

**HERITAGE IMPACT ASSESSMENT FOR THE
PROPOSED 765 kV HELIOS-JUNO POWER LINE
AND SUBSTATIONS UPGRADE, CALVINIA,
VREDENDAL AND VANRHYNSDORP MAGISTERIAL
DISTRICTS, NORTHERN AND WESTERN CAPE**

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

HWC Case No.: 16081014AS0812E

Sahra Case No.: 8856

Report for:

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On behalf of:

ESKOM Holdings SOC Limited



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EXECUTIVE SUMMARY

1. Site Name

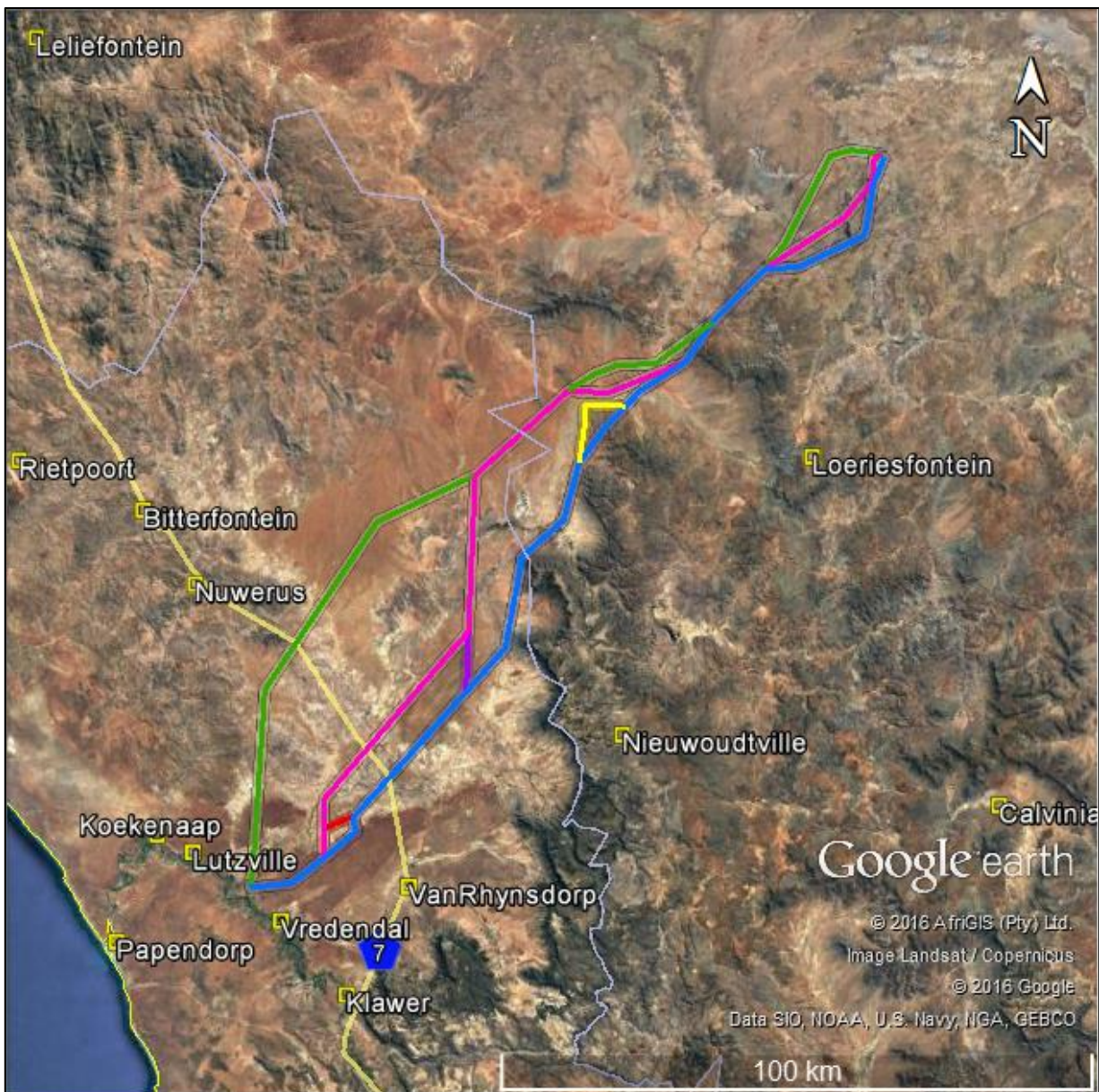
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2. Location

Three alternative alignments stretch between the Helios Substation located 52 km north of Loeriesfontein, Northern Cape, and the Juno Substation located 8 km northwest of Vredendal, Western Cape. It covers a multitude of farms over its 175 km length. The endpoints at the substations are as follows:

- Helios Substation: S30° 29' 50" E19° 33' 45".
- Juno Substation: S 31° 36' 30" E18° 26' 50"

3. Locality Plan



4. Description of Proposed Development

ESKOM proposes to construct a 175 km long 765 kV transmission line within an 80 m wide servitude stretching between the Juno and Helios Substations. An access and service road would be constructed beneath the power line but, where possible, existing roads will be used. Three corridors of 2 km width as well as some deviation options have been identified for assessment. Both substations will require upgrades as part of the project in order to accommodate additional transmission capacity.

5. Heritage Resources Identified

There are three main aspects of heritage relevant to this project. Although no field survey of the alignments was carried out, it can be confidently predicted that archaeological sites will be the most common type of heritage resource encountered along the route. Many sites are already known, with some being very significant. Palaeontological resources may also be impacted, but the chances of finding fossils in the pylon excavations are deemed to be low. The Knersvlakte landscape is the third primary aspect of heritage of concern. Despite its aridity and lack of relief, it is an aesthetically pleasing landscape that escalates in value during the flower season. It also has tremendous scientific significance for its botanical resources. These factors and the many archaeological sites and occurrences mean that the area can be regarded as a cultural landscape.

6. Anticipated Impacts on Heritage Resources

Archaeological sites and fossils may be physically impacted during the construction period through the excavation of pylon foundations and the construction of access roads. Once the operational phase starts it is not envisaged that further impacts to such resources would occur. Visual impacts to this landscape would occur with construction of the proposed power lines and would continue for the life of the power lines. In addition to the archaeological impacts, the physical disturbance of important botanical species can also be regarded as an impact on the scientific cultural landscape.

7. Recommendations

Although there has been no ground survey of the three corridors, it can be stated with a fairly high degree of certainty that impacts to archaeological resources are manageable. Impacts to the landscape are more significant for Alternative 3 than for Alternatives 1 and 2. They cannot be mitigated but do not constitute a fatal flaw. It is thus recommended that the proposed project be authorised. Alternative 1 is strongly favoured followed by Deviation 1E and Deviation 1F. Alternative 2 and Deviation 1H are less favoured, while Alternative 3 is least favoured. If the project is authorised, the following points should be included in the conditions of authorisation:

- An archaeologist should be contracted to walk the entire length of the final chosen alignment to locate and record all archaeological sites and occurrences and any other heritage resources that may lie within the proposed route. The archaeologist must make recommendations as to whether any mitigation work is required and advise on the extent of such work;
- A palaeontologist with field experience in the relevant areas should be contracted to comment on the final chosen alignment with a view towards establishing whether any sections may require monitoring or not. The extent and frequency of such monitoring

should be worked out between the palaeontologist and construction contractor in order to ensure that the most important areas, if any, are examined;

- Construction camps and laydown areas should be placed away from scenic areas and preferably located adjacent to settlements so as to avoid disturbance of pristine environments; and
- If any archaeological material or human burials are uncovered during the course of development then 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.

8. **Author/s and Date**

Heritage Impact Assessment: Jayson Orton, ASHA Consulting (Pty) Ltd, 21 February 2017

Heritage scoping study: J. van Schalkwyk, July 2015

Paleontological specialist study: M. Bamford, NGT Consulting, 28 April 2016

Visual specialist study: G. Griesel, Axis Landscape Architects cc, March 2014

Visual specialist study addendum: G. Griesel, Axis Landscape Architects cc, July 2015

Glossary

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

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

Hand-axe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age.

Holocene: The geological period spanning the last approximately 10-12 000 years.

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

Later 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.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

CCS: Crypto-crystalline silica

CRM: Cultural Resources Management

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

HWC: Heritage Western Cape

LSA: Later Stone Age

MA: Million years ago

MSA: Middle Stone Age

NBKB:Ngwao-Boswa Ya Kapa Bokoni

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

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

NID: Notification of Intent to Develop

PHS: Provincial Heritage Site

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

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1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Mokgope Consulting CC to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed construction of a 765 kV power line extending between the Helios Substation located some 50 km north of Loeriesfontein in Northern Cape and the Juno Substation near Vredendal in Western Cape (Figure 1). The Helios and Juno Substations would also be upgraded as part of the project. The end points of the project are as follows:

- Helios Substation: S30° 29' 50" E19° 33' 45".
- Juno Substation: S 31° 36' 30" E18° 26' 50"

The transmission line would cross a very large number of farms. A list of these farms has not yet been compiled because it is not yet known which alignment will be chosen. Once the impact assessment has been completed and a final alignment chosen, the farms will be identified and the land owners notified.

1.1. Project description

1.1.1. Transmission lines

ESKOM proposes to construct a 765 kV transmission line stretching between the Juno and Helios Substations. The transmission line would be some 175 km long and would require an 80 m wide servitude. The pylons would be spaced up to 500 m apart but may be closer depending on local factors such as topography, slope or bends in the line. Various types of pylons ranging between 35 m and 55 m high may be used. Their footprints range in size from 14.5 m x 14.5 m up to 40.8 m x 52.1 m. The various pylon options include the V-shaped tower with supporting cables and the four-footed self-supporting towers.

An access and service road would be constructed beneath the power line. It is likely that the majority of the access road would be created simply by the construction vehicles driving over the surface with the use of machinery to grade the road being restricted to small sections where the surface requires this. Where possible, existing roads will be used.

Three corridors of 2 km width have been identified for assessment such that deviations around sensitive areas can be accommodated. The final corridor and final alignment within that corridor have yet to be identified. While three primary corridors have been identified, there are also a number of deviations to avoid specific areas or to link two alternatives (Figure 2).

1.1.2. Substations

Both substations will require upgrades and expansions as part of the project in order to accommodate additional transmission capacity. The new areas to be included in the substations are 17 ha at Helios and 9 ha at Juno. The upgrade work will include the following:

- Construct a 765kV power line to connect to the substations;
- Include a 765kV yard at the substations;
- Include a 765kV busbar at the substations;

- Include a 2 x 765/400kV transformers at the substations;
- Extend the 400kV yard at the substations; and
- Extend the 400kV busbars at the substations.



Figure 1: Map showing the location of the study area which extends in an approximately direct corridor between the Juno Substation in the southwest (green star) to the Helios Substation in the northeast (purple star). See Figure 2 for alternative corridor details.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant since excavations for pylon foundations and the construction of access roads may impact on archaeological and/or palaeontological remains, while the pylons themselves create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.



Figure 2: Aerial view of the study area showing the proposed alternative alignments: BLUE = Alternative 1; PINK = Alternative 2; GREEN = Alternative 3; YELLOW, PURPLE & RED = deviation options.

1.2. Terms of reference

ASHA Consulting was requested to compile an integrated Heritage Impact Assessment (HIA) that would meet the requirements of the heritage resources authorities which include Heritage Western Cape (HWC), Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape, NBKB) and the South African Heritage resources Agency (SAHRA).

A heritage scoping report was submitted to SAHRA for consideration. SAHRA issued an Interim Comment requesting that¹:

- A Palaeontological Desktop/Scoping Study must be completed for each preferred power line route and submitted before final comments can be issued;
- A Heritage Visual Impact Assessment must be completed for the Perseus – Kronos route preferred route 1A prior to construction and submitted to SAHRA for comment;
- Walk-downs of all preferred routes must be completed by a qualified archaeologists and palaeontologist prior to construction. Sites for contractor's camps and laydown yards must also be included in the Walk-Down reports. These Walk-Down reports must be submitted to SAHRA prior to construction for comments;
- A 50 m buffer zone must be maintained from any identified heritage resources with regards to any of the activities described in the Draft EIRs;
- Should any evidence of archaeological remains and paleontology be uncovered during the construction phase, an archaeologist or a palaeontologist, according to the nature of the finds, must be called to site to inspect the findings. The SAHRA APM unit (Natasha Higgitt/Phillip Hine 021 462 4502) must be alerted immediately, should the newly discovered heritage resources prove to be of archaeological or palaeontological significance. A Phase 2 rescue operation may be necessary, for which a permit must be applied. Heritage Western Cape must be notified of any identified heritage resources uncovered in the Western Cape Province.

A Notification of Intent to Develop (NID) was submitted to HWC for their consideration. They responded with the following comment:

Heritage Western Cape is in receipt of your application for the above matter received on 12 August 2016. This matter was discussed at the Heritage Officers meeting held on 19 August 2016.

You are hereby notified that, since there is reason to believe that the proposed electrical transmission line will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of section 38(3) of the NHRA be submitted. This HIA must have specific reference to the following:

- Impacts to archaeological heritage resources
- Visual impacts of the proposed development in relation to the cultural landscape.

The required HIA must have an integrated set of recommendations.

The comments of relevant registered conservation bodies and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

It should also be noted, however, that following S.38(3) of the National Heritage Resources Act (No. 25 of 1999), even though certain specialist studies may be specifically requested, all heritage resources should be identified and assessed.

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 Environmental Affairs 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

¹Note that most of these SAHRA requirements cannot be met pre-authorisation.

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”; andd) “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”; orb) “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 National Department of Environmental Affairs.

3. METHODS

3.1. Literature survey and information sources

This HIA was conducted from the desktop some time after completion of the various specialist studies. As such, some information was drawn from the available reports, while the majority was from the present author’s professional experience within the study area. Photographs of heritage resources are by the author except where cited otherwise.

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 maps were sourced from the Chief Directorate: National Geo-Spatial Information.

3.2. Field survey

No field survey was carried out by the present author. However, it is noted that the author of the scoping HIA (Van Schalkwyk 2015) did conduct fieldwork; he drove around the roads in the study area for five days in May 2013 but stated in his report that he was not able to access the land on which the power line would be constructed. The season of the survey is irrelevant because no field walking was carried out. As such, the present HIA is essentially a desktop-based assessment.

3.3. Specialist studies

The following heritage-related studies have been carried out as part of this project and incorporated into the present HIA:

- A scoping HIA was compiled by Van Schalkwyk (2015; see Appendix 2) in July 2015;
- A palaeontological study was conducted by Bamford (2016; see Appendix 3) in April 2016; and
- A visual study was conducted by Griesel (2014; see Appendix 4) in March 2014 with an addendum added in July 2015 (Griesel 2015; see Appendix 5).

HWC requested specialist archaeological input and this is contributed by the present author within the body of the HIA. The other studies as listed above are appended (Appendices 2 to 5).

3.4. Impact assessment

For consistency, the impact assessment was conducted through application of a scale supplied by Mokgope Consulting.

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.

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. Heritage Western Cape (2016), however, uses a system in which resources of local significance are divided into Grade IIIA, IIIB and IIIC. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are referred to as Not Conservation Worthy (NCW).

SAHRA (2007) has formulated its own system² for use in provinces where it has commenting authority (including Northern Cape). In this system sites of high local significance are given Grade IIIA (with the implication that 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).

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. However, the draft HIA was submitted to relevant interested and affected parties as required by HWC in their response to the NID application.

3.7. Assumptions and limitations

This study was compiled from the desktop with no field survey. Ground truthing all alignments comprehensively would be an enormous task and, because it is assumed that no very highly significant above-ground heritage resources (i.e. Grade II or Grade I) will be located within very close proximity of the alignments it is deemed appropriate that a ground survey be delayed until just before construction. However, the author has extensive field experience in the northernmost and southernmost parts of the study area and in western South Africa in general. It is assumed that generally established patterns will hold true and that predictions related to the distribution of archaeological and other heritage resources will be reliable.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The study area is largely undeveloped rural land used for livestock grazing. A large substation occurs at either end of the corridors and an existing 400 kV transmission line already runs between these substations largely following Alternative 1 of the present project, except in the far northeast where it follows Alternative 2 for the last approximately 28 km. In the far south, near the Juno Substation other activities include vineyards and vegetable farming as well as a single small solar energy facility. The vicinity of the Helios Substation in the northeast has become a target area for renewable energy developments; two wind energy facilities are currently under construction, while another and a solar energy facility have been authorised. In the southern half of the study area a large number of properties are part of the 85 500 ha Knersvlakte Nature Reserve under the management of CapeNature. The reserve protects a large section of the Succulent Karoo region, an internationally significant biodiversity hotspot (CapeNature 2014).

²The system is intended for use on archaeological and palaeontological sites only.

4.2. Site description

No photographs of the study area were provided by Van Schalkwyk (2015) but Griesel (2014) provides a good range of pictures with which to characterise the landscape. The reader is referred to Griesel (2014: 13-21) as presented in Appendix 4.

The following brief description of the study area progresses from southwest to northeast along the proposed alignments. In the vicinity of Vredendal the landscape is comprised of flat plains with the topography largely related to the Olifants, Hol, Varsche and Sout Rivers that traverse the area. Away from the rivers the plains of the Knersvlakte stretch towards the northeast until the edge of the escarpment which, in the vicinity of the proposed power line corridors, is far less pronounced than it is further to the south. Above the escarpment the corridors once again traverse relatively flat plains, although rocky hills and drainage lines occur in places.

5. HERITAGE CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. Because the study was carried out from the desktop, this section forms the baseline against which the impact assessment can be conducted. Van Schalkwyk (2015) reviewed much of the western half of South Africa but the present review shall limit itself to the study area and its immediate surrounds. The review begins in the southwest with the Knersvlakte then proceeds to the northeast into southern Bushmanland.

5.1. Archaeological aspects

The well-researched southern part of the Knersvlakte is characterised by two vegetation types: Namaqualand Spinescent Grassland and Vanrhynsdorp Gannabosveld (Mucina *et al.* 2010). This is important because archaeological remains are virtually completely absent from the surface in the Grassland areas, while the Gannabosveld areas reveal frequent archaeological resources. The difference is that the grassland occurs in areas of thick sand cover and there is no doubt that the harder surface that supports the Gannabosveld, and on which one finds many artefacts extends beneath the sand cover. The last 21 km of Alternative 1 and a 7 km section of Alternative 3 just north of the Hol River traverse Spinescent Grassland areas and are thus of very low sensitivity.

The Gannabosveld areas, by contrast, are erosional surfaces where artefacts have been revealed and concentrated. A number of examples are on record from the immediate vicinity of the present corridors (e.g. Kaplan, 2010; Orton 2010, 2011, 2012a). The material found dates to the Early Stone Age (ESA), Middle Stone Age (MSA) and Late Stone Age (LSA). In one case within the Alternative 3 corridor (Site A in Figure 3) artefacts were found to be embedded within heuweltjies (ancient termite mounds). The relationship between the artefacts and these mounds which are common in the Gannabosveld areas is as yet unknown (Orton 2011).

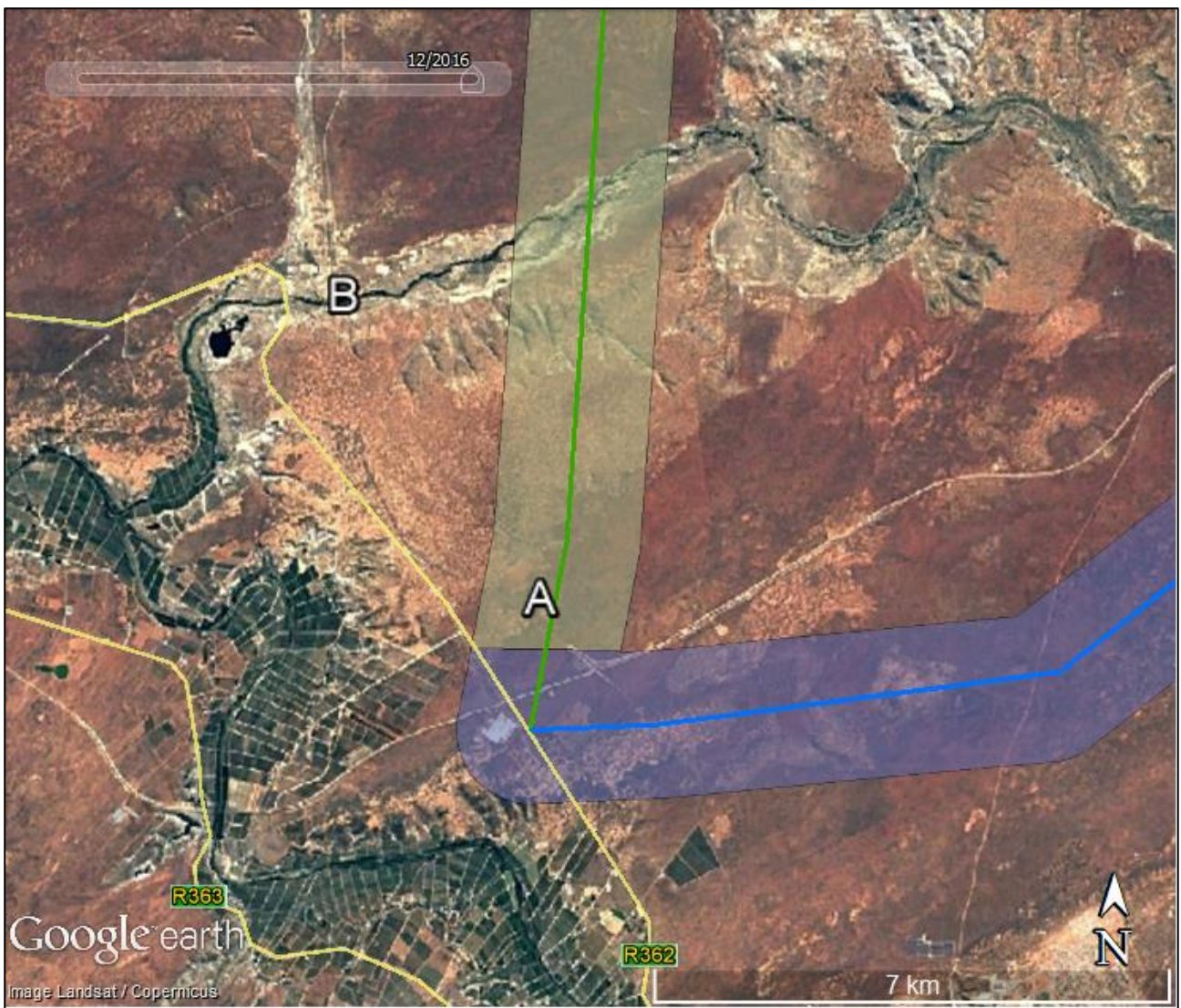


Figure 3: Aerial view of the vicinity of the Juno Substation showing localities mentioned in the text (marked A to B).

Areas where rivers are crossed may be more sensitive since erosion is often enhanced. Examples include an area along the Hol River just before it meets the Olifants River where artefacts were commonly encountered on the floodplain (Site B in Figure 3). These included a very unusual ground stone point (Orton & Hart 2011). Many other examples occur along the margins of the Varsche River. Just before its confluence with the Hol River there is an important site located within the Alternative 2 and Alternative 1H corridors (Site C in Figure 4). This site revealed a rich collection of bifacial points attributable to the 'Still Bay' phase of the MSA as well as a scattering of LSA material that included pottery (Mackay *et al.* 2010). Further upstream and within the same two corridors is a very large LSA scatter that contains materials that range in age from the mid-Holocene (perhaps some 5000 years ago) to within the last 1000 years (Site D on Figure 4). The site is extremely unusual in the Knersvlakte for its incredible richness and includes stone artefacts, ostrich eggshell fragments and beads, marine shells, animal bones (including a tortoise burial) and much pottery (Orton 2012b, 2012c). Just upstream and still within the same two Alternative corridors is an eroding area where a large number of ESA artefacts have been exposed including a number of hand-axes (own data; Site E on Figure 4).

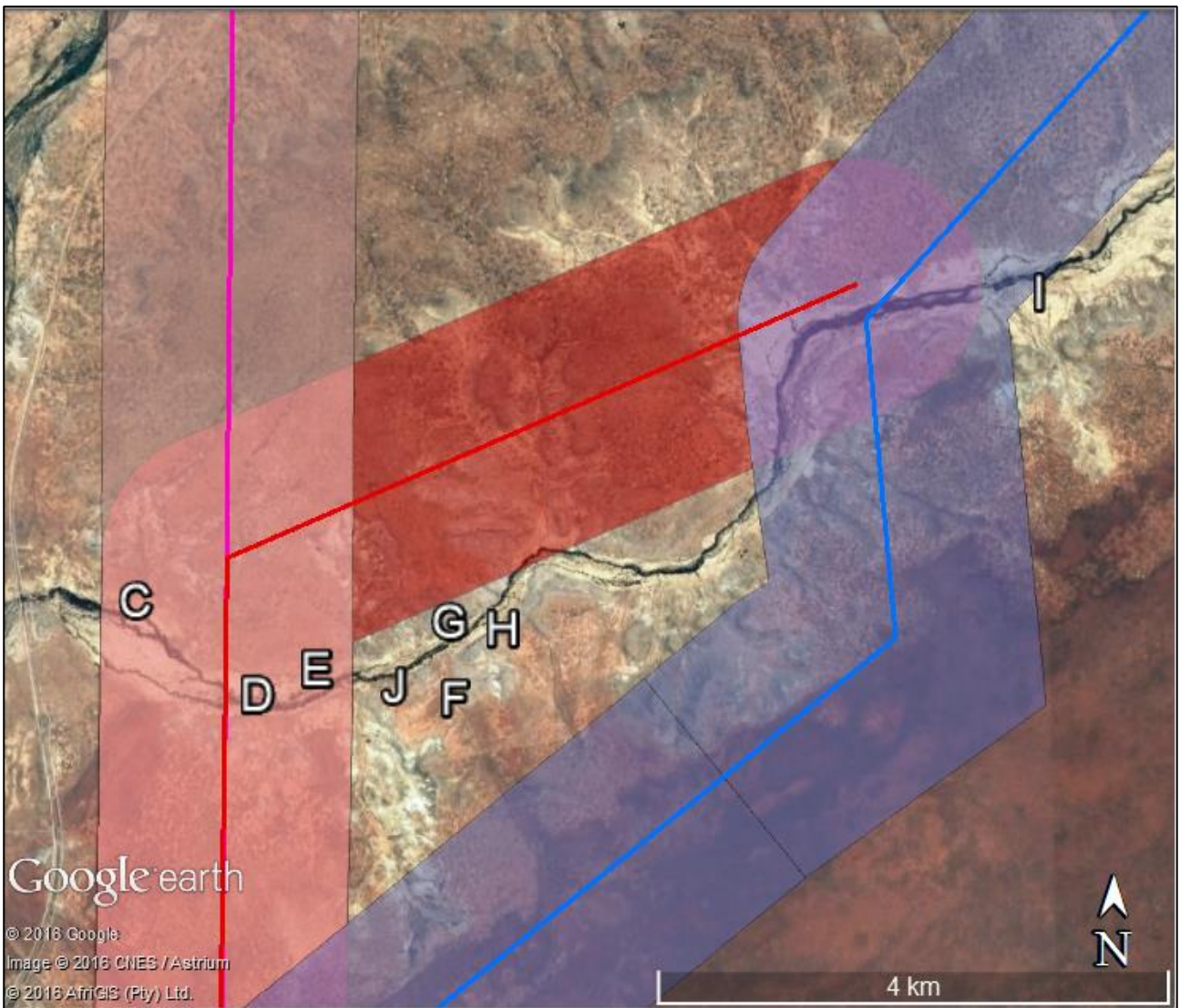


Figure 4: Aerial view of the vicinity of the Varsche River showing localities mentioned in the text (marked C to J).

The vicinity of the Varsche River is notable not only for the very high density of archaeological sites on record along its southern margin (own data), but also because in one area the river has carved a channel right through the centre of a large limestone outcrop (Figure 5). Several rock shelters have formed along the margins of the river and excavations at these sites have yielded very important archaeological data. Two of them, Reception Shelter and Buzz Shelter (Sites F & G in Figure 4), have between them provided an archaeological sequence for much of the latter half of the Holocene (Orton *et al.* 2011a; Orton 2012c), while nearby VR003 (Site H on Figure 4) has revealed a deep LSA and MSA sequence (Steele *et al.* 2012, 2016). All three of the latter sites fall just outside of the proposed corridors. Further upstream along the Varsche River and just on the margin of Alternative 1 are two intriguing open sites (Site I in Figure 4) that have MSA and/or LSA artefacts associated with what appear to be land snail middens (Orton *et al.* 2011b; Figure 6). If confirmed to be anthropogenic middens, they would be of great scientific value.

Also along the Varsche River (and on the eponymous farm) is an historical archaeological site comprised of a mud brick house ruin, a circular stone storage building (*kafhok*), a threshing floor (Figure 7) and the foundations of one or two other structures (Site J in Figure 4).



Figure 5: View towards the east along the Varsche River showing the limestone cliffs. The positions of Reception Shelter (yellow arrow) and Buzz Shelter (red arrow) are indicated. Alternative 1H would run along the skyline on the left hand side of the photograph [25 January 2008].



Figure 6: View of a potential MSA snail midden along the southern bank of the Varsche River [25 January 2008].



Figure 7: Threshing floor along the southern bank of the Varsche River [30 June 2014].

Following the Alternative 2 corridor towards the northeast one reaches the N7. To the east of the N7 in this area are many archaeological sites and occurrences that include large numbers of LSA and MSA artefacts as well as historical remains. Site K in Figure 8 marks the location of a historical ruin with an associated ash and bone midden which is located close to a spring along the Geelbeks River, a tributary of the Sout River (Figure 9). Sites L to P mark a selection of the more important MSA and LSA sites that occur in this area. There are a total of 53 sites on record in this area (own data). All of these sites fall within the Alternative 2 alignment.

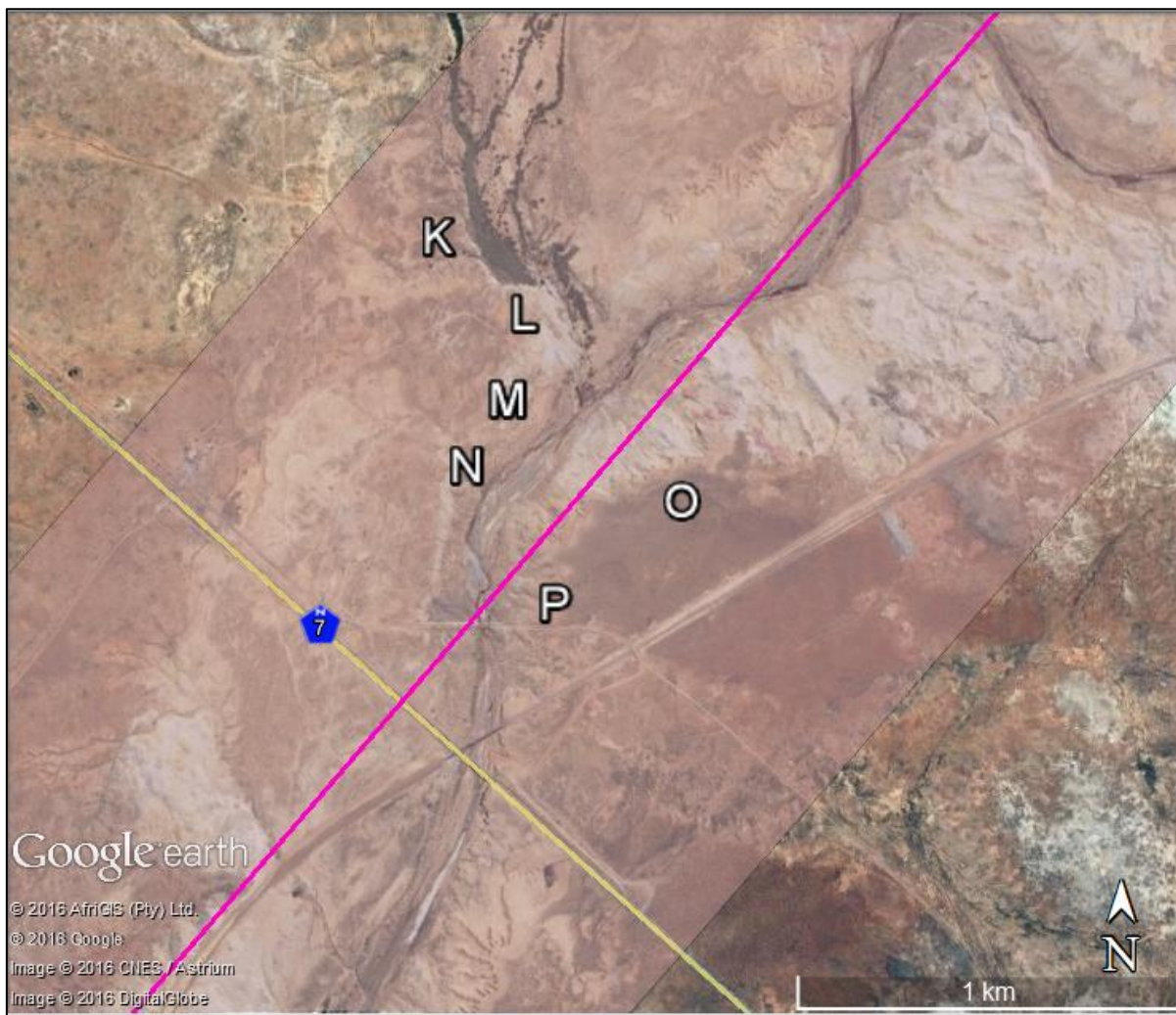


Figure 8: Aerial view of the vicinity where the Sout River, the N7 and the Sishen-Saldanha Railway cross one another showing localities mentioned in the text (marked K to P).



Figure 9: View towards the south of the historical ruin on the farm Quaggaskop. The location of the bone midden is arrowed [7 November 2007].

Moving to the north, the Alternative 3 corridor just skirts the south-eastern end of a small mountain alongside the N7 road at the north-western edge of the Knersvlakte. One of the valleys in this mountain houses a geometric rock art site (Orton 2013; Site Q in Figure 10; Figure 11). Such sites are very rare in Namaqualand and this is the only known painted example located outside of the granite hills and below the escarpment. At the foot of the same valley is an LSA stone artefact scatter (Site R in Figure 10). Both are just outside of the Alternative 3 corridor. Another geometric rock art site, this time engraved, occurs at Ratelgat further to the south (Deacon 2014) and will not be affected by any of the proposed corridors. In the northern part of the Knersvlakte Kaplan (2014) located many archaeological resources including widespread MSA artefacts, occasional ESA artefacts and a well-preserved, *in situ* LSA site. Although located 11 km outside of the Alternative 3 corridor, this survey is mentioned for the large amount of material found and the seemingly strong relationship between many of the sites and the stream bed that passes through the area.

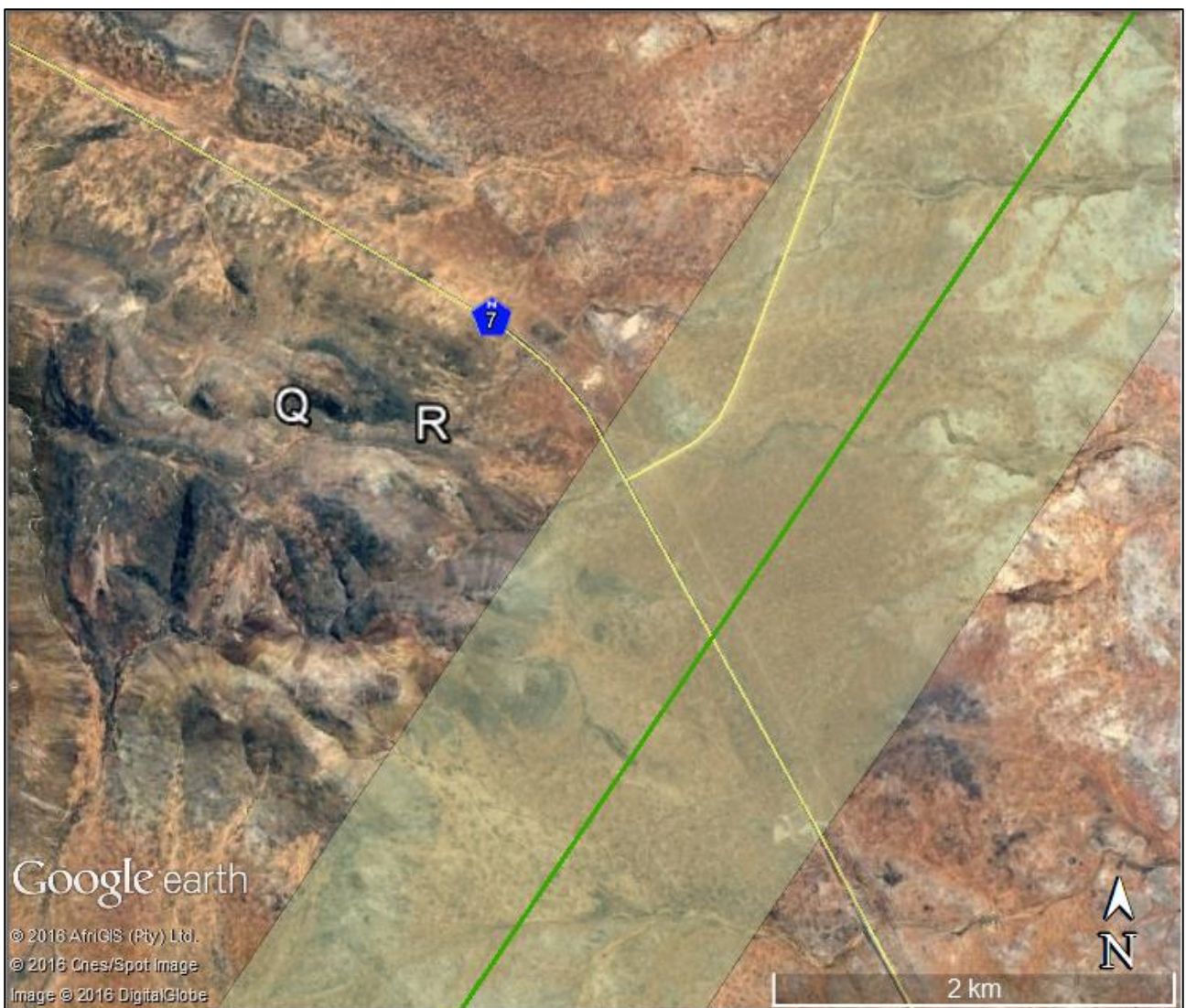


Figure 10: Aerial view of the vicinity of the area southwest of Nuwerus showing localities mentioned in the text (marked Q to R).



Figure 11: One of the painted panels at the rock art site to the southeast of Nuwerus [14 September 2013].

The remainder of the Knersvlakte is an unknown, but it is likely that archaeological material will be present throughout. As already noted, eroding areas with exposed hard surfaces and the margins of rivers are likely to have accumulated deflated archaeological material. Figure 12 shows a part of the study area where the Sout River leaves the escarpment and that may well be very sensitive in this regard.

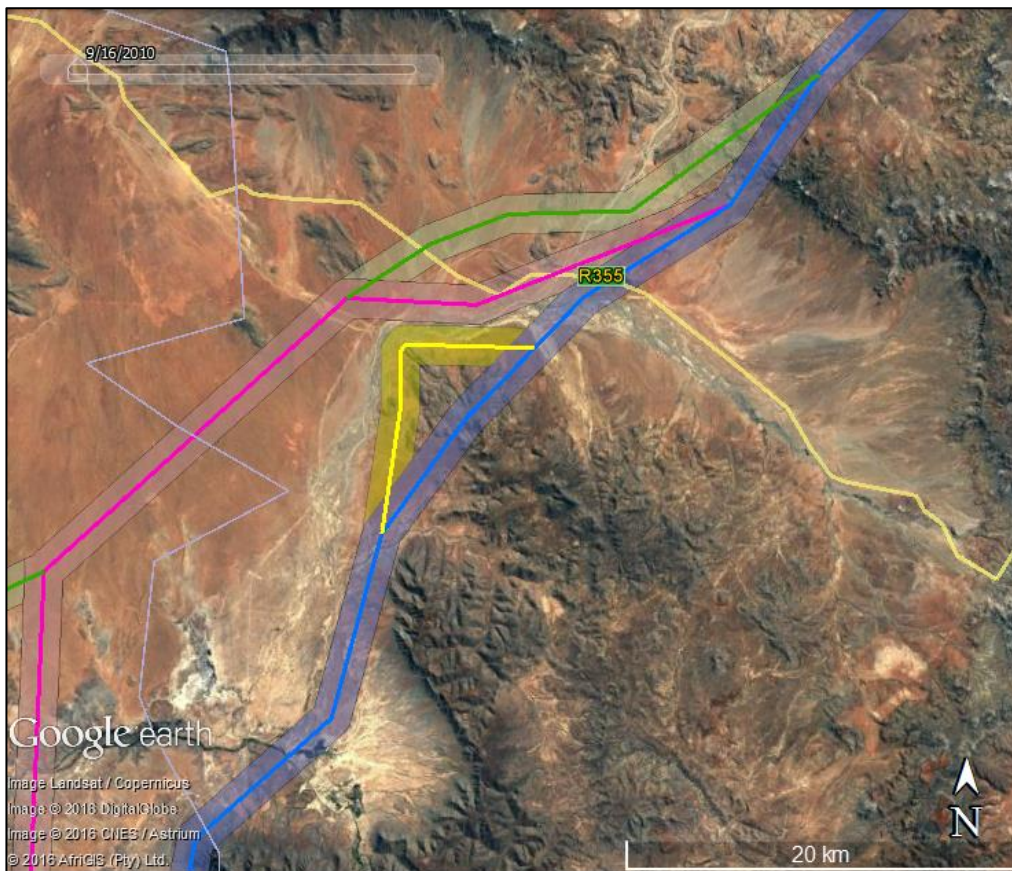


Figure 12: Aerial view of the area at the edge of the escarpment where the various alternative corridors cross the Sout River and some of its tributaries. The pale blue zig-zag line at left is the provincial boundary.

The only other part of the study area that is reasonably well understood is the vicinity of the Helios Substation in southern Bushmanland where a number of impact assessment studies have been carried out for electrical developments. Beaumont *et al.* (1995:240) have stated that “Thousands of square kilometres of Bushmanland are covered by a low density lithic scatter”. Although this is often true in many areas, such scatter is more prevalent further north of the present study area. Nevertheless artefacts dating to the ESA, MSA and LSA have been reported as part of the local background scatter, although the ESA seems to be the most poorly represented of the three with most artefacts being Pleistocene-aged. Background scatter material seems to be highly variably distributed (Orton 2017a, 2017b). The same applies to archaeological sites with, for example, Webley and Halkett (2012) reporting many good Stone Age sites and Fourie (2011) and Van der Walt (2012) finding nothing at all. Interestingly, studies of areas close to the Helios Substation tend to produce only a few sites, while the survey that recorded many sites was located some 10-13 km to the south (Webley & Halkett 2012).

The over-riding pattern in the area seems to be that Stone Age sites are located on hilltops or close to stream beds. Van Schalkwyk (2011), Webley and Halkett (2012) and Orton (2014) all found this to hold true. Widespread but low density MSA artefacts forming part of the background scatter were also reported, along with occasional concentrations. Webley and Halkett (2012) noted that the sites mostly just had stone artefacts and ostrich eggshell, but also reported one with pottery and a bead. They found another site, located close to a stream bed, which had a number of grooved grindstones on it. Some of the sites recorded by Webley & Halkett (2012) were of high quality and many seemed worthy of at least some mitigation. Figure 13 shows the distribution of these sites, with the three most significant ones labelled S, T and U.

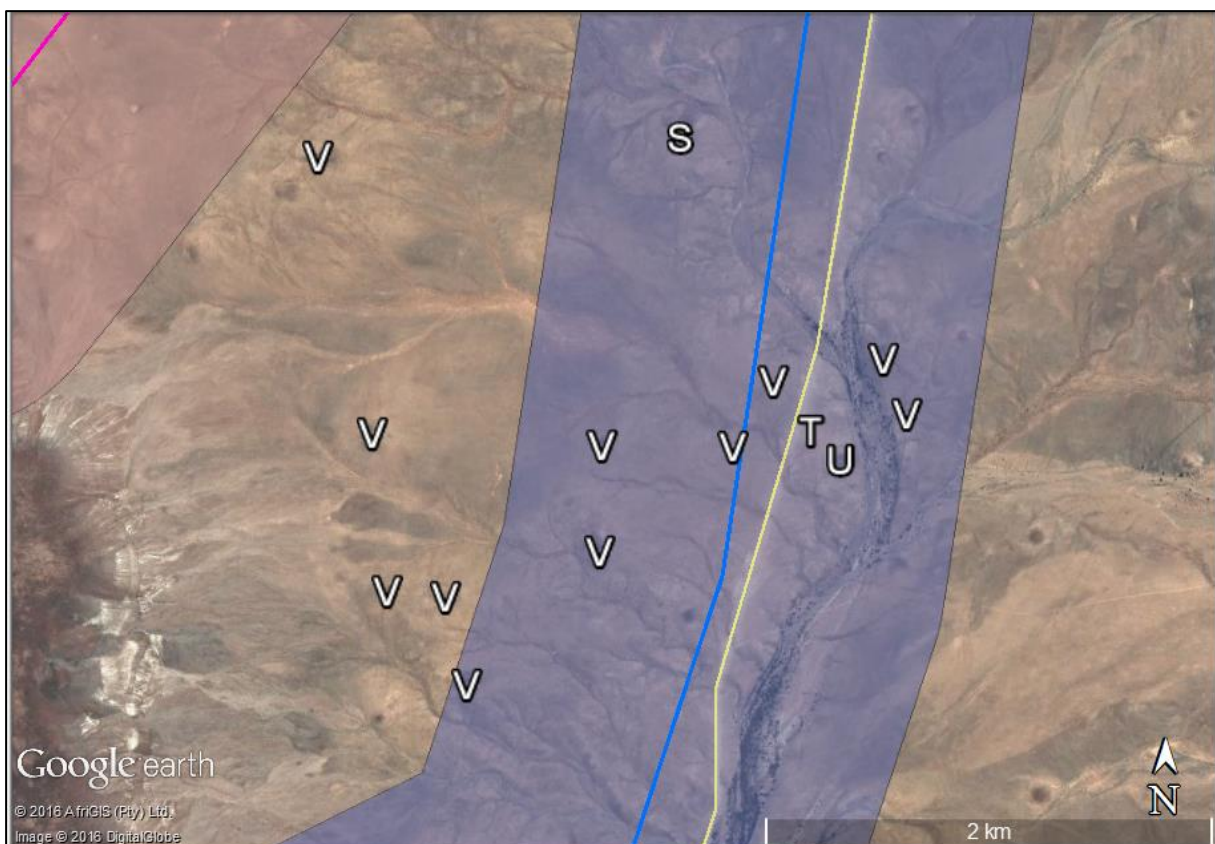


Figure 13: Aerial view of an area some 10-13 km south of the Helios Substation showing important Stone Age archaeological sites (labelled S to U) and other mitigation-worthy sites (all labelled V).

Closer to the Helios Substation a number of other mitigation-worthy sites have been recorded (Orton 2014; 2017a, 2017b). Figure 14 shows the distribution of these sites. Once more they are focused on hilltops and along the Klein Rooiberg River that runs through the area. Pottery was only seen on one of these sites (W in Figure 14); it also had a backed bladelet in crypto-crystalline silica (CCS). Along the river an extensive scatter of CCS artefacts was accompanied by much ostrich eggshell (Figures 15 & 16). Other surveys have yielded only low density scatters of stone artefacts of varying age (Kaplan 2008; D. Morris 2007, 2013).

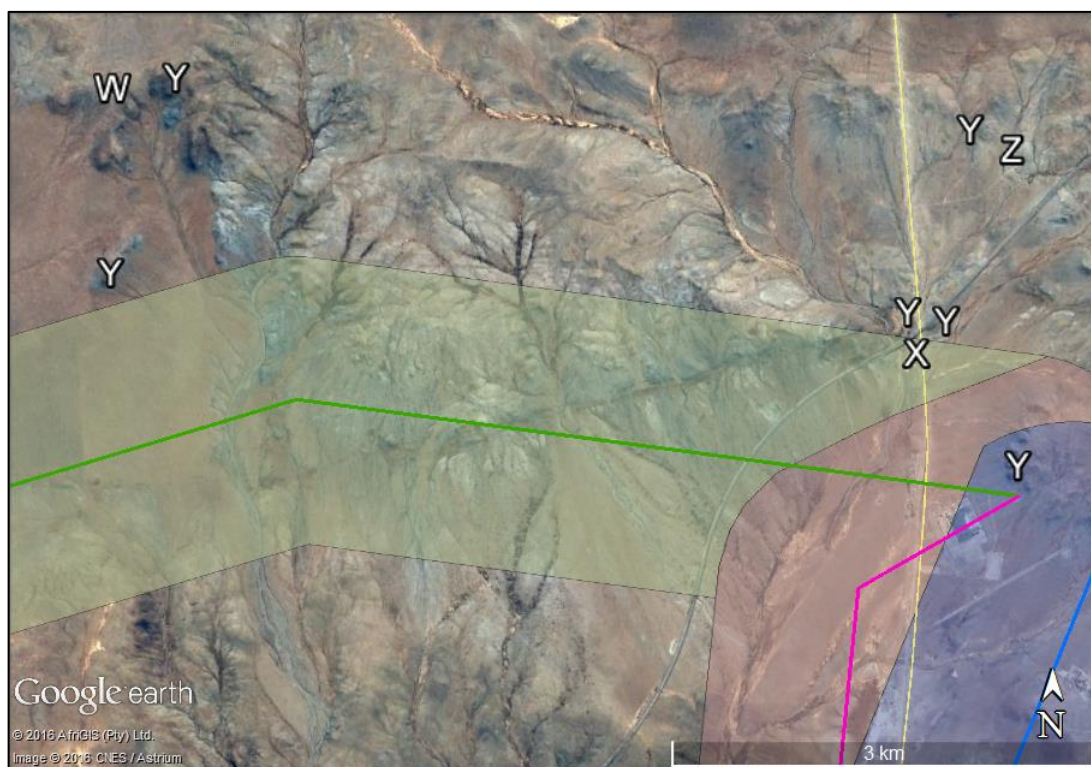


Figure 14: Aerial view of the area around the Helios Substation showing two important archaeological sites (labelled W & X) and other mitigation-worthy sites (all labelled Y). An historic ash midden lies at the point marked Z.



Figure 15: The location of the site marked X in Figure 14. The site is on the side of a hill. The Sishen-Saldanha Railway is visible [30 January 2014].



Figure 16: CCS artefacts and fragments of ostrich eggshell from the site marked X in Figure 14. Scale in cm [30 January 2014].

A local farmer told Fourie (2011) that rock art and engravings do occur in the area and also mentioned an ostrich eggshell flask cache that had been found on his farm. These finds all date to the LSA. Ostrich egg caches have been reported from various parts of western South Africa (Henderson 2002; Jerardino *et al.* 2009; D. Morris 1994; Morris & Von Bezing 1996; Parkington 2006) and 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.

Historical archaeological material seems to be rare in the general landscape in this area and seems to be no older than the very late 19th century (e.g. Orton 2017a; Webley & Halkett 2012). One house is reported to have an ash midden associated with it (labelled Z in Figure 14), but most of the materials on it were 20th century in age (Orton 2014, 2017a).

5.2. Palaeontology

The oldest geology in the region is granite bedrock of the Namaqua Metamorphic Province that occurs in the far north-eastern part of the study area and is entirely unfossiliferous. Sediments of the Nama and Vanrhynsdorp Groups cover much of the study area. These sediments are listed by Bamford (2016) as late Proterozoic (770-550 million years ago (MA)) in age and by Almond and Pether (2009) as latest Proterozoic/early Cambrian (550-540 MA). According to Almond and Pether (2009), these sediments are very highly sensitive in terms of palaeontology with the Vanrhynsdorp Group in particular containing prolific trace fossils. They note the Vanrhynsdorp Group to be important for trace and body fossils spanning the Precambrian/Cambrian boundary, while the position of lenticular carbonate groups containing large columnar stromatolites is uncertain. The Nama Group they state contains abundant but low diversity trace fossils, small stromatolites and shelly invertebrates.

Some Dwyka Group sediments also occur to the southwest of the Helios Substation. These are part of the Karoo Supergroup and are from the late Carboniferous to Early Permian (320-290 MA). According to Almond and Pether (2009) they contain trace fossils, organic-walled microfossils, rare marine invertebrates (e.g. molluscs), fish and vascular plants but are of low sensitivity. Bamford (2016) also notes the presence of fossil pollens and spores, as well as arthropod and fish trackways.

Bamford (2016) lists the Whitehill and Tierberg Formations of the Ecca Group as also occurring within the study area but notes that relatively few fossils have been found in them. Almond and Pether (2009) note the Whitehill to be highly sensitive and the Tierberg moderately sensitive. They list a variety of fossils that are known to be present in these formations. In the north-eastern part of the study area (not included in the geological map in Bamford 2016: fig.2) there are many dolerite outcrops that are entirely unfossiliferous and that have thermally metamorphosed the surrounding Ecca mudrocks. Almond (2016a, 2016b) only located low diversity trace fossils in these Ecca rocks that he considers to be of very little scientific value.

Overlying the rocks are Quaternary sediments that generally are not fossiliferous but can preserve fossils in areas associated with ancient water courses, pans and river gravel deposits. Almond (2016a, 2016b) examined many areas of these sediments in an area to the west of the Helios substation and found nothing of concern.

5.3. Historical aspects, the built environment and the cultural landscape

The Knersvlakte was always a very inhospitable landscape that was, as far as possible, avoided during historical times. Occupation of the region proceeded from the Olifants River on the southern edge of the Knersvlakte directly into the Hantam area (Nieuwoudtville and Loeriesfontein area) and the Kamiesberg Mountains of central Namaqualand. Because of the difficulties of farming in the Knersvlakte historical farmsteads are few and far between. Many farms have no buildings at all and were only – and still are – used as grazing farms. The ruined farmsteads on Varsche Rivier and Quaggaskop (see above) are certainly unusual. Few other land uses have ever occurred throughout much of the study area, although the farm Quaggaskop (where the Alternative 2 alignment crosses the N7) was subjected to small-scale diamond mining during the mid-20th century. Occasional old cultivated lands are evident on aerial photography but they are likely to be relatively recent. Figure 17 shows a section along Alternative 2 in which it is clear that there was no cultivation present in 1951. A marble mine is evident at that time though. They no doubt date back to times when there was more rainfall and the area was better watered.

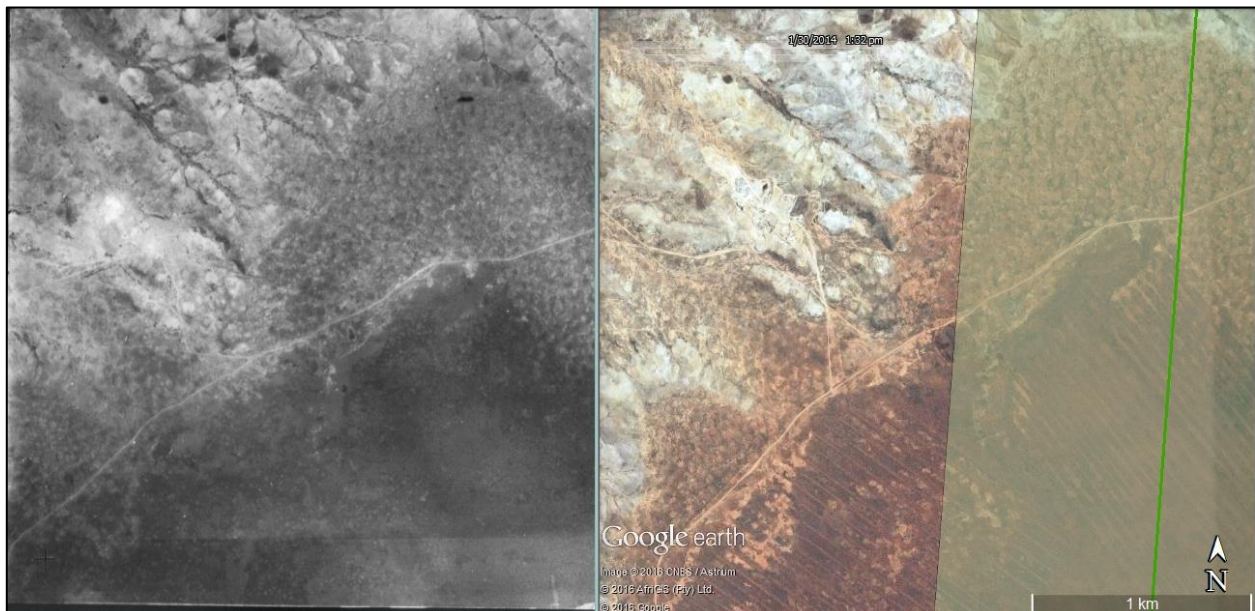


Figure 17: Comparative aerial views from 1951 (left) and 2016 (right; sourced from Google Earth) of a section of the Knersvlakte to the north of the Hol River where old cultivated lands are evident. A marble mine is present just left of centre in both views.

In the study area and elsewhere in the Karoo to the east, there is an important vernacular architectural tradition that is represented by an ever-decreasing number of structures (e.g. Figure 18). These are the so-called 'brakdak' buildings which have roofs that were plastered with mud for lack of better roofing materials. Other vernacular flat-roofed buildings, especially those referred to as Karoostyle (Marincowitz 2006) were roofed with corrugated iron, although it is quite possible that some may have started out as brakdak houses. Figure 19 shows a Karoostyle house that lies just north of the Helios Substation at 'Z' in Figure 14. Other structures like historic roads and bridges are also of concern. The only example known to the present author is the old road bridge over the Sout River in the central Knersvlakte on the farm Quaggaskop (Figure 20). Figure 21 shows that this bridge and its associated road pre-date 1951 and are thus generally protected. The bridge may even pre-date 1927 when Mossop (1927) shows the Sout River crossing in what appears to be the same position and at the same angle.

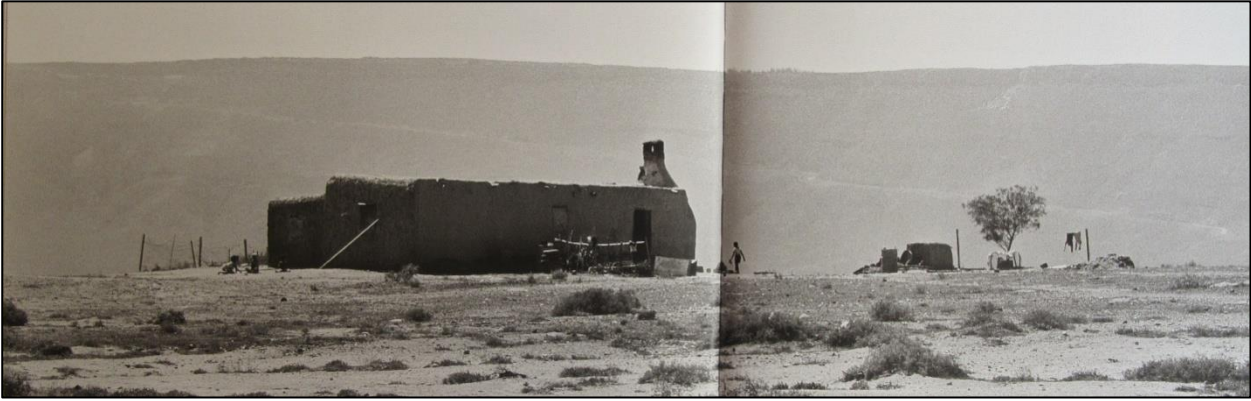


Figure 18: View of a brakdak house taken by Fagan (2008: 100-101) in the early 1960s. The Vanrhynsdorp Pass is faintly visible in the background rising from right to left which means that this structure would be some kilometres to the southeast of Alternative 1.



Figure 19: View of a Karoo-style house located just north of the Helios Substation (Z in Figure 14) [30 January 2014].



Figure 20: View of the old single-span road bridge over the Sout River [4 February 2008].



Figure 21: Early 20th century map showing the current road to the north as at 1927 (double solid lines). Earlier routes are marked by double dashed lines further to the west. Source: Mossop (1927: opp. page 116).

From the above review it is clear that there are relatively few historical traces on the landscape of the study area that contribute to the cultural landscape. However, the Knersvlakte is certainly regarded as a pre-colonial cultural landscape because of the vast quantities of stone artefacts that are present in some areas and are probably buried beneath the cover sands in other areas. Following Orton (in press), the Knersvlakte can be regarded as a Type 4 pre-colonial cultural landscape in which the multitude of archaeological artefacts and occurrences cannot easily be separated into individual sites.

The farm known as Ratelgat is mapped by Winter & Oberholzer (2013) as a cultural landscape of Grade II significance (although note that it is incorrectly located in their report). Part of the farm that houses a memorial to the Griqua prophet A.A.S. le Fleur, who lived there and died in 1941, and the grave of his grandson Paramount Chief A.A.S. le Fleur, who died and was buried there in 2004, is a Provincial Heritage Site (PHS). This landscape lies between the Alternative 2 and 3 corridors (Figure 22) and is also home to some rock engravings as noted above.

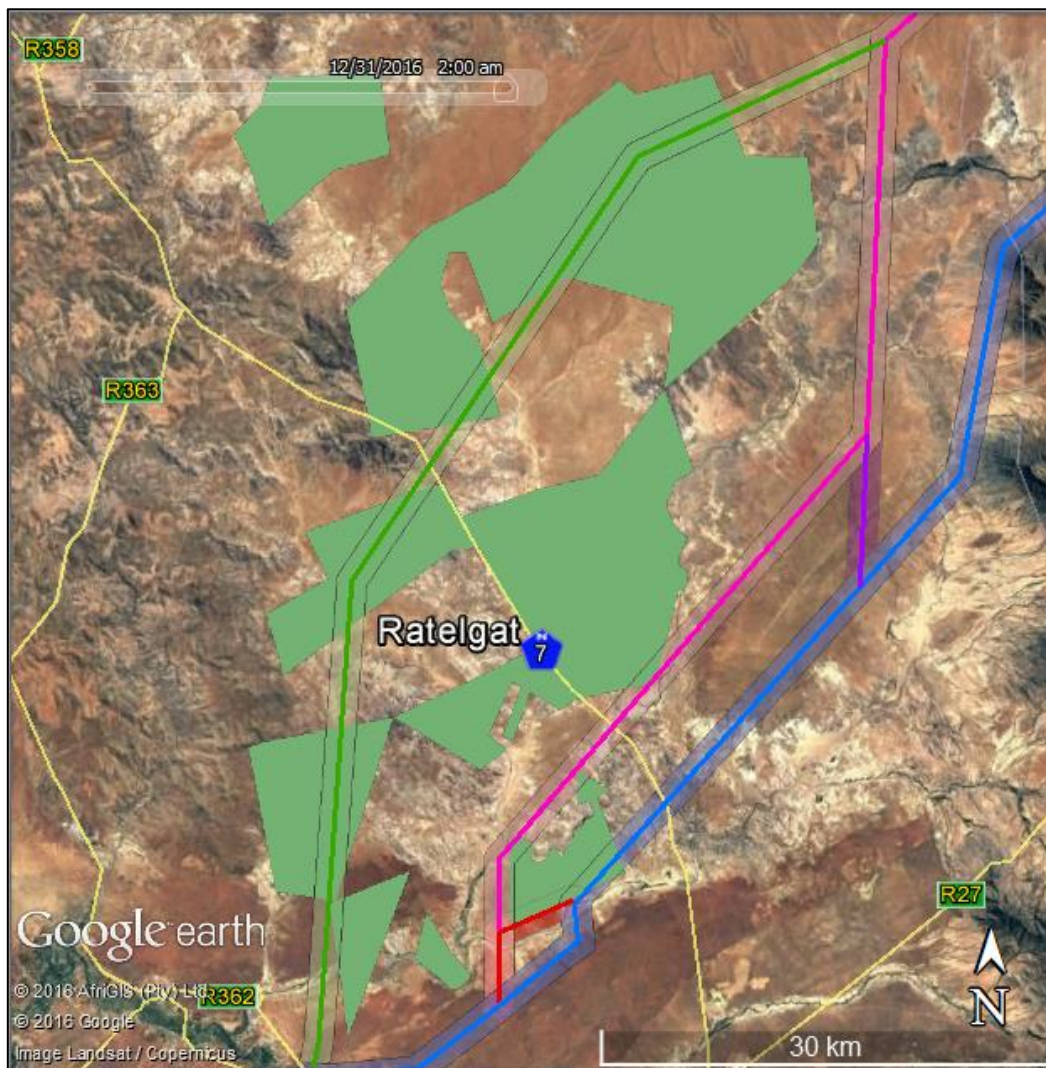


Figure 22: Aerial view of the Knersvlakte showing the land currently protected in the Knersvlakte Nature Reserve (green shading) relative to the various route alternatives. The Griqua farm Ratelgat is also indicated.

Of course the NHRA also defines scientific value as cultural value. The Knersvlakte has very high scientific value for its botanical diversity and large parts of it have been protected in the Knersvlakte Nature Reserve for this very reason (Figure 22). This botanical heritage thus constitutes a type of cultural landscape that is crossed by the various alternative corridors, but especially Alternative 3.

The escarpment is an important scenic resource in the region. Winter and Oberholzer (2013), who only mapped Western Cape scenic resources, considered the escarpment to be of Grade III significance and this can certainly be extrapolated further north to the area where the proposed transmission line would mount the escarpment. They do not discuss the Knersvlakte as a vast, empty, arid landscape which, to some people, has very high aesthetic value for its scenic beauty.

5.4. Graves and graveyards

Unmarked pre-colonial graves can occur almost anywhere in the landscape, although very few have ever been reported from the general vicinity of the present study area (A. Morris 1992). The

locations of such graves cannot be predicted and they can only be dealt with if found accidentally. Formal burials connected with farms, either the farmers' families or the graves of workers, occur in association with various farmsteads in the area. Although no graveyards are known by the present author in close proximity to the proposed alternative power line routes, there are almost certain to be a number of graves located in the study area.

5.5. Scenic routes

Two scenic routes – the N7 and the R27 – are relevant to the study area. The N7 is the major route between Cape Town and Springbok. It forms part of an internationally renowned 'flower route' and, in early Spring, many people make use of it specifically to view the displays of wild flowers that adorn the Namaqualand landscape. This route is already crossed by the existing 400 kV transmission line that runs parallel to the Alternative 1 alignment (Figure 23). Winter and Oberholzer (2013) do not map this road as a scenic route but do recognise the R27 that runs south of the study area as a Grade II scenic resource. Where it mounts the escarpment via the historic Vanrhyns Pass it provides spectacular views over the southernmost part of the study area. It is, however, well far enough away from the proposed corridors that there is no chance of the power lines being visible from it.



Figure 23: View towards the south along the N7 at the point where the existing 400 kV transmission line crosses the road. The Matsikamaberg is visible in the background immediately right of the road.

5.6. Visual impacts to the landscape

Griesel (2014:ii) notes the study area to be an open, vast, uninterrupted and uncluttered landscape covered by uniformly textured, low-growing vegetation. "The unspoilt, panoramic landscape is an amenity that greatly contributes to the pristine and remote character of the landscape." Much of the study area is considered to be highly sensitive due to its relatively undeveloped and pristine condition, the generally high visual quality and the associated tourism value. With the exception of the escarpment, there is very low variability in the terrain of the

study area which results in a low visual absorption capacity. The vegetation cover will provide little to no visual screening for the proposed transmission line (Griesel 2014, 2016).

Griesel (2014, 2016) states that previous human activities and interventions (mining and existing infrastructure, including power lines, roads, etc.) have had only minimal effects on the original landscape with the result that its character is little altered from the original natural landscape. As discussed in section 5.3 of the present report, the landscape is predominantly natural. The primary cultural significance lies in the scientific value of the botanical environment and the many archaeological occurrences, both in the Knersvlakte part of the study area.

The visibility of the proposed power lines along each of the three proposed routes has been mapped by Griesel (2014: figs 17-19) to a distance of 5 km. The maps show that there is little difference between the Alternative corridors in the amount of land from which the lines would be visible. This is because the landscape tends to be so flat. Small areas from where the lines will not be visible relate to local topographic relief and make no meaningful contribution to the overall assessment.

The physical impacts to important botanical resources is also regarded as an impact on the cultural landscape but this aspect is considered by the botanical specialist and is not addressed further here.

5.7. Statement of significance

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.

Although the archaeological resources are not fully explored along any of the three corridors, there is no doubt that resources of high cultural significance for their scientific value will be present in places (e.g. the vicinity of the Varsche River sites). The majority of resources, however, are likely to have relatively low cultural significance.

Graves are deemed to have high cultural significance for their social value but are likely to be uncommon in the landscape.

The region is generally not very sensitive from a palaeontological point of view and those fossils likely to be present can be considered to be of low cultural significance for their scientific value.

The cultural landscape, including all historical structures and features, as well as tourism, scenic and botanical value is considered to have variable cultural significance for its aesthetic and scientific values. Broadly, the highest value lies on the Knersvlakte in the southwest with diminishing cultural value towards the northeast.

5.8. Summary of heritage indicators and provisional grading

Because of the relative paucity of structures and graves, the main heritage resources of concern here are archaeological resources and the cultural landscape.

Although only two sections of the study area are quite well-known from an archaeological point of view, there is enough data on record to allow an indication of the range of gradings that can be expected. The Varsche Rivier 003 archaeological site is suggested to be of Provincial significance and could be assigned Grade II. VR048, because of its exceptional density and the diversity of materials present, is a Grade IIIA site. A number of other archaeological sites in the same area can be considered at least Grade IIIB resources in terms of the HWC system and could be rated as 'General Protection A' on the SAHRA system. It must be emphasized that the vast majority of archaeological occurrences in the Knersvlakte landscape will be in poor context and will lack scientific value. Such resources would be considered 'not conservation-worthy' by HWC since they do not merit retention as part of the National Estate. SAHRA would regard such resources as 'General Protection C'.

The cultural landscape has value for its scientific significance (related to both archaeology and botany) and aesthetic significance but this value is largely confined to the south-western part of the study area, the region known as the Knersvlakte. Here the landscape can be graded as Grade IIIA. Further to the north-east, away from the N7 and R27, the landscape is less easily accessible, and then above the escarpment, in the vicinity of the Helios Substation, it is also somewhat degraded because of the other electrical developments that are underway (with more having been authorised). The landscape in the latter area is worthy of Grade IIIC. It is notable, however, that Alternative 1 follows an existing power line and that this corridor is thus of slightly lesser sensitivity throughout its length.

6. ASSESSMENT OF IMPACTS

In this section the impacts of the three alternative corridors are assessed against the No-Go alternative (Tables 1 to 4). The deviations are not formally assessed but are addressed in the discussion as appropriate. Only impacts to archaeology (including graves), palaeontology and the landscape are assessed. In practice, the impacts to the first two are likely to be similar for all three alternatives and cannot be differentiated because of the paucity of data. Only the landscape impacts are differentiable by route alternative.

6.1. Impacts to archaeological resources

Impacts to archaeological resources would occur during the construction phase, although minor impacts could continue into the operational phase through the continued use of access roads that cross over archaeological sites. The impacts would largely be direct impacts related to the damage and/or destruction of archaeological resources during the excavation of pylon foundations and through driving across archaeological sites. Some more important sites might suffer from indirect (contextual) impacts due to the proximity of the power lines to the sites. The magnitude of impacts is 'moderate' because the disturbance footprint of power line developments tends to be fairly small. Because of the potential for very important archaeological sites to occur the extent has been rated as 'provincial' but mitigation involving the rescue of scientific data would reduce this. Impacts to archaeological resources are irreversible and permanent. Overall, the significance before mitigation is likely to be **high**, although with mitigation this will reduce to **moderate**. There are not fatal flaws.

The No-Go alternative would result in impacts of moderate significance. Impacts would occur through the continued use of the land for livestock grazing which would result in trampling damage to artefacts and possibly accelerated erosion which can disturb archaeological sites. New farm tracks may also be constructed over archaeological sites.

Mitigation measures will involve a full walk-down of the final chosen alignment to record all archaeological sites that would be directly affected and to ascertain the need for archaeological excavation/sampling at each. Should such work be required it would likely involve laying out a grid over the relevant sites and excavating material from the squares so that this can be analysed, described and stored in the relevant provincial repository (either IZIKO SA Museum in Cape Town for the western Cape or the McGregor Museum in Kimberly for Northern Cape).

Despite these mitigation measures the possibility remains that archaeological materials could still be impacted and construction staff should be made aware of the possibility. This relates especially to unmarked pre-colonial human burials. Should any burials or dense artefact concentrations be encountered then these should be protected *in situ* and immediately reported to the relevant heritage resources authority and/or an archaeologist for assessment.

6.1.1. Alternatives and Deviations

Only deviation 1H is not supported here because it will result in a ring of power lines around the very important Varsche Rivier property on which many important archaeological sites lie. It is preferable to erect the new power lines all on the southern side of the property alongside the existing lines. Alternative 2 would also result in power lines on more than one side of Varsche Rivier. In the case of both Alternative 2 and Deviation 1H the lines would run within about 250 m of the important VR048 LSA site. While Alternative 3 runs near to a painted rock art site, it would not be visible from the site because of the site's location within a valley.

6.1.2. Cumulative impacts

It is likely that archaeological resources are widespread, especially in the Knersvlakte section of the study area. As such, and because of the generally low levels of development throughout the study area, cumulative impacts are of no concern.

6.2. Impacts to palaeontological heritage

Bamford (2016) concludes that the chances of finding fossils are low, either because of their rarity or because they are difficult to recognise. Because of the presence of Karoo Supergroup sediments, the north-eastern part of the study area may theoretically be the most sensitive, but recent fieldwork by Almond (2016a, 2016b) in that area suggests that there is little concern there. Impacts would occur during the construction phase, primarily through the excavation of pylon foundations but possibly also during the creation of access roads. Impacts to fossils are rated as having a low magnitude because of the small footprint of each pylon and because the fossil outcrops can sometimes be extensive. Because of the limited importance of the fossils expected in the area the extent of the impact is considered to be local. Impacts are relatively unlikely to happen which leads to a significance of **moderate** before mitigation. With mitigation the impact significance would be reduced to **low**. There are no fatal flaws.

The No-Go alternative is not likely to result in any significant impacts occurring because surface disturbances from the continued use of the landscape for livestock grazing are unlikely to reach deep enough to intersect significant fossils.

Bamford (2016) has suggested that monitoring should be conducted so as to identify and rescue any fossils that might be revealed. Once the final route is chosen a palaeontologist should be consulted in order to determine which areas require monitoring. The frequency of monitoring can be determined in consultation with the contractors so as to minimise the amount of specialist time required on site. It is likely that only certain sections would need to be checked.

6.2.1. Alternatives and Deviations

Given the widespread but likely very sparse distribution of significant fossils, none of the alternatives or deviations is particularly favoured over any other.

6.2.2. Cumulative impacts

Palaeontological resources are likely to be widespread and sparse with impacts being uncommon. Because of the generally low levels of development throughout the study area, cumulative impacts are of no concern.

6.3. Impacts to the cultural and natural landscape

It is difficult to separate the cultural and natural landscape, especially in the light of the main cultural significance relating partly to natural features (botanical aspects). Impacts to the landscape would occur during the construction and operation phases of the development. During the construction phase the landscape would experience direct impacts as roads are made and the power lines erected. These activities would result in a degree of scarring of the landscape. During the operation phase there is likely to be some rehabilitation of disturbed areas but the presence of the power line and its access road would still result in a degradation of the visual context of the landscape. The expected magnitude of impacts is moderate because the power lines would not be visible from great distances and, being lattice structures rather than solid, they do tend to blend with the background from a distance. Because of the importance of the area from a scientific (botanical) and tourism perspective, the extent is rated as provincial. If the power line is built then impacts to the landscape are inevitable and the significance before mitigation is calculated as being **high**. After mitigation the significance would still be **high**. There are no fatal flaws.

The No-Go alternative is not likely to result in any unexpected changes to the visual qualities of the landscape.

Mitigation of the power lines and pylons is not feasible because of their size but careful placement of the construction camps and laydown areas will avoid unsightly visual intrusions on the landscape during the construction phase. Rehabilitation of these areas is also important in reducing impacts but, in the present specialist's opinion these measures will not result in a large enough change in overall magnitude to affect the overall significance. Griesel (2015) suggests that, as far as is possible, laydown areas and construction camps should be located adjacent to existing settlements. This is because the landscape character in a pristine environment is far more easily altered, while any disturbance alongside a settlement would be readily associated with the

settlement. In general, it should be ensured that during construction the overall disturbance footprint is minimised.

6.3.1. Alternatives and deviations

Griesel (2014, 2015) prefers Alternative 1 which would result in the new power line being constructed close to the existing power lines and roads rather than through pristine landscapes. The magnitude of the impacts is deemed to be slightly higher for Alternative 3 than for Alternatives 1 and 2. This is because Alternative 3 passes through many areas of land included within the Knersvlakte Nature reserve. Such land inherently has higher conservation and botanical value making it more susceptible to landscape impacts. In general it is better to cluster similar developments so as to avoid a proliferation of low density developments across the broader landscape.

6.3.2. Cumulative impacts

Even though there are relatively few power lines crossing the broader study area, the Knersvlakte, in particular, is a very visually sensitive landscape. A proliferation of powerlines could certainly result in a negative cumulative impact of potentially moderate significance. Clustering of the power lines (i.e. use of Alternative 1 for the present project) would help to minimise the cumulative impacts and this should be a factor influencing the decision as to which alternative to use.

Table 1: Assessment of impacts for Alternative 1.

Impact	Source	Magnitude	Reversibility	Extent	Duration	Probability of occurrence	Ranking	Significance	
								Without mitigation	With mitigation
1. Destruction of archaeological resources (incl. graves)	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Moderate (3)	Irreversible (5)	Provincial (3)	Permanent (5)	Almost certain (4)	64	High	Moderate
		Minor (1)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	26		
2. Destruction of palaeontological resources	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Low (2)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	28	Moderate	Low
		Minor (1)	Irreversible (5)	Site-bound (1)	Permanent (5)	Extremely remote (1)	12		
3. Visual impacts to the cultural landscape and scenic routes	<ul style="list-style-type: none"> Erection and existence of power lines in rural contexts Creation/construction and existence of access roads 	Moderate (3)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	60	High	High
		Moderate (3)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	60		

Table 2: Assessment of impacts for Alternative 2.

Impact	Source	Magnitude	Reversibility	Extent	Duration	Probability of occurrence	Ranking	Significance	
								Without mitigation	With mitigation
4. Destruction of archaeological resources (incl. graves)	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Moderate (3)	Irreversible (5)	Provincial (3)	Permanent (5)	Almost certain (4)	64	High	Moderate
		Minor (1)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	26		
5. Destruction of palaeontological resources	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Low (2)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	28	Moderate	Low
		Minor (1)	Irreversible (5)	Site-bound (1)	Permanent (5)	Extremely remote (1)	12		
6. Visual impacts to the cultural landscape and scenic routes	<ul style="list-style-type: none"> Erection of power lines in rural contexts Creation/construction of access roads 	Moderate (3)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	60	High	High
		Moderate (3)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	60		

Table 3: Assessment of impacts for Alternative 3.

Impact	Source	Magnitude	Reversibility	Extent	Duration	Probability of occurrence	Ranking	Significance	
								Without mitigation	With mitigation
7. Destruction of archaeological resources (incl. graves)	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Moderate (3)	Irreversible (5)	Provincial (3)	Permanent (5)	Almost certain (4)	64	High	Moderate
		Minor (1)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	26		
8. Destruction of palaeontological resources	<ul style="list-style-type: none"> Excavations for pylon foundations Creation/construction of access roads 	Low (2)	Irreversible (5)	Local (2)	Permanent (5)	Unusual but possible (2)	28	Moderate	Low
		Minor (1)	Irreversible (5)	Site-bound (1)	Permanent (5)	Extremely remote (1)	12		
9. Visual impacts to the cultural landscape and scenic routes	<ul style="list-style-type: none"> Erection of power lines in rural contexts Creation/construction of access roads 	High (4)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	65	Very high	Very high
		High (4)	Reversible (3)	Provincial (3)	Medium (3)	Certain/inevitable (5)	65		

Table 4: Assessment of impacts for the no-Go Alternative.

Impact	Source	Magnitude	Reversibility	Extent	Duration	Probability of occurrence	Ranking	Significance	
								Without mitigation	With mitigation
10. Destruction of archaeological resources (incl. graves)	<ul style="list-style-type: none"> Continued use of the land for grazing/ agriculture 	Minor (1)	Irreversible (5)	Site-bound (1)	Permanent (5)	Unusual but possible (2)	24	Moderate	Moderate
		Minor (1)	Irreversible (5)	Site-bound (1)	Permanent (5)	Unusual but possible (2)	24		
11. Destruction of palaeontological resources	<ul style="list-style-type: none"> Continued use of the land for grazing/ agriculture 	None (0)	Irreversible (5)	Site-bound (1)	Permanent (5)	Extremely remote (1)	11	low	Low
		None (0)	Irreversible (5)	Site-bound (1)	Permanent (5)	Extremely remote (1)	11		
12. Visual impacts to the cultural landscape and scenic routes	<ul style="list-style-type: none"> Continued use of the land for grazing/ agriculture 	None (0)	Reversible (3)	Site-bound (1)	Site-bound (1)	Extremely remote (1)	5	Low	Low
		None (0)	Reversible (3)	Site-bound (1)	Site-bound (1)	Extremely remote (1)	5		

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

Aside from the specific heritage management and mitigation measures that have been stipulated above, the only general management measures that should be incorporated into the environmental management program are the following:

- The environmental control officer (ECO) should ensure that an archaeological walk down and any necessary archaeological mitigation measures have been completed prior to commencement of the construction phase. It is recommended that an archaeologist be appointed to conduct the walk down survey at least 12 months prior to the start of construction so as to allow enough time for the mitigation process to be finalised if necessary;
- The ECO is to ensure that the development footprint is kept as small as possible and that no unnecessary disturbance to the landscape takes place;
- The ECO should brief the construction staff on the potential to uncover archaeological artefacts, fossils and, most importantly because of their significance and their ease of identification, human burials. Should any such materials be found during the construction phase of the project then they should be protected in situ and immediately reported to the ECO who in turn should ensure that the appropriate heritage resources authority or an archaeologist or palaeontologist as appropriate are contacted.

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

Section 38(3)(d) requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development. The project is intended to help stabilise the local electricity grid and improve the distribution of power to the surrounding towns. Temporary employment would also be created during the construction period. So long as any necessary mitigation measures are carried out there is no reason to suggest that the heritage impacts would outweigh the benefits of the project.

9. CONSULTATION WITH HERITAGE CONSERVATION BODIES

HWC required that comments be sought from the Municipality and any registered heritage conservation bodies. The report was, therefore, sent to the Matzikama Municipality for comment on 20th January 2017 as per the appended email (Appendix 6). There are no heritage conservation bodies with interests in this area registered on the HWC database³.

A response was received from the Matzikama Municipality on 20th February 2017. The response made the following points:

- The Municipality considers the report to be comprehensive and they are in support of the recommendations; and

³ <http://hwc.org.za.dedi6.cpt3.host-h.net/conservation-bodies>

- The Municipality suggested that CapeNature and the Griqua Ratelgat Eco, Cultural, Heritage and Tourism Development Farm should be considered for consultation. Contact details were kindly provided.

Response from heritage consultant:

- The Municipality's support for the report and recommendations is acknowledged;
- Regarding CapeNature, the environmental assessment practitioner noted that CapeNature had been consulted during the Public Participation Process and had indeed submitted comment. These comments were provided to the heritage consultant. There were no comments related to heritage resources, although it is noted that they do not support Alternative 3 because of greater biodiversity and visual impacts.
- Despite the fact that the Griqua Ratelgat Eco, Cultural, Heritage and Tourism Development Farm are not registered as a heritage conservation body, an email was duly sent to them (Mr Cecil le Fleur) on the advice of the Matzikama Municipality on 20th February 2017. Mr Le Fleur responded on 21 February 2017 expressing his thanks at being contacted but stating that he was travelling overseas and would not be able to comment at that time.

Note that all the original email files were submitted digitally with this application.

10. CONCLUSIONS

The primary heritage indicators of concern for this project are archaeological resources and the cultural landscape.

Archaeological resources are widely scattered throughout the study area but are likely to be more prevalent in the south-western half, the area known as the Knersvlakte. These resources, although widespread, are likely to be mostly of fairly low significance but there is always the chance that a more important site might be found, especially in association with river valleys and floodplains. At least one archaeological site worthy of Grade II status is known to occur in the study area (VR003), although it falls just outside of two of the proposed corridor alternatives.

The landscape, and more specifically the Knersvlakte section, is significant primarily for its scientific value which resides in the very special plant communities of the area. Many farms are part of the Knersvlakte Nature reserve which would be more strongly affected by Alternative 3 than the other two alternatives. The landscape also holds tourism value, especially during early Spring when the N7 becomes a scenic route of at least provincial significance as thousands of people travel to see the wild flower displays of Namaqualand. The emptiness and aesthetic beauty of the arid Knersvlakte landscape is also special, but probably to a smaller group of people. The landscape close to the Helios Substation has been degraded through the construction of wind energy facilities in the area.

The potential proliferation of power lines in the landscape is a potential cumulative impact of concern. However, if Alternative 1 is chosen for this project then the clustering of power lines would help to preserve the pristine qualities of the remainder of the study area. Alternative 3 is perhaps the most sensitive because it is the furthest away from the existing power lines and closest to Ratelgat.

11. RECOMMENDATIONS

Although there has been no ground survey of the three corridors, it can be stated with a fairly high degree of certainty that impacts to archaeological resources are manageable. Impacts to the landscape are more significant for Alternative 3 than for Alternatives 1 and 2. They cannot be mitigated but do not constitute a fatal flaw. It is thus recommended that the proposed project be authorised. Alternative 1 is strongly favoured followed by Deviation 1E and Deviation 1F. Alternative 2 and Deviation 1H are less favoured, while Alternative 3 is least favoured. If the project is authorised, the following points should be included in the conditions of authorisation:

- An archaeologist should be contracted to walk the entire length of the final chosen alignment to locate and record all archaeological sites and occurrences and any other heritage resources that may lie within the proposed route. The archaeologist must make recommendations as to whether any mitigation work is required and advise on the extent of such work;
- A palaeontologist with field experience in the relevant areas should be contracted to comment on the final chosen alignment with a view towards establishing whether any sections may require monitoring or not. The extent and frequency of such monitoring should be worked out between the palaeontologist and construction contractor in order to ensure that the most important areas, if any, are examined;
- Construction camps and laydown areas should be placed away from scenic areas and preferably located adjacent to settlements so as to avoid disturbance of pristine environments; and
- If any archaeological material or human burials are uncovered during the course of development then 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 – Heritage Scoping Study

APPENDIX 3 – Palaeontological study

APPENDIX 4 – Visual Impact Assessment

APPENDIX 5 – Visual Impact Assessment Addendum

APPENDIX 6 – Consultation

Please note that all the original email files were submitted to HWC digitally with this application.

1. Email to Matzikama Municipality



Fri 2017-01-20 02:28 PM

Jayson Orton <jayson@asha-consulting.co.za>

Helios-Juno power line HIA

To: annalivdw@matzikamamun.co.za

Message HIA - Juno-Helios Tx lines [DRAFT FOR COMMENT].pdf (4 MB)

Dear Annali

Thank you for taking my call just now. Please find attached the Helios-Juno power line HIA we discussed. I would appreciate any feedback the municipality may have on the heritage aspects of this project before the 20th February 2017.

with all best wishes
Jayson



Jayson Orton

ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
jayson@asha-consulting.co.za
T: 021 788 8425 | C: 083 272 3225
www.asha-consulting.co.za

2. Email response from Matzikama Municipality

RE: Helios-Juno power line Heritage Impact Assessment



From "Thesme Van Zyl" <thesme@matzikamamun.co.za>
to jayson@asha-consulting.co.za and copy to 2 people

Mon 2017-02-20 10:08 AM

You replied to this message on 20 February 2017 06:45:03 PM.
You forwarded this message on 21 February 2017 06:57:42 AM.

To: **Jayson Orton**
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
jayson@asha-consulting.co.za
T: 021 788 8425 | C: 083 272 3225
www.asha-consulting.co.za

Dear Dr Orton

RE: Helios-Juno power line Heritage Impact Assessment

Thank you for the opportunity to give input into the Heritage Impact Assessment for the proposed 765 kV Helios-Juno Power Line and Juno Substation Upgrade, Calvinia, Vredendal and Vanrhynsdorp Magisterial Districts, Northern and Western Cape.

After having worked through your comprehensive report on the Heritage Impact it is clear to this office that you have considered a wide range of impacts with the necessary care and attention and therefore we are in support of suggestions made towards the construction of the Helios-Juno Power Line and Juno Substation Upgrade.

This office fully supports recommendations as referred to in your Heritage Impact assessment report on pg. 35 point 11.

Please note that this office would also recommend that the following affected and interested parties be considered for input:

- Cape Nature - (Vanrhynsdorp) Elbe Cloete (Regional Manager) : ecloete@capenature.co.za

Elbé Cloete
Regional Manager | Western Region



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- Griqua Ratelgat Eco, Cultural, Heritage and Tourism Development Farm – Mr Cecil Le Fleur –
E-mail: leflourcecil@gmail.com

Greetings

Thesmé van Zyl
Development and Town Planning Services / Ontwikkeling en Stadsbeplannings Dienste
MATZIKAMA MUNISIPALITEIT / MUNICIPALITY

☎ 027-201 3351/02
☎ 0866279835
📍 98 Vredendal 8160
📍 Kerkstraat / Church Steet 37 Vredendal 8160

3. Email to Mr Cecil le Fleur (Ratelgat) **urgent heritage comment**



From "Jayson Orton" <jayson@asha-consulting.co.za>
to leflourcecil@gmail.com

Mon 2017-02-20 06:52 PM



HIA - Juno-Helios Tx lines [DRAFT FOR COMMENT].pdf (3,9 MB)

Dear Mr le Fleur

I have recently completed a heritage impact assessment for proposed power lines between the Helios substation near Loeriesfontein and the Juno substation near Vredendal. HWC requires consultation with registered heritage conservation bodies as well as with municipalities. The Matzikama Municipality suggested I try to get comment from you as well. This seemed an excellent idea even though Ratelgat is not registered. However, I am due to submit the report on Wednesday 22nd February. If it is at all possible for you to provide a comment by the end of tomorrow (21 Feb) then I will certainly include it. I have attached it here for your consideration.

I would also encourage you to register your interest in heritage with HWC so that you may be consulted in the future about projects in the area. Their database is the only readily available source of conservation bodies we can draw on and HWC requires that consultants use it.

With all best wishes
Jayson



Jayson Orton
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
jayson@asha-consulting.co.za
T: 021 788 8425 | C: 083 272 3225
www.asha-consulting.co.za

4. Email from Mr Cecil le Fleur (Ratelgat)


Re: urgent heritage comment



From "Cecil le Fleur" <leffleurcecil@gmail.com>
to "Jayson Orton" <jayson@asha-consulting.co.za>

12:56:04 AM



 You replied to this message on 21 February 2017 06:50:35 AM.

Dear Mr Ortan

Thank you for informing and including us in your HIA. I am unfortunately abroad at the moment. Where I am, I have limited access to internet. I have only now received your message. It will definitely be to late to respond.

I will, however, take your advice and register with HWC as soon as possible. We are already registered as a Cultural Council at the Western Cape Cultural Commission.

Best Regards

Cecil le Fleur