

**HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED
KOKERBOOM 3 WIND ENERGY FACILITY ON FARMS 214/1
AND 214/2, NORTH OF LOERIESFONTEIN, CALVINIA
MAGISTERIAL DISTRICT, NORTHERN CAPE**

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

SAHRA Case No.: TBC

Report for:

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On behalf of:

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EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by Zutari (Pty) Ltd (formerly Aurecon South Africa (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of a wind energy facility on a site some 65 km north of Loeriesfontein in Northern Cape. The study area is located on Portions 1 and 2 of Karee Doorn Pan No. 214. It is centred on S30° 22' 00" E19° 30' 00".

The project will entail the construction of up to 60 wind turbines with a hub height of up to 150 m and a rotor diameter of up to 180 m, as well as associated roads, power lines, substation, battery energy storage system and support infrastructure. Two other operational wind energy facilities occur to the south and east of the proposed site, namely Khobab and Loeriesfontein Wind Farms respectively, while other renewable energy projects have been granted environmental authorisations in close proximity.

The study area is comprised of gently undulating topography with low, scrubby vegetation. The ground is variably sandy or gravelly and some pans occur.

Heritage resources were found to be fairly common in the study area but were mostly of very low cultural significance. A few archaeological sites of up to medium cultural significance were located. The farm complex in the north-western part of the study area contains heritage structures and ruins of up to medium significance. The landscape is also considered to be a heritage resource but its cultural component is very limited and a new layer of electrical infrastructure is starting to dominate the landscape around the site.

Because the final layout has been surveyed during a detailed walkthrough in June 2021 and impacts to heritage resources are likely to be minimal, it is proposed that the project be allowed to proceed. No further heritage walkthroughs are required prior to layout approval or commencement of construction. However, the following conditions should be included as part of the authorisation should one be issued:

- The archaeological site at waypoints 722, 1938 and 1939 must be subjected to mitigation (in the form of sampling and collection) prior to construction of turbine #25 and the adjacent road;
- The site at waypoint 091 should be avoided if possible, although this is not required;
- The site at waypoints 717 to 719 must be demarcated as a no-go area and monitored by the ECO to ensure that it is not damaged during construction; and
- If any archaeological material or human burials are uncovered during the course of development then the find should be protected from further disturbance and work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Brakdak: A flat roofed house made with beams overlaid by sticks and then reeds and all with a mud/clay layer on the top.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Late Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Muurkas: A cupboard built into a wall.

Patinated: having a weathered surface indicative of having been exposed to the elements for a long period of time.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

CCS: Cryptocrystalline silica

CRM: Cultural Resources Management

DEFF: National Department of Environment, Forestry and Fisheries

EIA: Environmental Impact Assessment

EMPr: Environmental Management Programme

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

LSA: Late Stone Age

MSA: Middle Stone Age

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION	1
1.1. The proposed project.....	2
1.1.1. Project description.....	2
1.1.2. Identification of alternatives.....	3
1.1.3. Aspects of the project relevant to the heritage study	3
1.2. Terms of reference	3
1.3. Scope and purpose of the report	4
1.4. The author	4
1.5. Declaration of independence.....	4
2. HERITAGE LEGISLATION	4
3. METHODS.....	6
3.1. Literature survey and information sources	6
3.2. Field survey	6
3.3. Specialist studies.....	6
3.4. Impact assessment.....	6
3.5. Grading	6
3.6. Consultation.....	7
3.7. Assumptions and limitations.....	8
4. PHYSICAL ENVIRONMENTAL CONTEXT	8
4.1. Site context	8
4.2. Site description	8
5. FINDINGS OF THE HERITAGE STUDY.....	10
5.1. Archaeology	17
5.1.1. Desktop study.....	17
5.1.2. Site visit: Stone Age archaeology	18
5.1.3. Site visit: Historical archaeology	22
5.2. Historical aspects and the built environment	23
5.2.1. Desktop study	23
5.2.2. Site visit	24
5.3. Graves.....	25
5.4. Cultural landscape.	25
5.5. Statement of significance and provisional grading	26
5.6. Summary of heritage indicators.....	26
6. ASSESSMENT OF IMPACTS	27
6.1. Impacts to archaeological resources.....	27
6.1.1. Management and mitigation requirements.....	28
6.2. Impacts to the cultural landscape	28
6.3. Existing impacts to heritage resources.....	28
6.4. The No-Go alternative.....	29
6.5. Cumulative impacts	29
6.6. Levels of acceptable change	29
7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME	31

8. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS.....	31
9. CONCLUSIONS	31
9.1. Reasoned opinion of the specialist	33
10. RECOMMENDATIONS	33
11. REFERENCES	33
APPENDIX 1 – Curriculum Vitae	36
APPENDIX 2 – Projects considered in cumulative impact assessment.....	38
APPENDIX 3 – Site Sensitivity Verification	39

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Zutari (Pty) Ltd (formerly Aurecon South Africa (Pty) Ltd) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of a wind energy facility on a site some 65 km north of Loeriesfontein in Northern Cape (Figures 1 & 2). The study area is located on Portions 1 and 2 of Karree Doorn Pan 214. It is centred on S30° 22' 00" E19° 30' 00" and the project is to be known as the Kokerboom 3 wind energy facility (WEF).¹ The operational Khobab and Loeriesfontein WEFs occur on neighbouring farms to the south and east respectively.

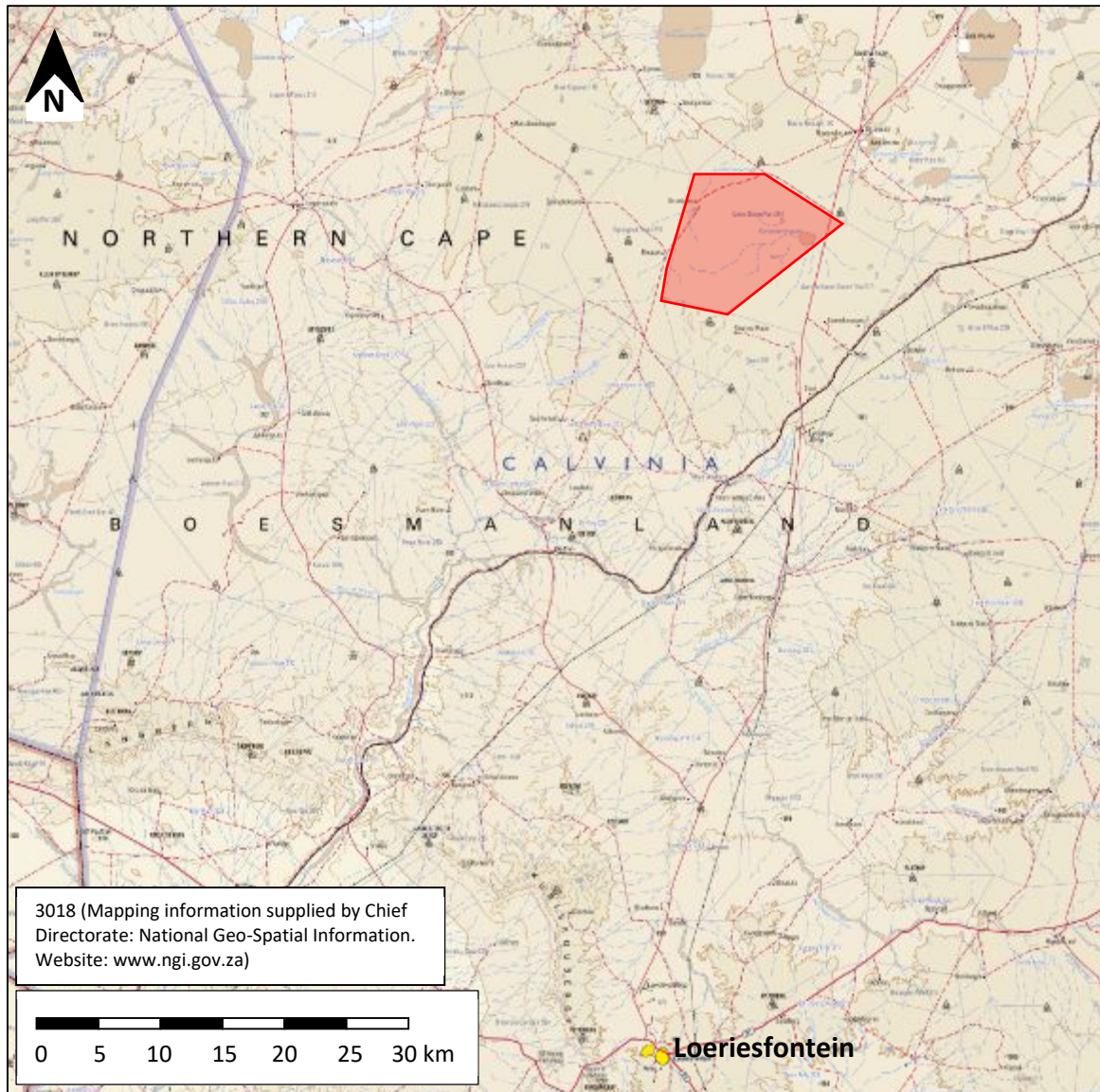


Figure 1: 1:250 000 topographic map showing the location of the Kokerboom 3 site (red shaded polygon) relative to the town of Loeriesfontein in the south. The bold wavy line passing from southwest to northeast is the Sishen-Saldanha Railway.

¹ Note that an earlier assessment considered the then proposed Kokerboom 3 WEF but the project description and layout have changed sufficiently to call for a new Scoping and Environmental Impact Assessment. The earlier heritage assessment can be found here: <https://sahris.sahra.org.za/cases/kokerboom-3-wef>.

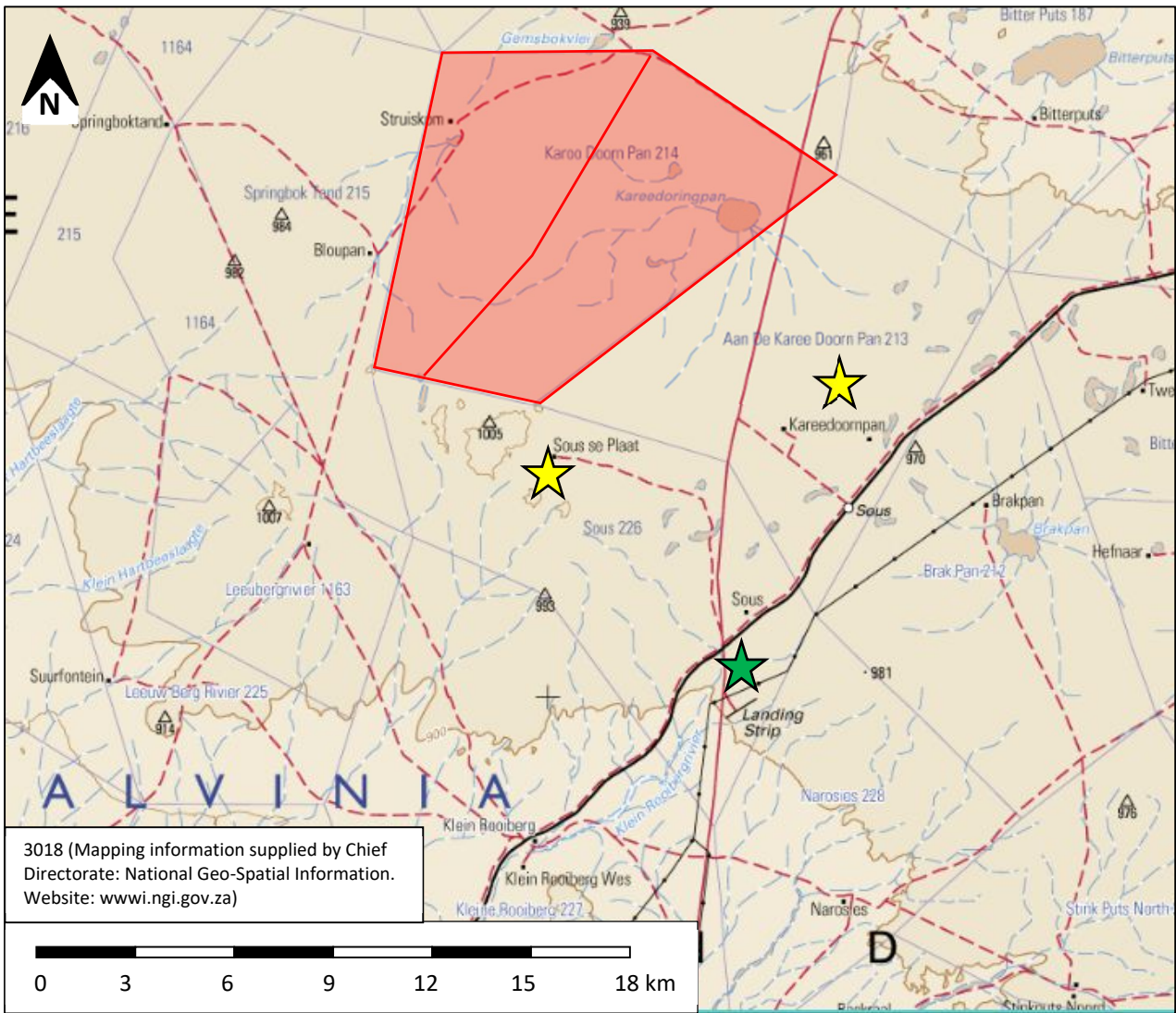


Figure 2: 1:250 000 topographic map of the immediate vicinity of the study area (red shaded polygons = site). Other wind farm developments already constructed in the vicinity are indicated by the yellow stars, while the green star denotes the position of the Eskom Helios Substation.

1.1. The proposed project

1.1.1. Project description

The proposed project would have a generating capacity of up to 300 MW and would comprise of the following components:

- Up to 60 wind turbines with a hub height of up to 150 m and a rotor diameter of up to 180 m (maximum tip height 240 m);
- Hard standing surfaces of up to 150 m x 100 m and laydown/assembly areas of approximately 150 m x 15 m alongside each turbine;
- Internal access roads with reserves of 20 m width. The actual roads will be 6 m in width with a 1 m wide drain on either side while the remaining 12 m will be for burial of electrical cabling (the 12 m will be rehabilitated after construction with the 8 m road and drain width remaining present during operation);

- A 5 ha area containing the substation (approximately 1 ha), operation and maintenance building (approximately 0.5 ha), oil storage (approximately 0.1 ha), battery energy storage facility with a capacity of up to 150 MWh (approximately 2 ha), parking and associated facilities;
- Medium voltage underground powerlines linking the turbines to the substation and following the roads;
- Three temporary laydown and site camp areas of up to 15 ha each (two would be near the entrances and one near the substation. It is not yet known how many will be utilised so this assessment has assumed that all three will be used); and
- A centralised concrete batch plant will be erected for the concrete works required during construction. An area of approx. 100m x 100m is required for the batch plant. The batch plant area will include aggregate stockpile areas, cement silos, truck parking areas and the batch plant itself. Where possible, the batch plant will be located within one of the construction laydown areas.

1.1.2. Identification of alternatives

- Although it makes no difference from a heritage point of view, two alternative battery technology types are proposed:
 - Lithium-ion; and
 - Redox flow.

No other alternatives are proposed. Specialist field data were used to develop a layout with the minimum possible overall impact. Alternative locations for some project components were previously assessed and discarded prior to the EIA Phase of the project. As such, the only alternative for assessment is the No-Go alternative.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA was asked by Zutari to compile a heritage impact assessment (HIA) that would meet the requirements of the heritage authorities and deal with all aspects of heritage except palaeontology which has been considered by another specialist. In this regard, ASHA was asked to:

- Undertake an initial site investigation to determine the *status quo* and identify any sensitive features or no-go areas;
- Provide shapefiles of all sensitive features;
- Undertake a follow-up site investigation (walkthrough) to examine the final micro-sited layout;
- Make use of the Zutari Impact Assessment Methodology when assessing impacts for all alternatives proposed as part of the Kokerboom 3 Wind Farm as well as cumulative impacts;
- Provide a detailed description of appropriate mitigation measures that can be adopted to reduce or avoid negative impacts and improve positive impacts for each phase of the project, where required, and the significance of impacts pre- and post-mitigation;

- Provide a summary of succinct and practical recommendations based on mitigation measures identified to form the basis of Environmental Authorisation requirements, should the development be authorised;
- Comply with the content requirements for specialist reports listed in Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014, as amended); and
- Provide a site sensitivity verification report using the Screening Tool map.

1.3. Scope and purpose of the report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the National Department of Environment, Forestry and Fisheries (DEFF) who will review the Environmental Impact Assessment (EIA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in the Western Cape and Northern Cape provinces of South Africa since 2004 (Please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;

- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith”;
- Palaeontological material: “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace”;
- Archaeological material: a) “material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures”; b) “rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation”; c) “wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation”; and d) “features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found”;
- Grave: “means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place”; and
- Public monuments and memorials: “all monuments and memorials a) “erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government”; or b) “which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.”

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEFF.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:250 000 map was sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

The site was surveyed on 20 and 21 February 2017, 24, 25, 26 and 28 February 2020 and 8, 9 and 15 June 2021 (the latter dates being a detailed walkthrough of the final layout). Two archaeologists conducted the surveys. The surveys were during late summer and mid-winter but, in this relatively dry area with only low vegetation, seasonality makes no difference to the visibility of heritage materials on the landscape. During the surveys the positions of finds were recorded on hand-held GPS receivers set to the WGS84 datum (Figure 3). Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

It should be noted that the amount of time between the dates of the field inspection and final report do not materially affect the outcome of the report because of the stability of the landscape.

3.3. Specialist studies

No specialist studies were commissioned for the present report, although palaeontological heritage resources have been assessed by another specialist (Dr John Almond) and reported on separately².

3.4. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by the Environmental Assessment Practitioner, Zutari.

3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

² Almond, J. 2020. Palaeontological heritage assessment: site sensitivity report & letter of exemption from further specialist studies. Proposed Kokerboom 3 and Kokerboom 4 Wind Farms near Loeriesfontein, Namaqua District Municipality, Northern Cape. Report prepared for Zutari (Pty) Ltd.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' and rated with an A (high/medium significance, requires mitigation), B (medium significance, requires recording) or C (low significance, requires no further action).

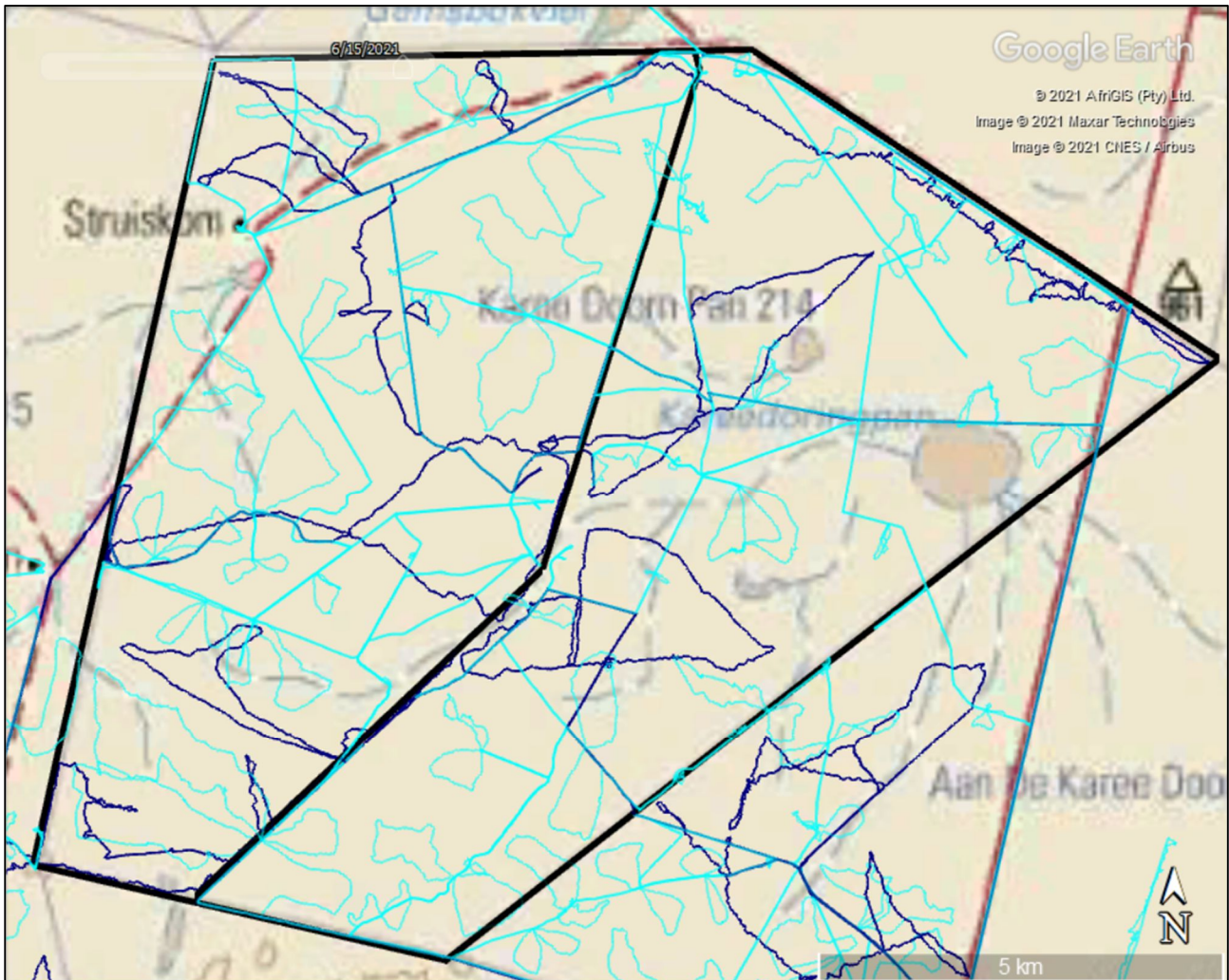


Figure 3: Map of the Kokerboom 3 study area (the two bold black polygons denote relevant farm portions) showing the drive and walk paths created during the survey (light [2017 & 2020] and dark [2021] blue lines). Note that blue lines outside the study area relate to other surveys by the present author.

3.6. Consultation

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP.

3.7. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. Assumptions need to be made regarding the quality of the assessments for nearby projects and, at times, professional judgement on the likely distribution of heritage resources is required in order to achieve a better understanding and assessment of cumulative impacts.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The site is in a very remote location on land that is used for livestock grazing. A precedent has already been set for the development of wind energy facilities, with two already constructed to the south and east of the present study area (see Figure 2), and several authorised wind energy facilities nearby, including Kokerboom 1 and 2, Dwarsrug, Xha Boom, Graskoppies, Hartebeest Leegte and iThemba, as well as a solar energy facility having been authorised nearby (see Appendix 2). Other applications in the area have included both wind and solar energy projects. A large Eskom Substation (Helios) lies 12 km southeast of the present study area, alongside the gravel road that leads northwards from Loeriesfontein. Between the substation and the study area, the Sishen-Saldanha Railway bisects the landscape.

4.2. Site description

The site is generally flat (Figure 4), but, broadly, the southern part is somewhat higher-lying than the north. A number of pans were present, while small outcrops of dolerite (Figure 5). The flatter ground tends to be sandy with small shrubs (Figure 6), while on the higher ground erosion has resulted in the surfaces being gravelled (Figure 7).



Figure 4: View across the northern part of the study area showing the endless plain that forms about a quarter of the study area to the north of the large drainage line (2017).



Figure 5: View towards the southeast showing dolerite outcrops overlooking a pan in the northern part of the study area (2017).



Figure 6: View towards the south across a flat, sandy plain with low vegetation. The neighbouring Khobab Wind Farm is visible in the background (2020).



Figure 7: View towards the north in the central part of the study area showing the gravel surface on the high ground (foreground) (2017).

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. Table 1 lists all heritage resources recorded during the field surveys in the Kokerboom 3 wind energy facility study area. An indication of the heritage significance and the amount of time required on site for adequate mitigation (where necessary) is also provided. The locations of the finds in the Kokerboom 3 study area are mapped in Figures 8 to 10.

Table 1: List of heritage resources recorded during the surveys. Under ‘Significance’ an indication is given of the amount of time required on each site to carry out archaeological mitigation where appropriate³. Field Ratings are in terms of the grades described in Section 3.5.

Waypoint	GPS	Description	Significance [mitigation]	Field rating
678	S30 21 30.9 E19 33 37.5	LSA stone artefact scatter on the northern edge of a pan. It has CCS artefacts and ostrich eggshell fragments.	Low	GPB
679	S30 21 30.0 E19 33 39.9	LSA stone artefact scatter on the northern edge of a pan. It has CCS artefacts and ostrich eggshell fragments.	Low-medium	GPA

³ Mitigation is required only in instances where direct disturbance is proposed at the location of an archaeological site. Note that in the current site layout all significant heritage resources except one (at waypoints 722, 1938, 1939) have been suitably buffered and avoided and thus no direct mitigation is required. Refer to section 6.

Waypoint	GPS	Description	Significance [mitigation]	Field rating
		It was noted that there were many ostrich eggshell fragments and several historical glass and ceramic fragments along the edge of the pan in this area. These are not significant.	4 hours	
680	S30 19 38.6 E19 31 14.9	A dolerite outcrop with many ostrich eggshell fragments and occasional CCS artefacts.	Very Low	GPC
681	S30 19 38.7 E19 31 13.0	A dolerite outcrop with a cluster of ostrich eggshell in between boulders on the outcrop.	Very Low	GPC
682	S30 19 39.2 E19 31 13.3	A single small bedrock grinding patch (very shallow) on a dolerite outcrop.	Very Low	GPC
683	S30 19 42.1 E19 31 12.5	A dolerite outcrop with many ostrich eggshell fragments and one CCS artefact.	Very Low	GPC
684	S30 19 51.4 E19 31 32.5	A scatter of ostrich eggshell fragments, including one burnt piece, on a dune to the south of a pan.	Very Low	GPC
685	S30 20 03.2 E19 31 36.8	A scatter of CCS artefacts and ostrich eggshell fragments in an open area alongside a streambed and to the north of some dolerite outcrops. There is also one quartz artefact.	Low- medium 2 hours	GPA
686	S30 20 11.0 E19 31 18.0	A scatter of ostrich eggshell fragments, including some burnt ones, and CCS artefacts between dolerite outcrops.	Low	GPB
687	S30 20 59.4 E19 32 12.8	An ephemeral artefact scatter on the edge of a pan. The material is unknown but might be hornfels. Although there are many ostrich eggshell fragments scattered along the pan margin here, there are none directly associated with these artefacts.	Very Low	GPC
688	S30 20 43.6 E19 29 32.8	A scatter of ostrich eggshell fragments, including one showing evidence of having been struck from the outer surface, located between boulders on a dolerite outcrop.	Very Low	GPC
689	S30 20 22.5 E19 29 36.4	A scatter of ostrich eggshell fragments and CCS artefacts as well as one burnt bone on a dolerite outcrop. They occur alongside and minimally inside a tiny enclosure built with dolerite blocks. The floor space is no more than 1m (W-E) by 2m (N-S) and the opening is towards the north.	Low- Medium 2 hours	GPA
690	S30 20 21.8 E19 29 34.3	A low density scatter of CCS artefacts.	Very Low	GPC
691	S30 19 58.0 E19 30 26.3	An ephemeral scatter of CCS artefacts.	Very Low	GPC
692	S30 20 14.8 E19 30 37.7	A dolerite outcrop with plenty of ostrich eggshell on and around it but no stone artefacts were seen.	Very Low	GPC
693	S30 20 14.9 E19 30 38.1	A dolerite outcrop with plenty of ostrich eggshell and some CCS artefacts on and around it.	Low	GPB
694	S30 19 57.7 E19 30 51.0	A scatter of ostrich eggshell fragments, including some burnt pieces, on a dolerite outcrop.	Very Low	GPC
695	S30 20 12.9 E19 28 07.0	The farmstead on Portion 2 of Farm 214. It has a modern house (maybe 1970s) as well as a shed that is likely to be early 20 th century and a mud brick house ruin that may be late 19 th century. The ruin has wooden door and window frames, some muurkaste, and bamboo ceiling which has collapsed. The roof poles seem to have been removed for reuse elsewhere. The house stands on a stone plinth. There is a very good chance that it was originally a brakdak house.	Medium Avoid	IIIB
696	S30 20 11.4 E19 28 04.0	This is the dump associated with the house ruin. It has a mixture of late 19 th /early 20 th century and later 20 th	Medium- Low Avoid	GPA

Waypoint	GPS	Description	Significance [mitigation]	Field rating
		century materials. There is a fairly low density of cultural materials.		
697	S30 22 13.0 E19 28 05.0	An area with an elevated density of background scatter alongside a pan/watercourse. The artefacts are of orange-coloured chert.	Very Low	GPC
698	S30 22 45.2 E19 28 46.9	A small scatter of LSA white CCS artefacts on a hilltop and overlooking a pan/watercourse to the north. There are about 25 artefacts.	Low	GPB
699	S30 22 41.3 E19 27 49.7	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert.	Very Low	GPC
700	S30 22 53.1 E19 27 28.3	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert. The south-western part of the study area seems to have this gravel and these artefacts far more than anywhere else on site.	Very Low	GPC
701	S30 21 21.8 E19 28 01.7	A scatter of ostrich eggshell fragments as well as some bone and one CCS artefact on a dolerite outcrop.	Low	GPB
702	S30 21 17.9 E19 27 50.1	An ephemeral scatter of ostrich eggshell fragments and some CCS on a dolerite outcrop.	Very Low	GPC
703	S30 21 18.6 E19 28 13.5	A scatter of ostrich eggshell fragments on a large dolerite outcrop (c. 40x30m).	Medium-Low 16 hours	GPA
704	S30 21 18.8 E19 28 14.1	A scatter of ostrich eggshell fragments and CCS artefacts on the same dolerite outcrop.		
705	S30 21 18.5 E19 28 14.6	Dense scatter of ostrich eggshell fragments with some stone artefacts in CCS, hornfels and quartzite located in a basin on the same dolerite outcrop.		
706	S30 21 19.3 E19 28 14.5	A large ostrich eggshell scatter (including some burnt pieces) and some stone artefacts in CCS, hornfels and 'other' on the southern slope of the dolerite outcrop.		
707	S30 21 18.8 E19 28 14.3	A scatter of ostrich eggshell fragments and artefacts of CCS and hornfels on the top of the dolerite outcrop.		
708	S30 21 18.8 E19 28 15.5	A large ostrich eggshell scatter and some stone artefacts in CCS, on the eastern slope of the dolerite outcrop.		
709	S30 22 26.2 E19 27 59.6	An area with an elevated density of background scatter associated with red gravel. The artefacts are of orange-coloured chert.	Very Low	GPC
710	S30 20 16.9 E19 29 55.3	A single grinding groove (very shallow groove) on a flat area of dolerite bedrock. There is also some ostrich eggshell around the outcrop.	Low	GPB
711	S30 20 15.5 E19 30 37.4	A widespread scatter of ostrich eggshell fragments on the southern side of a dolerite outcrop.	Very Low	GPC
712	S30 20 26.2 E19 30 52.1	A scatter of ostrich eggshell fragments and one tortoise bone alongside a small dolerite outcrop	Very Low	GPC
717	S30 23 10.9 E19 31 38.2	A large scatter of ostrich eggshell with CCS artefacts on a sandy dolerite hill. Includes a backed bladelet fragment.	Medium 16 hours	IIIB
718	S30 23 10.4 E19 31 38.8	A large and very dense scatter of ostrich eggshell with CCS and hornfels artefacts on a sandy dolerite hill.		
719	S30 23 09.9 E19 31 37.2	A large scatter of ostrich eggshell with CCS artefacts on a sandy dolerite hill.		
720	S30 23 03.1 E19 31 26.8	An ephemeral scatter of CCS artefacts on the summit of a shale hill. [1941 is part of this site.]	Very Low	GPC
721	S30 23 09.7 E19 31 29.9	An area of slightly higher density background scatter.	Very Low	GPC

Waypoint	GPS	Description	Significance [mitigation]	Field rating
722	S30 23 06.5 E19 30 54.5	A huge scatter of ostrich eggshell fragments and some CCS and hornfels artefacts on the side of a dolerite soil hill. Also some burnt ostrich eggshell fragments. [1937 and 1938 are part of this site.]	Medium-Low 8 hours	GPA
723	S30 23 35.8 E19 29 54.5	Elevated density background scatter of red/orange CCS artefacts.	Very Low	GPC
724	S30 23 27.7 E19 29 46.3	An outcrop of milky-coloured CCS. Not obviously flaked but there are blocks of it around the area that are worked. Also some flakes.	Very Low	GPC
725	S30 23 26.3 E19 29 41.3	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
726	S30 23 26.1 E19 29 40.0	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
727	S30 23 24.9 E19 29 39.9	Elevated density of background scatter with CCS of varying colour but the milky rock is notable.	Low	GPB
728	S30 23 20.0 E19 29 41.9	An outcrop of milky-coloured CCS. Not obviously flaked but there are blocks of it around the area that are worked. Also a number of flakes.	Low	GPB
729	S30 22 20.7 E19 31 51.4	A scatter of white CCS artefacts on a hilltop. There are many artefacts, including a backed bladelet and a backed point. There are also ostrich eggshell fragments.	Medium-Low 4 hours	GPA
730	S30 22 20.4 E19 31 53.9	A scatter of green bottle glass, one pink glass fragment, one clear glass fragment, one metal item of unknown function (looks like silver or similar and is untarnished) and also a piece of a harmonica.	Very Low	GPC
731	S30 22 23.5 E19 32 58.3	An ephemeral scatter of CCS artefacts on a hilltop.	Very Low	GPC
080	S30 19 11.4 E19 31 56.1	A scatter of ostrich eggshell fragments and some CCS artefacts on the south side of a dolerite outcrop. Also an upper grindstone on a dolerite cobble.	Low	GPB
081	S30 20 01.8 E19 31 31.0	A scatter of ostrich eggshell fragments on a dolerite outcrop.	Very Low	GPC
082	S30 20 05.8 E19 31 38.0	A scatter of ostrich eggshell fragments on a dolerite outcrop. A CCS flake was seen at the base of the outcrop to the east.	Very Low	GPC
090	S30 21 08.9 E19 32 13.2	A scatter of ostrich eggshell fragments and some CCS artefacts on the south-western margin of a large pan.	Low	GPB
091	S30 20 40.2 E19 29 30.9	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop.	Low	GPB
092	S30 20 41.5 E19 29 26.4	A scatter of ostrich eggshell fragments among the boulders on a dolerite outcrop.	Very Low	GPC
096	S30 20 29.0 E19 29 14.2	A scatter of ostrich eggshell fragments and some CCS artefacts on the south side of a dolerite outcrop.	Low	GPB
100	S30 20 29.7 E19 29 16.2	A scatter of ostrich eggshell fragments and a single CCS flake.	Low	GPB
101	S30 19 42.1 E19 31 00.5	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop.	Low	GPB
103	S30 19 42.0 E19 31 00.9	A scatter of green bottle glass near a dolerite outcrop. Likely all from one bottle.	Very Low	GPC
104	S30 19 40.5 E19 31 00.5	A scatter of ostrich eggshell fragments on the southern side of a dolerite outcrop.	Very Low	GPC
115	S30 22 35.1 E19 28 50.5	An area with an elevated density of background scatter alongside a pan/watercourse. The artefacts are of orange-coloured chert.	Very Low	GPC

Waypoint	GPS	Description	Significance [mitigation]	Field rating
117	S30 22 21.8 E19 29 25.8	A scatter of ostrich eggshell fragments and some CCS artefacts alongside a dolerite outcrop. Also some background scatter here.	Low	GPB
123	S30 23 48.6 E19 30 52.6	A light scatter of CCS artefacts.	Very Low	GPC
124	S30 23 52.8 E19 30 52.6	An area with an elevated density of background scatter.	Very Low	GPC
126	S30 23 42.2 E19 29 57.2	A light scatter of CCS artefacts.	Very Low	GPC
1926	S30 20 39.4 E19 34 18.7	Scatter of ostrich eggshell fragments about 30 m in diameter. There were rare quartz artefacts associated (4 flakes seen).	Very low	GPC
1927	S30 20 36.0 E19 34 16.5	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC
1928	S30 20 34.0 E19 34 20.0	An ephemeral scatter of ostrich eggshell fragments with a single crypto-crystalline silica flake.	Very low	GPC
1929	S30 20 33.4 E19 34 24.7	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC
1930	S30 20 36.3 E19 34 30.7	A scatter of refined white earthenware fragments. Two vessels represented, both transfer printed, one with blue and the other brown.	Very low	GPC
1932	S30 20 31.1 E19 34 15.9	Scatter of ostrich eggshell fragments about 15 m in diameter with a single crypto-crystalline silica flake.	Very low	GPC
1933	S30 19 22.3 E19 31 55.8	Scatter of ostrich eggshell fragments about 15 m in diameter. No artefacts were seen.	Very low	GPC
1934	S30 21 00.2 E19 32 10.0	Scatter of ostrich eggshell fragments about 20 m in diameter. No artefacts were seen.	Very low	GPC
1935	S30 21 06.0 E19 32 08.4	Scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen.	Very low	GPC
1936	S30 24 21.5 E19 27 52.9	An ephemeral scatter of stone artefacts on the top of a scarp. 3 in CCS, 1 in silcrete, 2 ostrich eggshell fragments. Also 2 hornfels flakes a short distance away.	Very low	GPC
1937	S30 23 05.0 E19 30 53.3	Scatter of ostrich eggshell fragments about 15 m in diameter. No artefacts were seen. [Part of site 722.]	Very low	GPC
1938	S30 23 05.0 E19 30 53.6	Scatter of ostrich eggshell fragments about 20 m in diameter. A number of artefacts in CCS and hornfels were seen but it is hard to see artefacts among the shale gravel and there are likely more. Some of them are background scatter artefacts. [Part of site 722.]	Medium-Low 8 hours	GPA
1939	S30 23 05.9 E19 30 54.5	Scatter of ostrich eggshell fragments about 20 m in diameter. A number of artefacts in CCS and hornfels were seen but it is hard to see artefacts among the shale gravel and there are likely more. Some of them are background scatter artefacts. [Part of site 722.]	Medium-Low 8 hours	GPA
1940	S30 23 06.9 E19 30 55.2	Scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen. [Part of site 722.]	Very low	GPC
1941	S30 23 03.1 E19 31 26.3	Scatter of ostrich eggshell fragments about 10 m in diameter with a few CCS artefacts. [Part of 720.]	Very low	GPC
1942	S30 23 03.7 E19 31 34.9	Ephemeral scatter of ostrich eggshell fragments around a dolerite boulder that looks like it was used as a lower grindstone.	Very low	GPC
520	S30 19 52.4 E19 27 52.1	A dense scatter of ostrich eggshell fragments about 10 m in diameter. No artefacts were seen.	Very low	GPC
521	S30 19 54.8 E19 28 20.5	Ephemeral LSA scatter of CCS artefacts (8 flakes seen).	Very low	GPC

Waypoint	GPS	Description	Significance [mitigation]	Field rating
522	S30 23 50.0 E19 28 10.5	Ephemeral scatter of ostrich eggshell fragments and three CCS flakes.	Very low	GPC
523	S30 23 48.4 E19 28 09.9	Ephemeral scatter of CCS artefacts. One core and nine flakes seen.	Very low	GPC
524	S30 23 46.5 E19 28 09.3	Ephemeral scatter of ostrich eggshell fragments with two CCS flakes and an upper grindstone/hammerstone on a sandstone-like cobble.	Very low	GPC

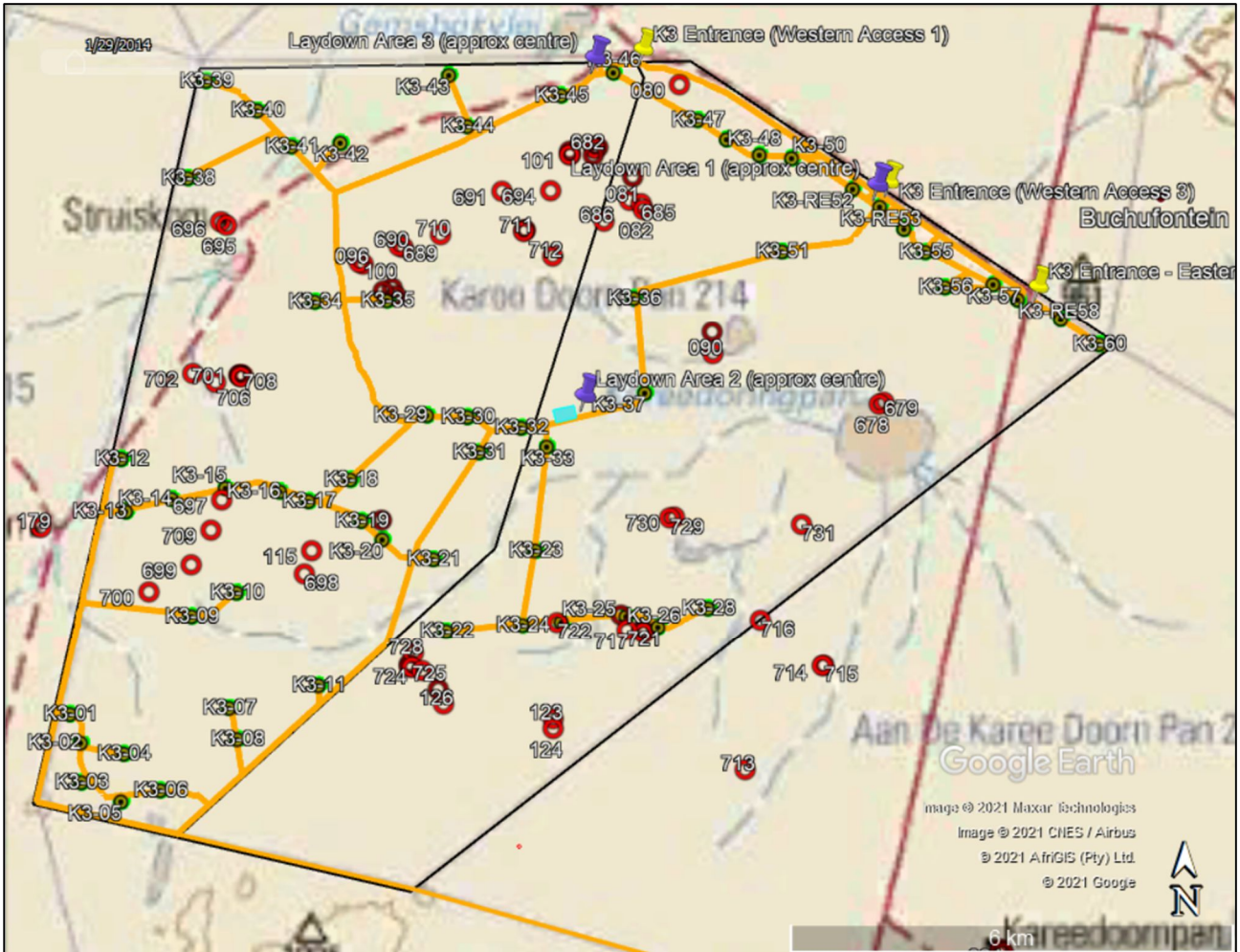


Figure 8: Map of the entire Kokerboom 3 study area showing the locations of all finds (red numbered symbols) relative to the proposed infrastructure (circles with central dots = turbines, orange lines = roads and cables, small turquoise rectangle = substation and O&M building, purple pins = laydown areas. Areas in the north and centre are enlarged below. Note that sites falling outside the study area are excluded from Table 1.

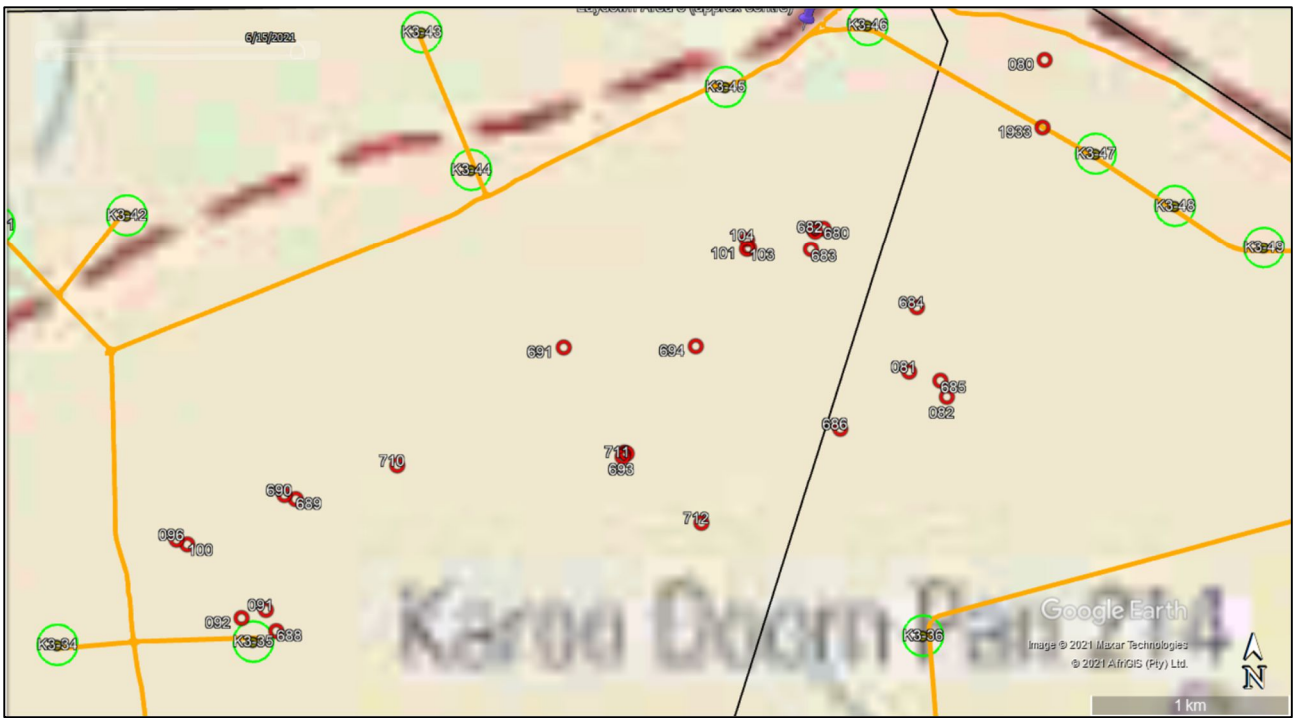


Figure 9: Map of the northern part of the Kokerboom 3 study area. Key as for Fig. 8 but green circles = turbine foundations and laydown buffers.

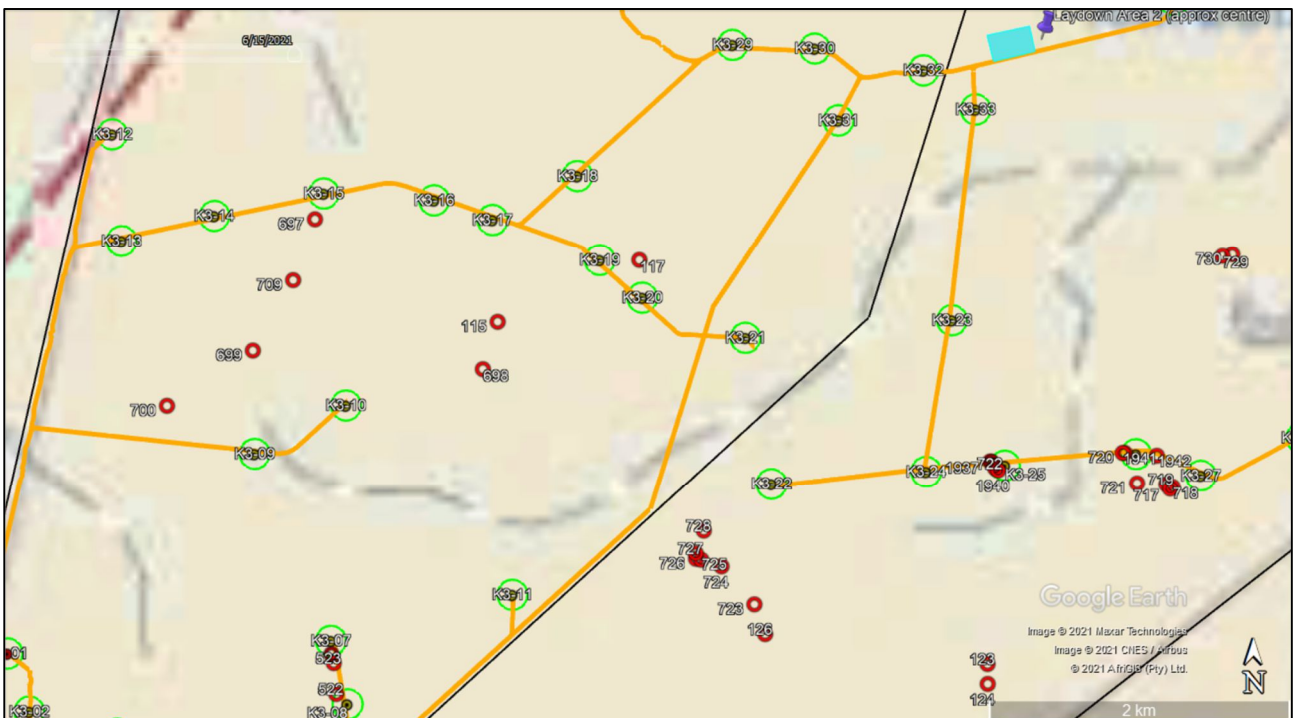


Figure 10: Map of the central part of the Kokerboom 3 study area. Key as for Fig. 8.



Figure 11: Map of the north-eastern part of the Kokerboom 3 study area. Key as for Fig. 8.

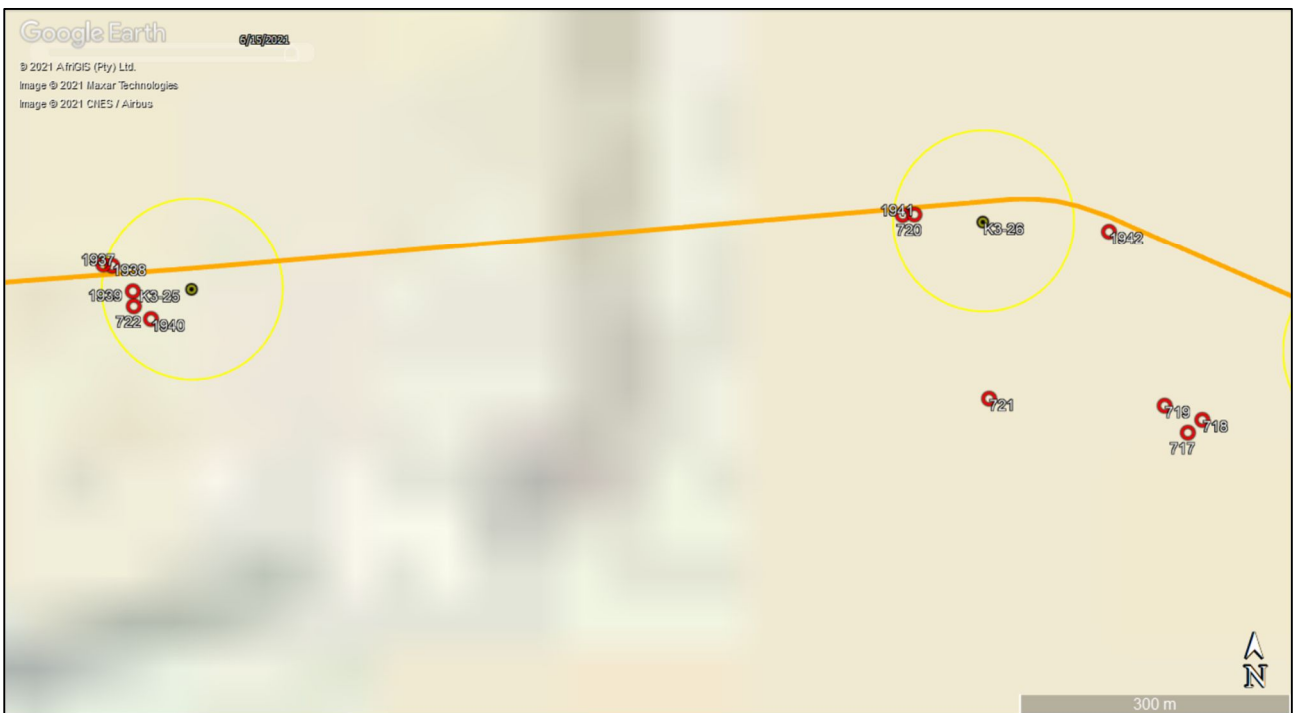


Figure 12: Enlargement from Figure 10. Key as for Fig. 8

5.1. Archaeology

5.1.1. Desktop study

Beaumont *et al.* (1995:240) have stated that “Thousands of square kilometres of Bushmanland are covered by a low density lithic scatter”. Many impact assessments have found this to be true,

although it can be stated that the scatter tends to be more noticeable in northern Bushmanland than in the south. The artefacts include material dating to the Early (ESA), Middle (MSA) and Late (LSA) Stone Ages.

In the general vicinity of the present study area Van Schalkwyk (2011) found Stone Age sites to be associated with hills – they were either located on the crests or at the foot of the hills and were from both the MSA and the LSA. In contrast, Orton (2017a, 2017b, 2017c) found MSA material to be more frequent on the lowlands and generally attributable to background scatter, while LSA sites were focused on hills. Orton (2013) found a few small LSA artefact scatters associated with both hill tops and the margins of the Klein Rooiberg River to the southeast. In addition to widespread but low density MSA artefacts forming part of the background scatter, Webley and Halkett (2012) also reported small LSA sites located on the crests of low hills a short distance to the south of the present study area. These sites revealed primarily stone artefacts and ostrich eggshell, although one had pottery and a bead on it. They found another site, located close to a stream bed, which had a number of grooved grindstones on it.

Beaumont and Morris (1985 in Morris 2013) found dense LSA sites around pans to the west of Brandvlei (well to the east of the present study area). The finds included scatters of stone artefacts, pottery and ostrich eggshell, the latter perhaps having originated from water containers. A later survey by Morris (1996) to the north of the present study area yielded further similar sites on dunes associated with pans; he also recorded ostrich eggshell beads and pottery there.

Also to the east, Rudner and Rudner (1968) recorded engravings on dolerite outcrops as well as occupation sites dating to the LSA. These sites included stone artefacts, pottery, ostrich eggshell beads and stone features that may have been the remnants of hut circles and/or kraals.

Fourie (2011), who found nothing during his survey, reports the oral testimony of a Loeriesfontein farmer regarding the presence of rock art and engravings in the area and also that a cache of ostrich eggshell flasks had been found on his farm. Such caches have been reported from various parts of western South Africa (Henderson 2002; Jerardino *et al.* 2009; Morris 1994; Morris & Von Bezing 1996; Parkington 2006) and date to the LSA. Similar flasks are on display in the Fred Turner Museum in Loeriesfontein along with several bored stones and soapstone pipes from farms in the general region.

Other surveys have yielded low density scatters of stone artefacts of varying age (Fourie 2017b, 2017c, 2017f; Kaplan 2008; Morris 2007, 2013), while some, despite large areas being surveyed, found nothing at all (Fourie 2011, 2017a, 2017d, 2017e; Van der Walt 2012, 2013).

The only historical archaeological material reported came from the farm Kleine Rooiberg, a short distance south of the present study area (see Figure 2). It consisted of ceramic, glass and metal fragments thought to date to the early 20th century (Webley & Halkett 2012).

5.1.2. Site visit: Stone Age archaeology

Archaeological resources were found to be widespread in the study area but with the southern part being surprisingly sparse (Figure 8). Many low density and/or small LSA occurrences were noted, often in association with dolerite outcrops. These generally had stone artefacts and ostrich eggshell fragments with the artefacts being of cryptocrystalline silica (CCS) and hornfels. Figure 13 shows an

example of finds at one of the better LSA artefact scatters seen during the survey. Figure 14 shows an example of a dolerite outcrop that had a widespread scatter of LSA material over it. Ostrich eggshell fragments were abundant with only a few stone artefacts seen. In the north-eastern part of the study area there was a cluster of scatters of ostrich eggshell with almost no associated stone artefacts (Figure 15).



Figure 13: LSA artefacts and ostrich eggshell fragments from the northern margin of the large pan in the north-eastern part of the study area (waypoint 679). Scale in cm.



Figure 14: A dolerite outcrop at waypoint 693 with a probably natural sandy hollow in it. There was a widespread scatter of ostrich eggshell and CCS artefacts on the outcrop.



Figure 15: Ostrich eggshell fragments at waypoint 1932. Scale = 10 cm.

An unusual find was a single grinding groove on a dolerite outcrop alongside an ephemeral watercourse (Figures 16 & 17). Such finds are common around water sources in northern Bushmanland and also occur occasionally in the Kamiesberg. Another dolerite rock that had clearly been smoothed through grinding but did not present a groove was seen at waypoint 1942. The last precolonial archaeological feature requiring discussion is the many background scatter artefacts that occur throughout the site. The density of such artefacts varies across the study area but is always far too low to merit any collection or further study. Figure 18 shows a number of these artefacts from an area close to a watercourse where they were denser than usual, while Figure 19 shows a range of BGS artefacts from across the study area. As is evident, they are well weathered indicating a relatively great age. They are almost certainly all from the MSA.



Figure 16: A dolerite outcrop at waypoint 710 with a single shallow grinding groove on it.



Figure 17: Close up of the grinding groove at waypoint 710. Scale in cm.



Figure 18: Background scatter artefacts at waypoint 115. Scale in cm.



Figure 19: Selection of artefacts pertaining to the background scatter of the study area. Scale in cm.

5.1.3. Site visit: Historical archaeology

A light scattering of historical artefacts was noted along the northern margin of the large pan in the eastern part of the study area (Figure 20). They may well represent an area where camp was set up after heavy rains and before the first house was built on the farm.



Figure 20: Historical artefacts from the northern margin of the large pan in the eastern part of the study area (near waypoint 679). They are a transfer-printed refined white earthenware (left), a coarse porcelain fragment with the glaze being sun-damaged (top right) and a wine bottle base (bottom right).

At the farm complex, which was built overlooking a pan, there is a ruined house built from sun-dried mudbricks on a stone plinth (Figures 21 & 22). A *muurkas* is evident and some windows and doors preserve wooden frames. While the roof beams were likely removed for reuse elsewhere, the presence of bamboo, much mud in the interior of the ruin and a flat-topped central wall suggest that the structure was very likely a *brakdak*. Also at this complex was an ash and artefact dump located 60 m northwest of the ruined cottage. The artefacts include a wide variety of materials dating from the last decades of the 19th century as well as some 20th century materials (Figure 23). The former include transfer and hand-painted refined white earthenwares as well as glass from wine and possibly mineral water bottles and some iron fragments.



Figure 21: The front façade of the ruined farmhouse at waypoint 695 in the north-western part of the study area.



Figure 22: The interior of the ruined farmhouse at waypoint 695 in the north-western part of the study area.



Figure 23: Historical materials from the ash dump at the farm complex (waypoint 696) in the north-western part of the study area.

5.2. Historical aspects and the built environment

5.2.1. Desktop study

Van Schalkwyk (2011) reported an early 20th century farmstead constructed of stone and brick with corrugated iron roofs. It is unlikely that many earlier farmsteads would be present because this harsh landscape was only permanently settled in relatively recent times. This is borne out by the fact that the farm under study was only surveyed in 1899. Prior to this, Van Schalkwyk (2011) notes that Dutch-speaking trek boers would have used the area on a seasonal basis. It was only after the 1870s introduction of wind pumps that water was more readily available and the area became more amenable to farming (Webley & Halkett 2012).

Van Schalkwyk (2011) found an unusual house on the neighbouring farm to the southeast. It was built of clay and bricks and then cladded with corrugated iron sheeting. He thought it to date to approximately the 1920s. Another corrugated iron house nearby was visited by Orton (2013) who described a well-maintained stone livestock enclosure (*'kraal'*), a recent but traditionally-styled cooking shelter (*'kookskerm'*) and another outbuilding. Van Schalkwyk (2011: fig. 8) also illustrates (but does not describe) another farmhouse from the region – it is far grander than that noted above and looks to be from the early to mid-20th century.

Loeriesfontein, the nearest town to the site, was first established in 1894 by Frederik Turner who built a shop, the first building in Loeriesfontein (Figure 24). Once the shop was established the town slowly grew around it.



Figure 24: The first building in Loeriesfontein as photographed in 1895 (Source: Fred Turner Museum, Loeriesfontein).

Van Schalkwyk (2011) and Orton (2013) both described a small graveyard with two graves close to the 1920s house mentioned above; one was dated to 1913. Van Schalkwyk (2011) also illustrated (but did not describe) an isolated grave.

5.2.2. Site visit

A single built heritage structure was located in the study area (Figure 25). This was an outbuilding at the farm complex at waypoint 695. Although heavily plastered, the building appears to have been built from stone. A stone plinth is visible below the plaster. Also nearby a water reservoir and wind pump are very likely older than 60 years of age but the reservoir has been plastered internally with modern grey cement (Figure 26). An abandoned piece of farm equipment also stands in the werf and is very likely a heritage object (Figure 27).



Figure 25: The farm outbuilding at waypoint 695 in the north-western corner of the study area.



Figure 26: Reservoir and wind pump at the farm complex at waypoint 695 in the north-western part of the study area.



Figure 27: An old piece of farm equipment at the farm complex at waypoint 695 in the north-western part of the study area.

5.3. Graves

No graves were seen in the study area and, due to the generally rocky substrate, the chance of finding graves is very limited.

5.4. Cultural landscape.

The site has a very weakly developed cultural landscape since the majority of anthropogenic interventions relate to farm tracks and fences. The landscape is largely a natural one (although it does still have cultural significance for its aesthetic value), but has now been compromised by two

neighbouring wind farm developments, the Helios Substation and associated power lines and the Sishen-Saldanha railway line which create a new 'cultural' layer on the landscape.

5.5. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), "cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined Section 3(3) of the NHRA (see Section 2 above).

The two most significant archaeological sites are deemed to have medium cultural significance and are graded IIIB. The precolonial one (waypoints 717-719) is significant for its scientific value, while the colonial period site (waypoint 695) has historical, architectural, technological and social value. Some other precolonial archaeological sites are rated low-medium significance for their scientific value and graded GPA. The vast majority of sites, however, is of low to very low significance and is graded GPB or GPC.

The farmstead has both archaeological and built heritage elements with significance as described above.

The cultural landscape has low cultural significance for its aesthetic and social value.

5.6. Summary of heritage indicators

The primary type of heritage resource of concern here is archaeology, since very many sites were found. Significant archaeological sites should not be disturbed without mitigation. While several archaeological sites that would require mitigation work have been recorded, most have been avoided by the current layout (Figure 28). It is still possible that other similar sites might occur in areas not covered by the survey but, because (1) the initial surveys aimed to visit as many locations suited to finding archaeology as possible, and (2) the follow-up survey looked at the actual final layout, the chances of further significant impacts still occurring are effectively zero.

The only other heritage resource is the broader cultural landscape. It is largely natural but has also been recently altered through the construction of two other wind energy facilities on neighbouring farms, the Khobab and Loeriesfontein WEFs. In general, a new development should not overly dominate the landscape. In this case the WEF would dominate but within the context of the existing electrical layer this is seen as acceptable.

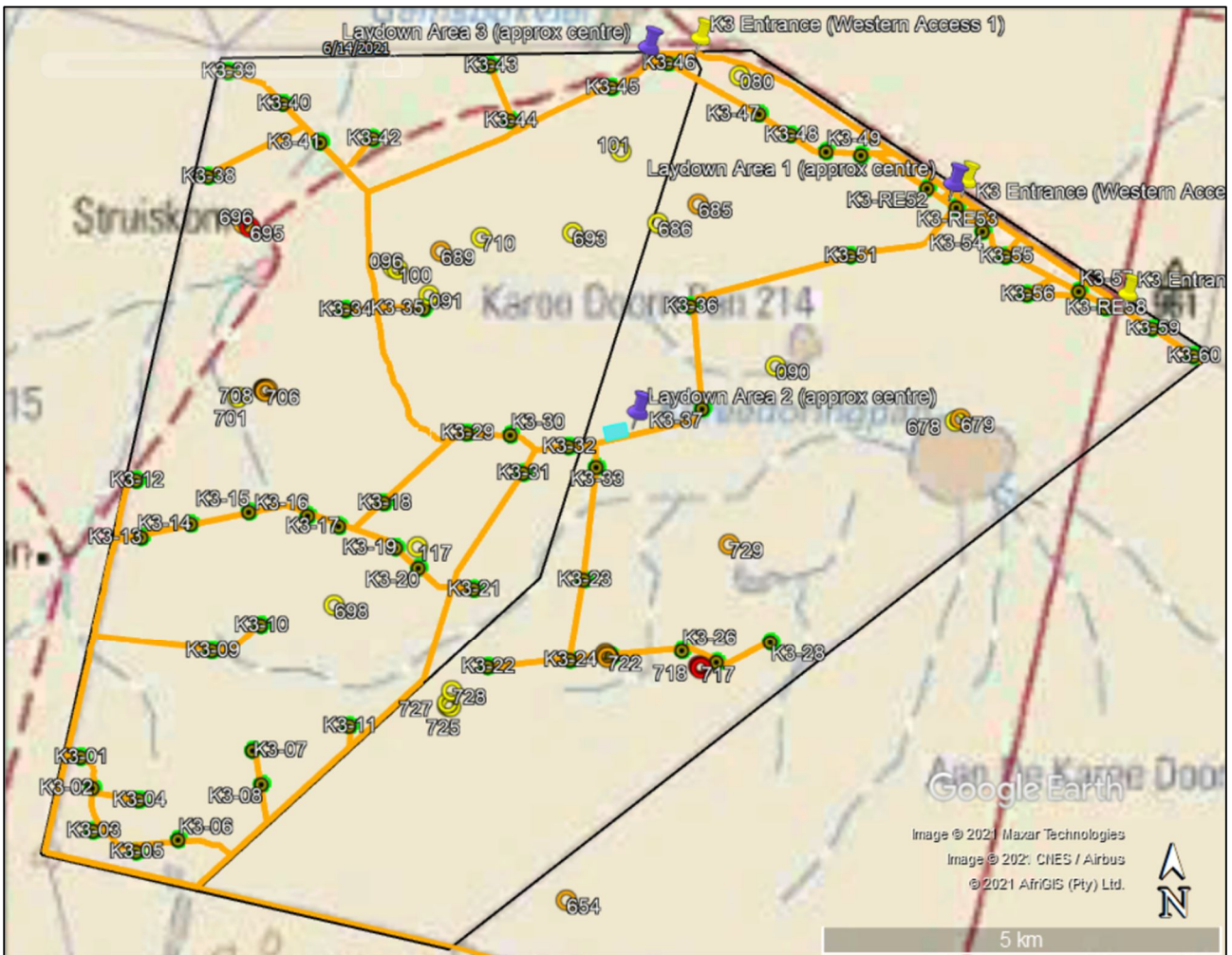


Figure 28: Aerial view of the study area showing sites of low (yellow), low-medium (orange) and medium (red) cultural significance (and hence sensitivity) relative to the project layout.

6. ASSESSMENT OF IMPACTS

Although graves have been listed in Section 5 above, they are not specifically assessed here because none are known and the chances of impacts to graves are exceedingly small. Their locations are also often very difficult to predict.

6.1. Impacts to archaeological resources

Impacts to archaeological resources would occur during the construction phase only, so long as all operation and decommissioning activities take place within the authorised footprint. It is anticipated that the construction activities related to the proposed Kokerboom 3 Wind Farm and associated infrastructure may cause damage or destruction to potential artefacts that are underground. They would be negative impacts because the sites may be damaged or destroyed and scientific data would be lost. Because the archaeological sites only have local cultural significance, the extent of the impacts would be local. The magnitude of impacts is likely to be moderate because the layout has avoided most known culturally significant sites but will impact on one site of medium-low cultural significance at turbine K3-25. Because damage to archaeological sites is completely

irreversible, the impacts are considered to be long term impacts. Because one known site with cultural significance lies within the layout footprint, it is certain that some impacts will occur. The overall significance rating of these potential impacts calculates to moderate negative without mitigation. With mitigation the magnitude of the impact would reduce to very low and the overall significance to very low. There are no fatal flaws because all archaeological sites could be mitigated should the need arise

6.1.1. Management and mitigation requirements

The grade GPA archaeological site at waypoints 722, 1938 and 1939 will require archaeological mitigation in the form of sampling and collection. The grade IIIB archaeological site at waypoints 717 to 719 should be demarcated by the ECO as a no-go area and must be monitored throughout the construction period to ensure that it is not damaged. The ECO should, in general, ensure that no activities take place outside of the authorised construction footprint.

Mitigation of the artefact scatter at waypoints 722, 1938 and 1939 would involve establishing a grid of metre squares and collecting all archaeological material in each square. Material would be scraped up from each square, sieved and sorted to extract the artefacts and other archaeological materials. These finds would be analysed and described in a report and the material would be stored in perpetuity in the provincial museum, in this instance the McGregor Museum, Kimberly. Because of the process that needs to be followed, it is recommended that mitigation should be commissioned as far in advance of construction as possible (at least six months in advance of construction being ideal, if construction timelines provide for this).

6.2. Impacts to the cultural landscape

Impacts to the cultural landscape would occur during all three phases and would relate to the presence of very tall industrial-type structures in a landscape that is otherwise gently undulating and distinctly rural and/or natural in character. They would be negative impacts because of the general incompatibility between wind turbines and the natural landscape. Because the cultural landscape is relatively weakly developed, it has been accorded low cultural significance and hence the extent of the impacts would be local. The magnitude of impacts is likely to be low because the area is so remote and there is an existing layer of electrical infrastructure and wind farms in the surrounding landscape. Damage to the landscape is reversible with rehabilitation but the impacts are considered to be long term impacts because the facility is likely to operate for many years. If the facility is constructed, then the probability is definite because the existence of the turbines will be inescapable. The overall significance rating of these potential impacts calculates to low.

No mitigation is possible because of the sheer size of the turbines. They cannot be screened or placed in such a way as to be less visible from surrounding roads and structures. The ratings with mitigation thus do not change and the overall impact remains low.

6.3. Existing impacts to heritage resources

There are currently no obvious threats to heritage resources on the site aside from the natural degradation, weathering and erosion that will affect archaeological materials. Trampling from

grazing animals and/or farm vehicles is minimal. The landscape has already been visually impacted by other electrical developments.

6.4. The No-Go alternative

With implementation of the No-Go alternative the site would remain in its present state, No heritage resources would be directly impacted and natural degradation through erosion, weathering (rain and wind) and trampling (by animals and vehicles) would continue to occur. These negative impacts are extremely minor and would be of **very low** significance.

6.5. Cumulative impacts

It is impossible to quantify the impacts to heritage resources because comprehensive surveys of all cumulative projects (see Appendix 2) are impossible and the reliability of the various reported surveys is likely to be variable. Furthermore, cultural significance assessment is variable between practitioners. Although some archaeological sites are likely to be (or have been) lost during the construction of other facilities (two wind energy facilities already occur, while other renewable energy facilities have been authorised nearby), it is clear that culturally significant heritage resources are rare on the local landscape (see desktop review above). Also, the individual significance of each site is such that it does not extend beyond the local area. The Kokerboom 3 wind farm layout avoids most known significant heritage sites and mitigation is easy to implement where needed (one site only). The project will thus make a fairly small contribution to cumulative impacts which are deemed to be of **low** significance in this case.

Although the construction of other facilities will also affect the cultural landscape (two wind energy facilities already exist, and other renewable energy facilities have been authorised nearby), it is deemed preferable to cluster the renewable energy developments such that the impacts are kept to one area. Further away the cultural and natural landscape would no longer be affected. Cumulative impacts are deemed to be of **low** significance in this case because the landscape is not highly sensitive and is rather more natural than cultural.

6.6. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. However, in the context of an area with other WEFs present, this latter impact is not deemed a significant issue.

Table 2: Assessment of heritage impacts.

Impact			Without Mitigation								With Mitigation							
Category	Impact Title	Impact description	Type	Extent	Magnitude	Duration	Probability	Confidence	Reversibility	Significance	Type	Extent	Magnitude	Duration	Probability	Confidence	Reversibility	Significance
Heritage	Impacts to archaeological resources	Damage to or destruction of archaeological sites and artefacts due to construction of turbines, access roads and related infrastructure	Negative	Local	Moderate	Long term	Certain	Sure	Irreversible	Moderate (-)	Negative	Site specific	Very low	Long term	Improbable	Sure	Irreversible	Very low (-)
Heritage	Alteration of cultural landscape	Addition of industrial-type structures to a rural landscape with minimal development in the broader area but with two operational wind energy facilities on neighbouring properties	Negative	Local	Low	Long term	Definite	Certain	Reversible	Low (-)	Negative	Local	Low	Long term	Definite	Certain	Reversible	Low (-)

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The Environmental Management Programme (EMPr) needs to make provision for the mitigation of the one site where this is required (defined by waypoints 722, 1938 and 1939). This should happen well before the start of construction so that the entire process can be concluded and a comment issued by SAHRA prior to work starting in the vicinity of the site. The site at waypoints 717 to 719 must be marked as a no-go area prior to construction commencing, using a buffer of 30 m around the waypoints and monitored during the construction phase. The ECO should regularly monitor all construction phase activities to ensure that they remain within the authorised footprint and that archaeological sites located outside of the footprint do not get inadvertently damaged or destroyed. Although any impacts would occur very quickly (just one vehicle driving in the wrong place can irreparably damage a sensitive archaeological site), it is obviously not feasible to be watching every aspect of construction throughout the construction period. Education of the staff is thus important to make sure that everyone knows the importance of remaining within the authorised footprints for all roads, turbine placements and other aspects of the development. Should the facility be decommissioned, then the protected areas (“no-go areas”) should again be cordoned off and protected while construction vehicles are on site.

8. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development. The development will provide electricity for use in South Africa. This is deemed an important function because of the historical and ongoing problems associated with South Africa’s electricity supply. The construction phase of the facility will also provide an increase in jobs for the local population. None of the heritage impacts (which are of low significance) is considered to be more important than these social and economic benefits.

9. CONCLUSIONS

This study has found that there are a number of significant heritage resources present on the site. Besides the landscape itself, which is of relatively low significance and has already been compromised by the other wind energy facilities, the only other heritage resources of concern are the archaeological sites. Because they were identified early on in the project, most have been avoided by the layout developed for the final assessment. One site graded GPA, however, will be impacted and will require mitigation (waypoints 722, 1938, 1939; Figure 29). A third site graded IIIB has been avoided; although it is far enough away that it should be safe (waypoints 717-719; Figure 30), it is the next nearest site to the layout. Although it is very likely that some isolated artefacts attributable to background scatter and other sites of low significance may be disturbed, the chances of further highly significant sites falling within the footprint are considered to be low because the final layout has been surveyed via a fine-scale walkthrough in June 2021. There are no specific areas within the current layout that require avoidance due to high cultural significance.

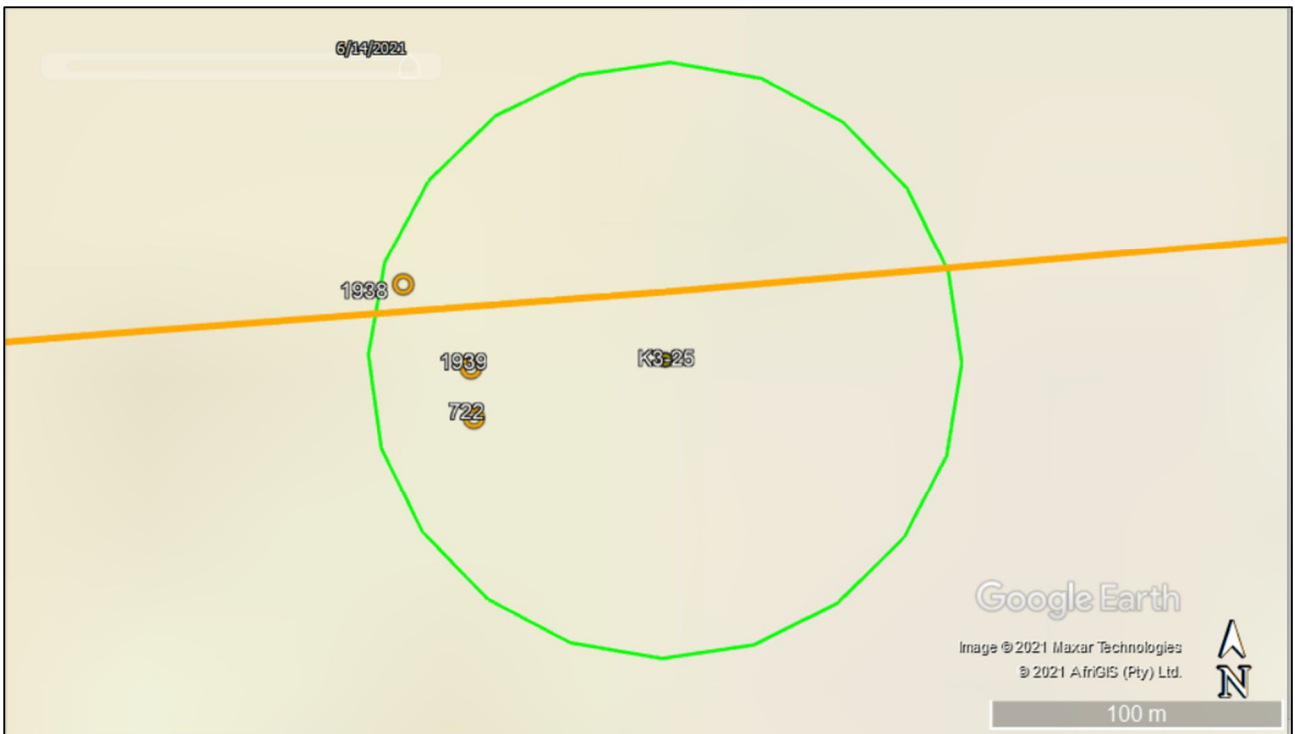


Figure 29: A site graded GPA (defined by waypoints 722, 1938, 1939) lies within the 100 m foundation and laydown buffer of turbine K3-25 and will be crossed by a road. It will require archaeological mitigation.

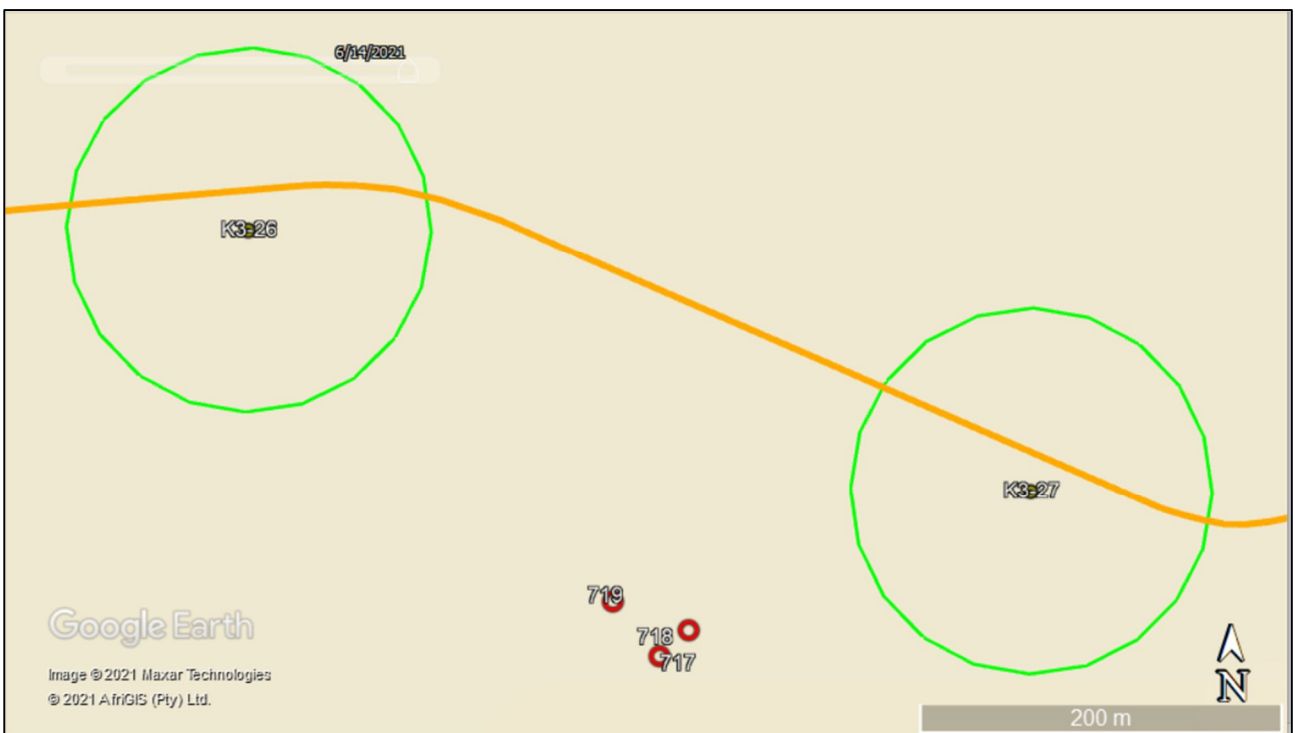


Figure 30: A site graded IIIB (defined by waypoints 717-719) lies 95 m from the nearest turbine foundation (K3-27).

9.1. Reasoned opinion of the specialist

Given that known significant impacts have been avoided in the site layout or can be easily mitigated and the chances of highly significant impacts occurring are negligible, it is the opinion of the present specialist that the proposed Kokerboom 3 WEF should be authorised in full. None of the alternatives, where available, is preferred over any other and any of them may be authorised. No further walkdown is required prior to the approval of the layout nor the commencement of construction.

10. RECOMMENDATIONS

Because the final layout has been surveyed via a detailed walk-through and impacts to heritage resources are likely to be minimal, it is proposed that the project be allowed to proceed. However, the following conditions should be included as part of the authorisation should one be issued:

- The archaeological site at waypoints 722, 1938 and 1939 must be subjected to mitigation (in the form of sampling and collection) prior to construction of turbine #25 and the adjacent road;
- The site at waypoints 717 to 719 must be demarcated as a no-go area and monitored by the ECO to ensure that it is not damaged during construction; and
- If any archaeological material or human burials are uncovered during the course of development then the find should be protected from further disturbance and work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae



Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 6A Scarborough Road, Muizenberg, 7945
Telephone: (021) 788 8425
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Memberships and affiliations:

South African Archaeological Society Council member	2004 –
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
ASAPA Cultural Resources Management Section member	2007 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233

CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
 - Stone Age archaeology (awarded 2007)
 - Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
 - Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP)

- Accredited Professional Heritage Practitioner

Fieldwork and project experience:

Extensive fieldwork as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Phase 1 surveys and impact assessments:

- Project types
 - Notification of Intent to Develop applications (for Heritage Western Cape)
 - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
 - Archaeological specialist studies
 - Phase 1 test excavations in historical and prehistoric sites
 - Archaeological research projects
- Development types
 - Mining and borrow pits
 - Roads (new and upgrades)
 - Residential, commercial and industrial development
 - Dams and pipe lines
 - Power lines and substations
 - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
 - Duinefontein, Gouda
- MSA rock shelters
 - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
 - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
 - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
 - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
 - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
 - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
 - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
 - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

APPENDIX 2 – Projects considered in cumulative impact assessment

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Portion 2 of the Farm Graskoppies No. 176; and Portion 1 of the Farm Hartebeest Leegte No. 216.
Hartebeest Leegte Wind Farm	EA issued	Mainstream	Wind	235MW	<ul style="list-style-type: none"> Entire part of the Remainder of the Farm Hartebeest Leegte No. 216.
Xha! Boom Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Entire part of Portion 2 of the Farm Georg's Vley No. 217.
Ithemba Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Western portion of Portion 2 of the Farm Graskoppies No. 176; and Western portion of Portion 1 of the Farm Hartebeest Leegte No. 216.
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227
Kokerboom 1 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> Remainder of the Farm Leeuwergrivier No. 1163; and Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> Remainder of the Farm Springbokpan No. 1164; and Remainder of the Farm Springbok Tand No. 2157.
Kokerboom 4 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1733 (Pty) Ltd (BVI)	Wind	60MW	<ul style="list-style-type: none"> Remainder of the Farm Aan De Karree Doorn Pan No. 213

APPENDIX 3 – Site Sensitivity Verification

A site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area. The details of the site sensitivity verification are noted below:

Date of Site Visit	20-21 February 2017 and 24-28 February 2020
Specialist Name	Dr Jayson Orton
Professional Registration Number	ASAPA: 233; APHP: 043
Specialist Affiliation / Company	ASHA Consulting (Pty) Ltd

- Provide a description on how the site sensitivity verification was undertaken using the following means:

- (a) desk top analysis, using satellite imagery;
- (b) preliminary on-site inspection; and
- (c) any other available and relevant information.

Initial work was carried out using satellite aerial photography in combination with the author's accumulated knowledge of the local landscape. This was used to determine any potentially sensitive areas so that they could be targeted during the site visits. Subsequent fieldwork served to ground truth the site, including areas identified as potentially sensitive. Desktop research was also used to inform on the heritage context of the area. This information is presented in the report (Chapter 5).

- Provide a description of the outcome of the site sensitivity verification in order to:

- (a) confirm or dispute the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; and
- (b) include a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.

The archaeology and cultural heritage map below (Figure A2.1) is extracted from the screening tool report and shows the archaeological and heritage sensitivity to be medium to low. The mapping appears to be based on geology and gives no consideration to the margins of pans which are typically considered as highly sensitive for archaeology. The site visit showed that in fact the majority of the site is of low sensitivity but with a number of small pockets (where archaeological and/or built heritage resources were found) considered to be of up to medium sensitivity. Some of these occurred around pans and there is no doubt that more sites would have been located close to pans if these areas had been searched more thoroughly. Figure 24 (above) shows the area considered to be archaeologically sensitive. A photographic record and description of the relevant heritage resources is contained within the impact assessment report (Chapter 5).

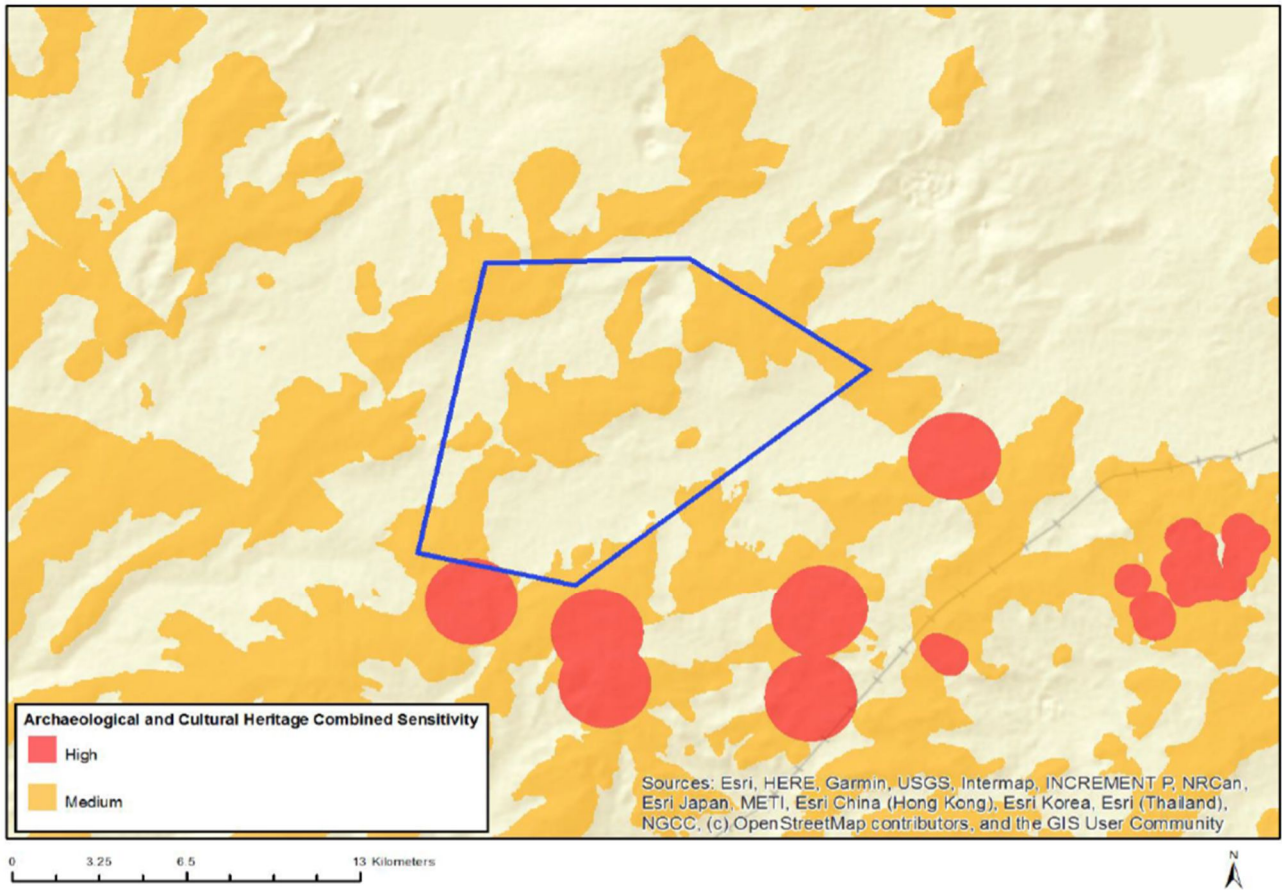


Figure A2.1: Screening tool map for the 'Archaeological and Cultural Heritage Theme'.