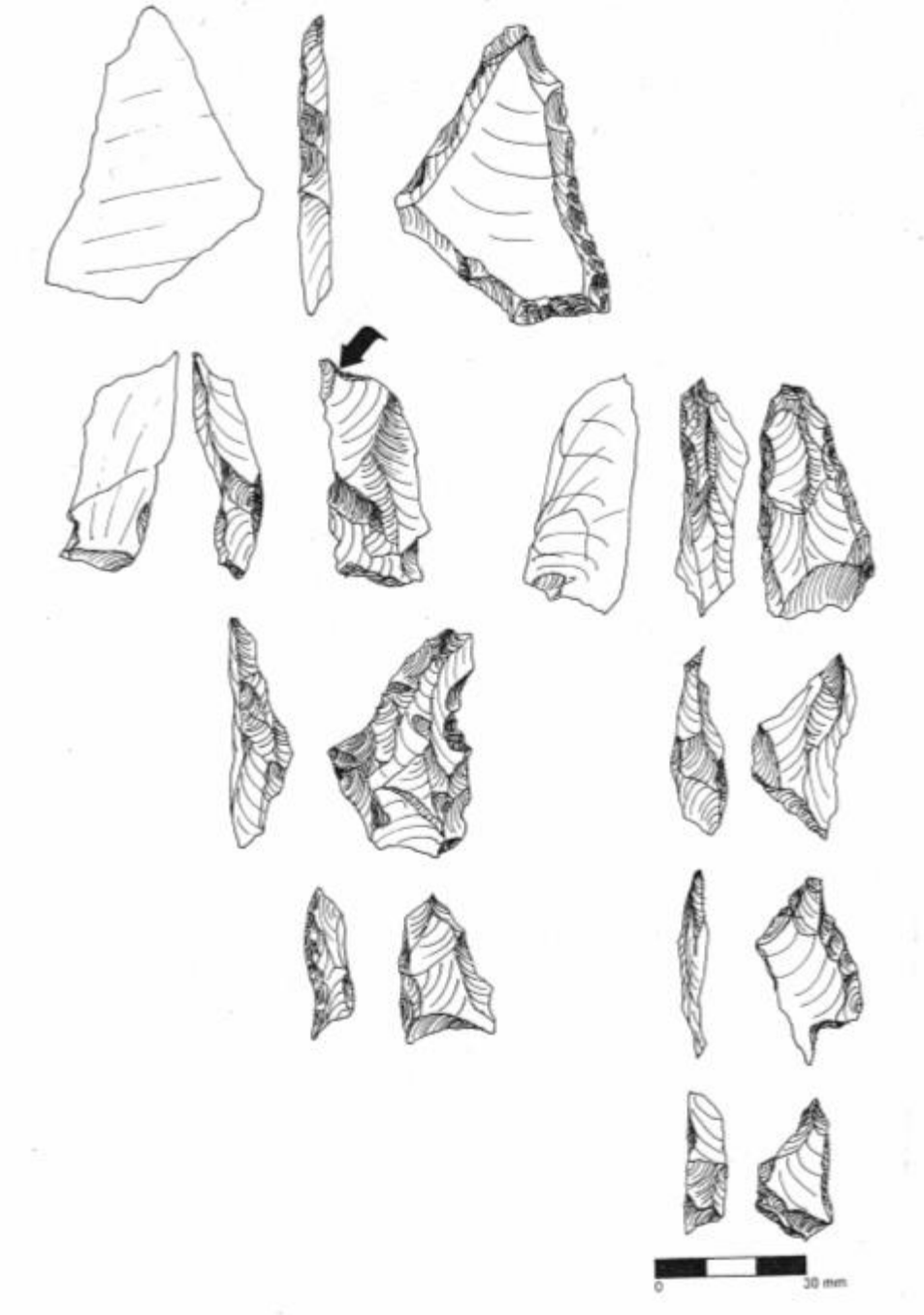


Figure 15: Examples of spokeshaves, adzes and burins from Olieboompoort[7] (© van der Ryst 2007)

[7] Rows 1, 3 & 5: spokeshaves; Row 2: burin; Row 4: adze.

Figure 16: Examples of stone tools collected at Boikarabelo Coal Mine (© Nel 2013)
Iron Age

3.2.2.2 Iron Age

The southern African Iron Age is generally associated with the appearance of metalworking and farming. The Iron Age archaeological record in the region begins around 300 CE and continuous to the mid-19th century. Although the Iron Age refers to metalworking and farming practices, pottery represents the predominant material culture most often noted.

Key indicators for Iron Age sites include pottery. In addition, certain other indicators may be noted to place a site within an Iron Age context. The archaeological surveys and excavations undertaken at Boikarabelo have identified grain bin foundations, grindstones, metal slag, as well as midden and kraal deposits (see Figure 19 to Figure 21 for examples). Another indicator of Iron Age occupation is the presence of burnt hut clay and floors (daga): this may be less easy to identify than other indicators.

Pottery is probably the easiest artefacts to identify in the project area, both as surface finds and exposed in excavations (resulting from animal and human activities). Pottery is most often found as fragments of fired clay pots. Figure 17 below shows a number of pottery fragments found at Boikarabelo.

Grainbin foundations are typically identified as a concentration of stones arranged in a roughly circular manner. Well-preserved grainbin foundations at Boikarabelo have been noted to be approximately one meter in diameter and often have lower grindstones associated, for example the one depicted in Figure 18.

Changes in soil colour and texture often indicate some form of past land use. Sometimes such changes are very obvious and noticeable on aerial imagery such as Google Earth (see Figure 23). On the ground, midden deposit may be identified as whitish to greyish finely textured ashy soil, sometimes with charcoal inclusions. Possible kraal deposit may be identified as whitish to pale greenish fairly rough textured soil. Should any such deposit be noted there is a high probability of also finding animal (and human) bones, pottery and other material culture intermixed with the deposit as indicated in Figure 22.

Although pottery is most frequently found as isolated surface scatters, there is a high probability that one or a combination of the other indicators is present as well. The more indicators present on a site, the higher the significance should be considered. Surface finds should therefore be mapped and plotted to create a site plan as depicted in Figure 24. Where sites include a lot of pottery, features and deposit, an archaeologist must called upon to assess the site before any further development takes place.

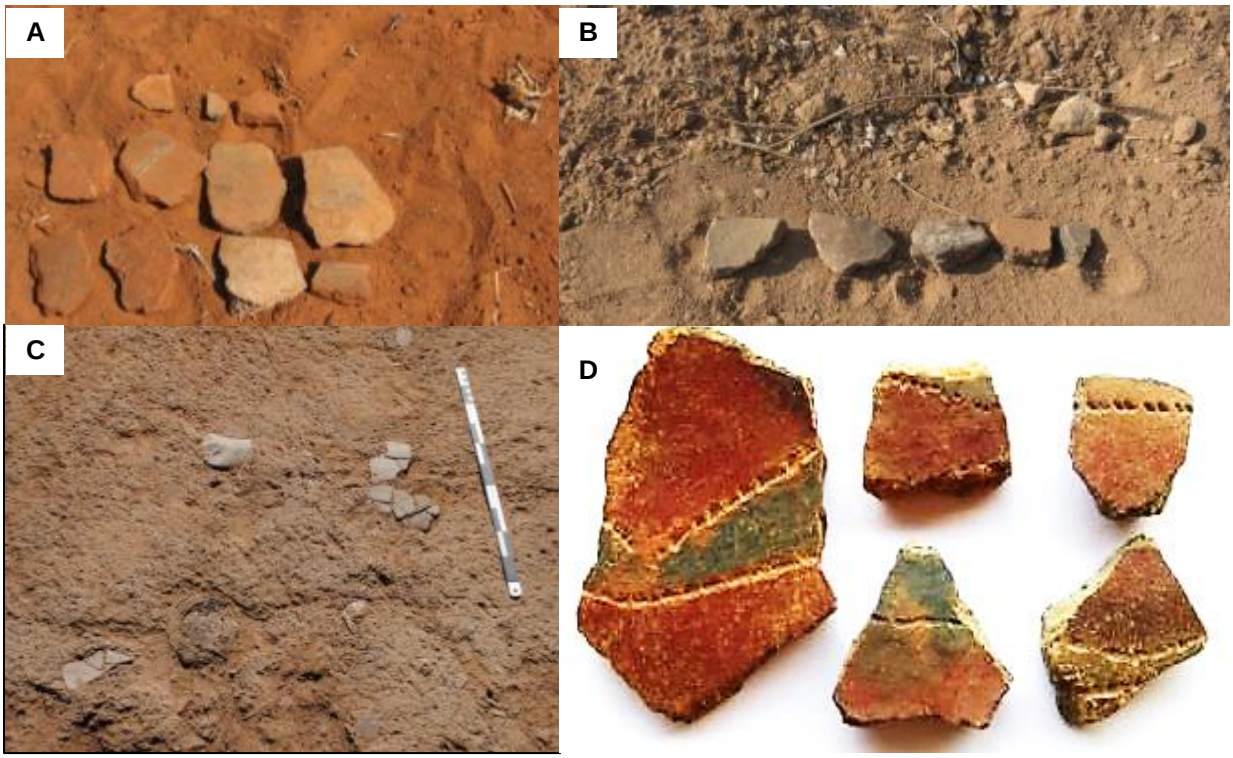


Figure 17: Typical examples of pottery found at Boikarabelo. A-B – surface finds; C – *in situ* pottery found in excavation; D – pottery analysed in laboratory

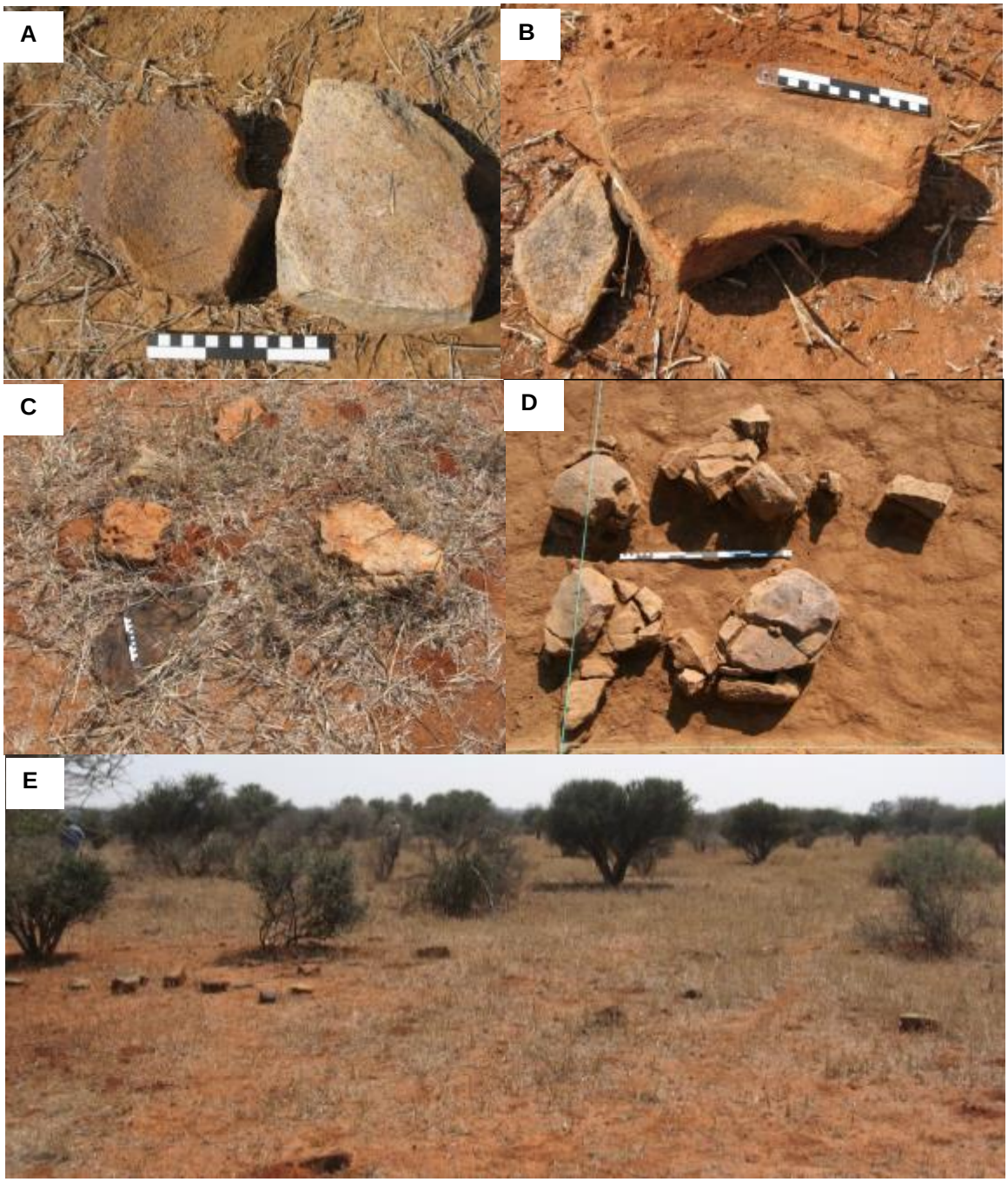


Figure 18: Lower grindstones and grainbin foundations found at Boikarabelo. A-B – lower grindstones; C – grainbin foundation; D – grainbin foundation exposed in excavation; E – typical grainbin site, note the stones indicting grainbin foundations and lower grindstones.

Figure 19: Example of an Iron Age lower grindstone, typically found at Boikarabelo.

Figure 20: Example of an Iron Age grainbin foundation, typically found at Boikarabelo.

Figure 21: Example of an exposed Iron Age grainbin foundation, excavated at Boikarabelo in 2012

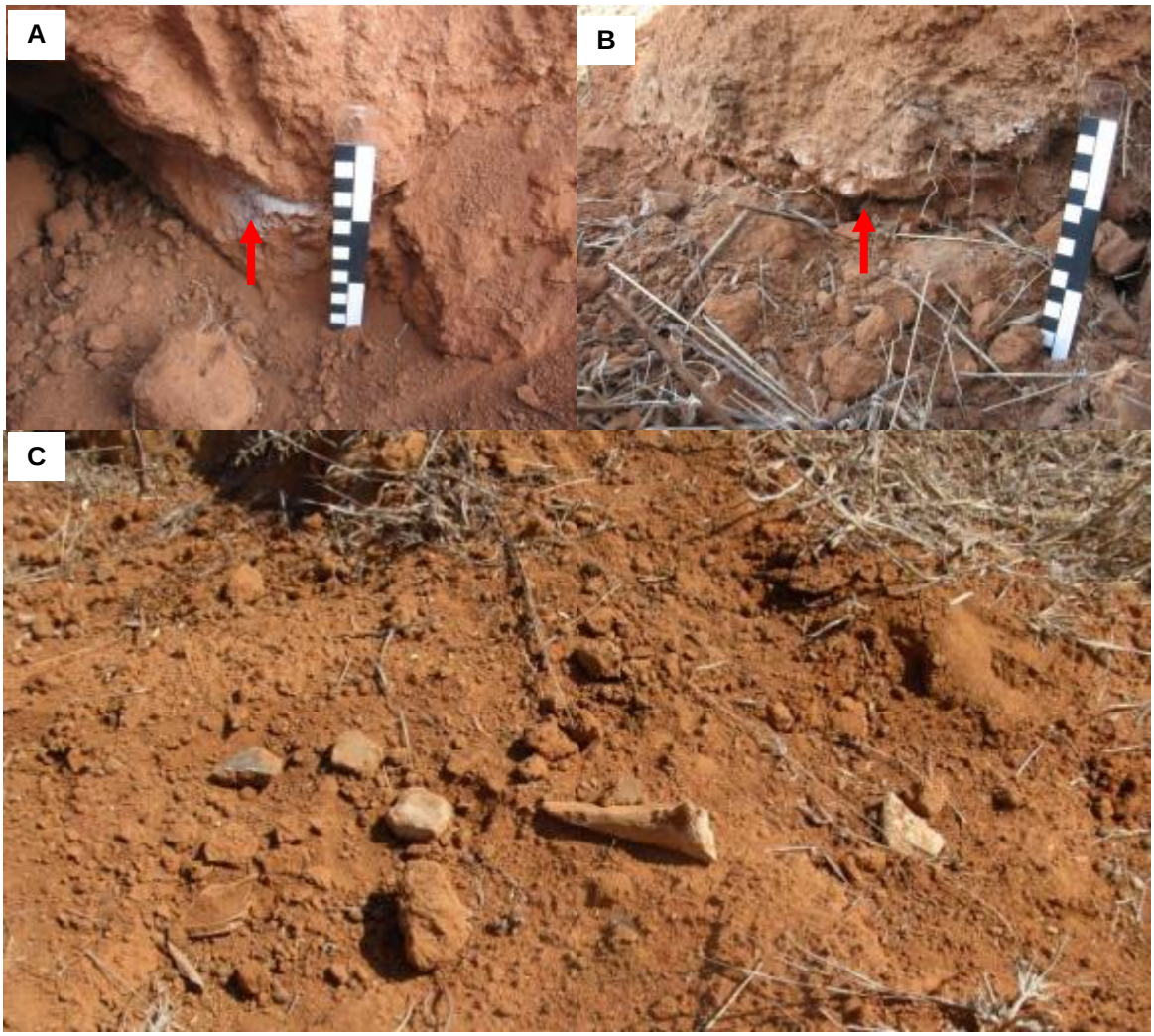


Figure 22: Examples of deposit found at Boikarabelo: A – ashy deposit in animal burrow; B – possible cattle dung or ash deposit in animal burrow; C – midden deposit with exposed animal bones and pottery.

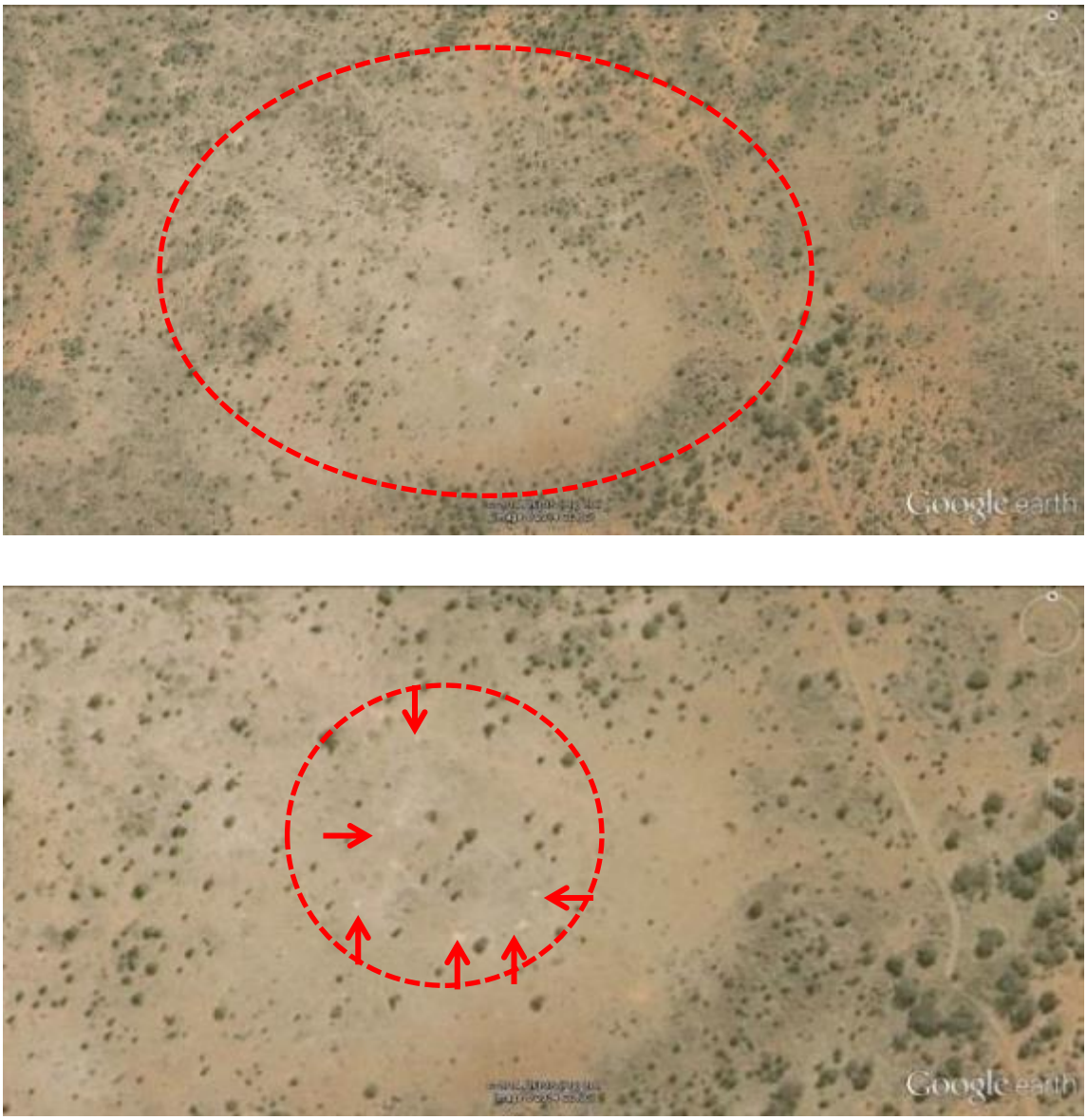


Figure 23: Example of an Iron Age site visible on Google Earth[8].

[8] The top image shows the general landscape, with the site in the bottom centre of the image – whitish ground surface. The bottom image shows the site zoomed in – the white patches are ashy deposits surrounding a central cattle kraal.

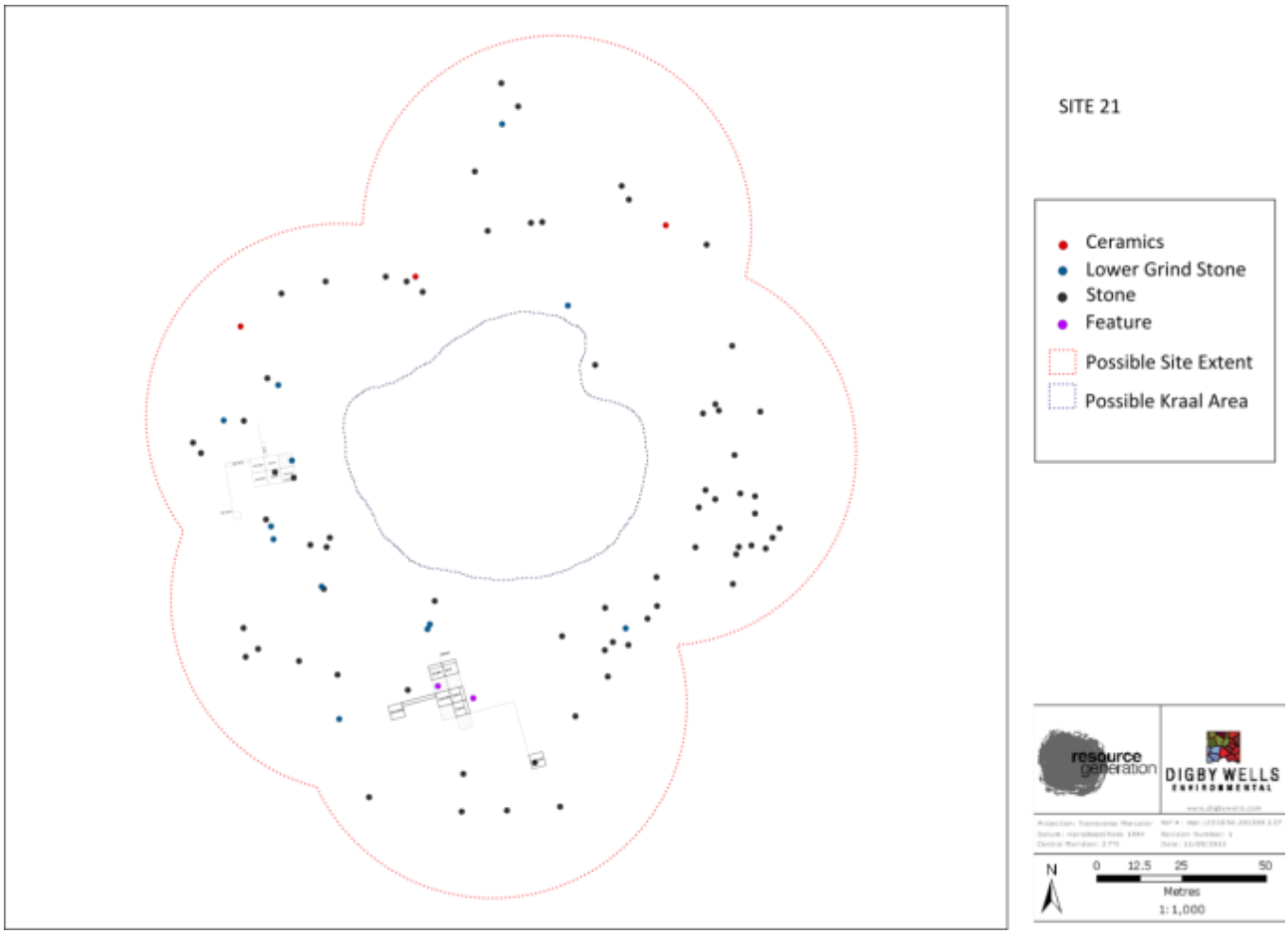


Figure 24: Example of mapped and plotted surface features to create a site plan of an Iron Age site at Boikarabelo

3.3 Site Recording

Everything that was identified in the development footprint during the site walk down must be recorded. If possible, the EM must plot the finds using GIS to develop a site map that will help to determine the significance of the site (see Figure 24). If the site is found to be very complex, the EM must appoint and archaeologist to assess the site and possibly undertake a watching brief during construction. In addition, such sites must be recorded on the South African Heritage Resources Information System (SAHRIS) Site Recording template. The site recording form or report must include all the observations made during the site walk down, including photographs.

The site recording forms are important in case very significant chance finds (e.g. human remains or rich deposits) are made during construction. The site reports will provide evidence that sites were screened before construction and that necessary mitigation measures were put into place. A site recording form template is provided at the end of the CFP document.

4 Proactive Palaeontological Monitoring Procedure

All fossils are generally protected in terms of Section 35 of the NHRA. It is therefore an offence to alter, damage, destroy or otherwise change palaeontological resources without permits issued by SAHRA. *Palaeontological* resources are defined as (NHRA Section 2):

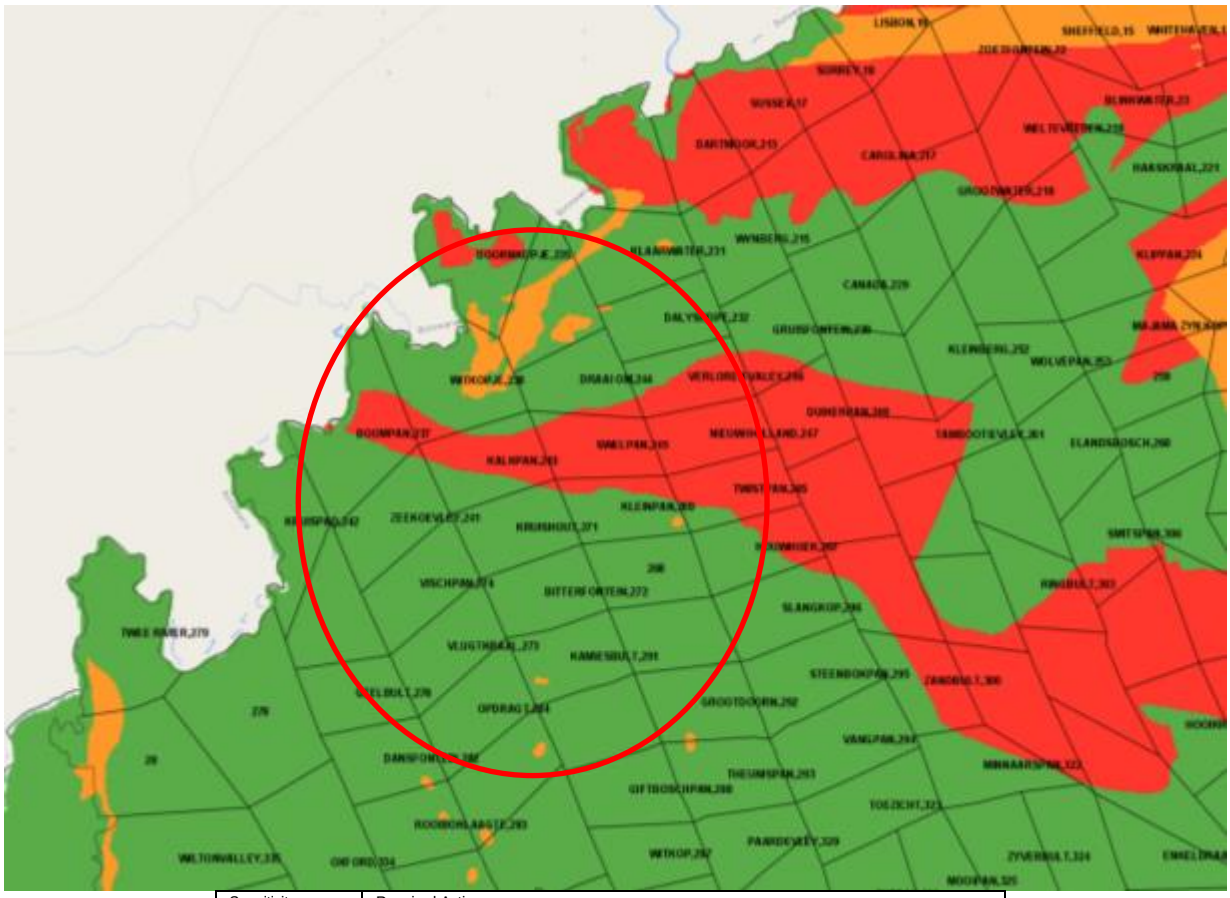
- Any fossilised remains or traces of animals or plants that lived in the geological past and any site that contains such remains or traces.
- However, fossil fuels or any fossiliferous rock intended for industrial use are excluded.

The following outlines a palaeontological monitoring procedure (PMP) to reduce or limit impacts on unidentified palaeontological resources in development footprint areas. The creation of the SAHRIS Fossil Sensitivity Map (Palaeo Map) has enabled the proactive management of palaeontological heritage resources (http://www.sahra.org.za/map/palaeo). The map serves as a guide with which to screen areas for palaeontological sensitivity.

The geology within which coal typically occurs is inherently plant fossil rich, but fossils in the coal itself are modified beyond recognition. Associated shale and mudstone allow for better preservation of fossil plants.

Figure 25 below is an excerpt from the Palaeo Map indicating the approximate area of the Boikarabelo Coal Mine and the expected palaeontological potential. The Mining Right Area is situated in an area ranging from moderate to very high fossil sensitivity. The minimum actions required by SAHRA therefore include desktop studies and a protocol to monitor any chance finds.

The most common of these are *Glossopteris* plants. Typical fossils will include leaves, flowers and fruits, ferns, sphenophytes and lycopods. In addition to Glossopterid fossils, the SAHRIS Fossil Heritage Layer Browser indicates other possible fossil types that may be expected in the various rocks, listed in Table 1 (http://www.sahra.org.za/fossil-heritage-layer-browser).



Sensitivity	Required Action
Very high	A physical field survey and assessment is required and a finds protocol must be implemented.
High	A palaeontological desktop study is required to determine if a field assessment is needed.
Moderate	A desktop study is required.
Low	No palaeontological studies are required, but a finds protocol must be implemented.
Insignificant / zero	No palaeontological studies are required.
Unknown	At least a desktop study is required to determine the sensitivity.

Figure 25: SAHRIS Palaeo Map indicating approximate location of Boikarabelo Coal Mine and fossil sensitivity

Table 1: Possible fossiliferous rocks occurring in the Boikarabelo Coal Mine properties

Stratigraphy & Age				Sensitivity	Fossil types	Rock types
KAROO SUPERGROUP	Jurassic	Stormberg Group	Clarens Formation	High	Silicified wood; plant remains; freshwater crustaceans; primitive bony fish; invertebrate trace fossils; rare dinosaurs *e.g.* Massospondylus; crocodylomorphs; advanced cynodonts including early mammals, *e.g. Erythrotherium;* dinosaurs and mammal track ways; coprolites; eggshell fragments.	Aeolian desert sandstone ("Cave Sandstone") Aeolian (wind-blown) sand, minor playa lake, ephemeral stream deposits, basaltic lava flows.
	Triassic	Beaufort Group	Eendragtpan Formation	Low	No coals (probably Beaufort Group. or Molteno equivalents)	Variegated mudrock of arid floodplains
	Permian	Ecca Group – Upper Ecca	Volksrust Formation	High	Trace; rare temnospondyl amphibian remains; invertebrates (bivalves, insects); minor coals with plant remains; petrified wood; organic microfossils (acritarchs); low-diversity marine to non-marine trace fossil assemblages.	Dark Grey Shale. Basinal dark mudrock with phosphatic / carbonate / sideritic concretions, minor coal offshore shelf, but possibly also nearshore / lacustrine / lagoonal deposits
		Ecca Group – Middle Ecca	Goedgedacht Formation	Very high	Glossopterid coal flora abundant; associated with thick coal seams.	Mudstone, sandstone, coal within proglacial alluvial fans, braided streams.
		Ecca Group		Moderate	Non-marine trace; vascular plants, including petrified wood; palynomorphs of *Glossopteris* flora; mesosaurid reptiles; fish including microvertebrate remains, coprolites; crustaceans; sparse marine shelly invertebrates (molluscs, brachiopods); microfossils (radiolarians *etc.*); insects.	Offshore basin plain (predominantly non-marine) to coastal deltaic sediments, minor volcanic ash (tuff).
	Carboniferous	Dwyka Group		Low	Trace; organic-walled micro; rare marine invertebrates (*e.g.* molluscs), fish, vascular plants; inter- and post-glacial trace fossil assemblages.	Glacial, inter- and post-glacial siliciclastic sediments (*e.g.* tillite).

The PMP comprises three primary steps that must be implemented prior to any large-scale development taking place. This section is structured as follows:

- Step 1 – determine geological context
- Step 2 – appoint qualified palaeontologist
- Step 3 – collect fossils.

4.1 Step 1 – determine geological context

The EM in association with the resident geologist must determine the geological context of areas where development will expose bedrock. The SAHRIS Fossil Heritage Layer must be consulted to determine whether the geology is considered sensitive.

If the geology is found to be insignificant, the following steps are not required. However, should the geology be considered low significance or higher, the following steps need to be implemented.

The SAHRIS Fossil Heritage Layer information can be used to ensure that a palaeontologist with the require expertise is identified, for example:

- Paleaobotanist if the rocks have potential to produce predominantly trace and plant fossils;
- An invertebrate palaeontologist if the rocks have potential to produce predominantly marine invertebrates or insects; and
- A vertebrate palaeontologist if the rocks have potential to produce predominantly vertebrate fossils such as fish or dinosaurs.

4.2 Step 2 – palaeontological field assessment

The EM must ensure that the services of a qualified palaeontologist are procured. The palaeontologist must undertake a field assessment to identify and assess any possible fossils that may occur in the rocks.

The palaeontologist will be responsible to collect any rare or unique fossils under a permit issued by SAHRA for suitable storage and curation. The palaeontologist may advise on common fossils that can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

4.3 Step 3 – ongoing fossil collection

The EM must ensure that the resident mine geologist regularly inspect the potential fossil bearing rock such as shale and mudstone of no economic value before being discarded. The EM must collect any identified fossiliferous material.

The relevant qualified palaeontologist must undertake inspections on a regular basis agreed with Boikarabelo Coal Mine to inspect the selected material and briefly survey the discard dumps, where feasible.

Inspections should ideally be monthly. However, if the EM and resident geologist are diligent and extract fossil material, inspections can be less frequent. If the palaeontologist considers fossil material to be poor, site inspections may be reduced to longer intervals.

The palaeontologist will remove fossils from the mine that considered to of good quality or scientific interest for cataloguing and long-term curation.

Fossils can only be removed if a SAHRA permit has been issued. The EM must also ensure that annual reports are submitted to SAHRA.

5 Chance Find Protocol

As indicated in the Introduction above, the purpose of CFPs is to reduce damage and destruction to any heritage resource that might be accidentally exposed during the course of development activities association. The CFP outlined here are based on the legal requirements and procedures contained in the NHRA. The AMP and PMP procedures discussed above under sections 3 and 4 above. The structure of this section is as follows:

- How to spot a chance find
- CFP procedure; and
- Legal processes.

5.1 How to spot a chance find

The guidelines presented in the AMP and PMP sections above should enable the EM and other persons to spot some chance finds during development. However, many chance finds will not be noted during large-scale earth moving. The EM should therefore ensure that contractors undergo induction training to identify any chance finds that may be exposed. The following list typical chance finds that may be exposed during development:

- Human remains, possibly with associated material culture such as pottery;
- Animal bones, possible indication of a midden;
- Pieces of brick-like burnt or baked clay, indicating possible hut remains; and
- Distinct, localized changes in soil colour and texture.

5.2 Chance Find Protocol Procedure

In the event that any heritage resources are accidently exposed during project activities, the H-E-R-I-T-A-G-E procedure must be implemented.

HALT ALL WORK	The moment a chance find is made, the person responsible must immediately stop all work near the find.
EXAMINE CHANCE FIND	The person who made the chance find must examine the find and secure the site to protect it from any further damage.
REPORT CHANCE FIND	The person who made the chance find must immediately report the chance find to her / his direct supervisor, according to reporting protocols instituted by the Mine. The supervisor must report the find to her / his manager and the EM. The EM must report the find to the relevant Authorities and an archaeologist or palaeontologist, as the case may be.
INVESTIGATE CHANCE FIND	The EM must ensure that a qualified specialist is engaged to investigate the chance find and site and assess its context, age and possibility of the find representing a more extensive site.
TAKE RECORD	The EM and specialist must ensure that proper records and documentation are kept. Documentation must start with the initial find report, and include records of all actions taken, persons involved and contacted, comments received and findings. Records and documentation will be necessary to request approvals and permits from the relevant Authorities to continue work on site.
APPROVALS AND PERMITS	The archaeologist or palaeontologist will submit a report, including all records kept by the EM to SAHRA. The report will include recommendations for any additional specialist work that may be necessary, or request approval to continue with the development.
GO AHEAD WITH PLANNED WORK	As soon as the necessary approvals have been issued, the Mine may continue with the development.
END CHANCE FIND PROCEDURE	The EM will be responsible to close off the chance find procedure. This may require implementing or integrating any requirements issued by any Authority into operational management plans.

5.3 Legal Processes

In addition to the CFP procedure outlined above, there are legal processes that must be followed when a chance find is made.

5.3.1 Archaeological and Palaeontological Chance Finds

All archaeological and palaeontological sites and materials are protected in terms of Section 35 of the NHRA. It is therefore important that any chance find be immediately reported to SAHRA. No person or entity is allowed to destroy, damage, alter, excavate or remove from its original site any archaeological or palaeontological material without a permit issued by SAHRA.

SAHRA will only issue permits to professionally trained archaeologists or palaeontologists. These professionals must keep proper records of any excavations or collecting programmes that may be required by SAHRA on reporting a chance find. Any finds considered to be significant must be placed in a public institution where it is available to anyone for study. Finds may not be kept by any Mine employees, contractors or local residents.

It is therefore important that Boikarabelo Coal Mine makes sufficient financial provision to ensure that archaeological and palaeontological sites are rescued. This should include contingencies to appoint a professional archaeologist or palaeontologist approved by SAHRA.

SAHRA also requires that permits are obtained for the destruction of sites: Permit applications have prescribed fees per site that must be paid before permits will be issued.

If these requirements are not met, SAHRA may serve on the owner or developer an order to cease work and may require an archaeological investigation and mitigation.

5.3.2 Burial Grounds and Graves

The NHRA protects certain types of graves in terms of Section 36 of the Act. Within context of the Boikarabelo Coal Mine, the main types include graves older than 60 years, and archaeological burials. Chapter XII of the NHRA: Regulations provide the legal framework that must be complied with in the event than graves or human remains chance finds are made. This process is summarized below.

The moment a grave or human remains are found, the site must be secured to ensure that no further damage or disturbance occurs. The H-E-R-I-T-A-G-E process outlined must be implemented as soon as possible after the find is made. Authorities who must be specifically notified are the SAHRA Burial Grounds and Graves (BGG) unit and the local South African Police Service (SAPS). These Authorities must inspect the grave to determine if the grave older than 60 years or otherwise protected in terms of the NRHA, and if any further graves exist in the vicinity.

Note that in practice, SAHRA generally delegates their responsibility to an archaeologist to inspect the grave site and provide a report on her / his findings to the SAHRA BGG for consideration.

In the event that the grave is found to be older than 60 years, the Mine must ensure that a proper investigation is undertaken by an archaeologist to establish the context of the grave/s. The NHRA and NHRA: Regulations require that test excavations and documentary research be undertaken if required. The outcome of this investigation may require on the following three processes to be implemented.

- If the archaeologist determines that the grave is protected in terms of Section 36 of the NHRA, then the processes outlined in Chapters XI and IX of the NHRA: Regulations must be implemented.
- If the archaeologist determines that the grave is archaeological, a permit application in terms of Section 35 of the Act and Chapters II and IV of the NHRA: Regulations must be made. In general, a grave is considered to be archaeological if it is older than 100 years and obviously associated with archaeological material.
- If the remains are younger than 60 years, an application to exhume and rebury the remains must be made to the provincial Department of Health and local municipality. However, it is advisable that the same consultation process is followed as it applies to graves older than 60 years.

6 Bibliography and Further Reading

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SITE RECORDING FORM

DATE: YYYY-MM-DD	**SITE NO.:**
RECORDER:	

SECTION 1: DEVELOPMENT DETAILS

DEVELOPMENT CATEGORY	IMPLEMENTED BY

SECTION 2: GEOGRAPHIC DETAILS

LIMPOPO PROVINCE	**ELLISRAS MAGISTERIAL DISTRICT**
LEPHALALE LOCAL MUNICIPALITY	**STEENBOKPAN**

FARM NAME & NO. / ERF NO. / STREET ADDRESS

GPS MODEL NAME/ NUMBER

ACCURACY

EAST COORDINATES	SOUTH COORDINATES

SECTION 4: SURVEY INFORMATION

WEATHER CONDITIONS

ENVIRONMENTAL CONDITIONS

SURVEY METHOD, E.G. PEDESTRIAN, TRANSECT, RANDOM, VEHICULAR, TOPOGRAPHICAL

SECTION 5: SITE INFORMATION CATALOGUE

VEGETATION TYPE, E.G. GRASSLAND, BUSHVELD, INVASIVE, SICKLEBUSH, ETC.

SITE LOCATION E.G. VALLEY, SLOPE, MOUNTAIN, PLAIN, SHELTER

SITE PERIOD, E.G. STONE AGE, IRON AGE, HISTORICAL

SITE TYPE, E.G. FIND SPOT, OPEN SCATTER, MIDDEN, STONE WALL, INDUSTRIAL, GRAVE OR BURIAL GROUND, BUILT ENVIRONMENT

ARTEFACTS PRESENT, E.G. LITHICS, POTTERY, PORCELAIN, SLAG

SITE EXTENT, E.G. APPROXIMATE DIAMETER, LENGTH & BREADTH, DEPTH, ETC.

SECTION 6: IDENTIFIED SURFACE INDICATORS

Fossil		**Stone tools**		**Stone tool source material**		**Stone tools in calcrete**		**Rock painting**		**Rock engraving**	
Pottery		**Ash**		**Cattle dung**		**Lower grindstone**		**Upper grindstone**		**Grainbin foundation**	
Metal slag		**Daga**		**Animal bones**		**Human bones**		**Burnt clay**		**Charcoal**	
Glass beads		**Worked stone**		**Metal**		**Glass**		**Hut floor**		**Other**	

SECTION 7: ARTEFACT DENSITY

Stone tool density calculated as number of tools per square meter	**1:1**		**≤5:1**		**≤10:**		**≤15:1**		**≤20:1**		**>20:1**			
Pottery density calculated as number of fragments per square meter	**1:1**		**≤5:1**		**≤10:1**		**≤15:1**		**≤20:1**		**>20:1**			
Animal bones density calculated as number of bones per square meter	**1:1**		**≤5:1**		**≤10:1**		**≤15:1**		**≤20:1**		**>20:1**			
Grainbin foundations density calculated as number of features per 10 square meters	**1:10**		**2:10**		**≤5:10**		**≤10:10**		**≤15:10**		**>15:10**			
Density of combined surface indicators per 10 square meters	**1:10**		**≤5:10**		**≤10:10**		**≤15:10**		**>15:10**		**>15:10**			

SECTION 5: PHOTOGRAPHIC RECORDS

CAMERA MAKE & MODEL AND IMAGE NUMBER/S

FILE LOCATION ON SERVER

SECTION 8: DETAILED SITE DESCRIPTION AND SKETCHES (OVERLEAF)

SITE RECORDING FORM