

Annex K

Heritage Specialist Report

**HERITAGE IMPACT ASSESSMENT
PROPOSED RENEWABLE ENERGY FACILITY AT THE
SUTHERLAND SITE, WESTERN AND NORTHERN CAPE
PROVINCES**

(Assessment conducted under Section 38 (8) of the
National Heritage Resources Act as part of an EIA.)

Prepared for

ERM SA

On behalf of

Mainstream Renewable Power Limited

March 2011



Prepared by:

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Date: 11th April 2011

To whom it may concern,

Declaration of Consultants Independence

Lita Ethel Webley (PhD) and David John Halkett (MA) of ACO Associates cc, authors of the Victoria West (Mini), Touws River (Paardevelei) and Sutherland Wind Farm specialist reports on heritage, hereby declare that we are independent consultants appointed by ERM to provide specialist input to the Mainstream wind farm projects. I hereby confirm that we have no business, financial, personal or other interest in the activity, application or appeal in respect of which we have been appointed other than fair remuneration for work performed in connection with the activity and application. All opinions expressed in my specialist report are our own.

A handwritten signature in black ink, appearing to read 'D. Halkett'.

A handwritten signature in black ink, appearing to read 'L. E. Webley'.

Dave Halkett and Lita Webley
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EXECUTIVE SUMMARY

ACO Associates CC have been appointed by ERM on behalf of the proponent, Mainstream SA, to undertake a Heritage Impact Assessment, as part of the EIA process, for the establishment of a wind energy facility on Portion 0 of Farm 30 (Klipfontein Extension), Nooitgedagt 148 Portion 1, Tonteldoos fontein 152, Portion 1 and Portion 6 (subdivision of portion 2), Beerenvallei 150, Portion 1 (Scholtzenhof), Schietfontein 179, Portion 1 and portion 2 (Subdivision of portion 2), Vanwykskraal 178, Portions 1 and 2, Welgemoed 268, Remainder, Schalkwykskraal 204, Remainder, Drie Roode Heuwels 180, Remainder, Portions 1 and 2 (subdivisions of Portion 2), Botmashoek 10, some 40 km south east of Sutherland. Most of the proposed facility lies in the northern Cape province with a small portion in the western Cape province. Ms Mary Patrick of Cape Archaeological Survey cc was appointed initially for the Scoping process but subsequently, ACO Associates cc have been appointed to compile the heritage component of the EIA.

The proposed facility would utilise wind turbines and photovoltaic cells to generate electricity that will be fed into the National Power Grid. The facility will have a collective generation capacity of between 538 MW– 811 MW.

Up to 400 wind turbines are planned for the 286km² site as well as the following associated infrastructure:

The layouts for laydown areas, cables and substations were not provided at the time of the survey and they will have to be examined and assessed based on our field knowledge, and if necessary during the EMP. Proposed road layouts were provided and were considered in only a broad sense as turbine positions remain nominal at this stage.

The fieldwork was conducted on the 21st February - 01st March 2011. It involved a walk and drive survey of many of the turbine positions and a broad overview of the entire development site/s.

The findings of the heritage assessment have revealed that the study area is rich in a wide variety of both colonial and pre-colonial heritage sites. Parts of the study area enjoy very high aesthetic qualities and constitute a layered cultural landscape of remarkable intactness. The impact of the proposal is of moderate negative significance with respect to physical heritage, but of medium – high significance with respect to cultural landscape.

In our opinion, no significant heritage limitations were encountered during the survey, although mitigation may be necessary in some cases once final layouts are decided.

Heritage Recommendations:

The Palaeontological Impact Assessment recommended:

- A field survey prior to major construction to determine the nature and extent of mitigation;
- Mitigation normally involves recording and/or collection of fossil material with a permit issued by SAHRA and/or Heritage Western Cape;
- It seems unlikely that any infrastructure will have to be repositioned;
- Selective monitoring of substantial excavations may be required.

The Pre-colonial and Colonial Archaeology:

- Discrete scatters of Middle Stone Age artefacts were identified in a number of locations but were marginal and lacked stratification or the presence of associated organic material. They are not considered to be of high significance;
- A few LSA sites containing ceramics and occasional formal stone microliths were identified. These often occur in the lee of ridges and near water sources. Some of these have been accorded high significance;
- A number of colonial household dumps/refuse heaps were recognised associated with domestic elements of the built environment. Some of these are considered to be of high significance;
- Micro-siting of turbines and access roads during the EMP will avoid significant impacts;
- Archaeological excavations or recording of sites is unlikely if appropriate micro siting takes place as necessary.

The Built Environment:

- There are occupied dwellings on the farms Theronsrus, De Kom and Welgemoed. They are not directly threatened by the turbines. Unoccupied standing historic farm buildings as well as ruins are found on Welgemoed and De Kom. These would be accorded high significance as would the clusters of sites centered on the old loan farms often located at springs and characterised by ruins and kraals;
- There are numerous stone built ruins, kraals and other stone features scattered across all the farms, relating to late 19th and early 20th use of the land. These remains are generally rated as having medium-high significance.
- Micro-siting of turbines and access roads during the EMP will avoid significant impacts

Graves:

- There is a well marked formal graveyard on Nooitgedagt, and a less formal one on De Kom, neither of which is threatened directly by the existing turbine positions. All graves, regardless of status, are accorded high significance. Some graves may no longer be easily identified from the surface due to loss of markers over time;
- There are numerous stone cairns and grave markers along the edges of rivers/drainage features which may represent graves. Graves are usually associated

with old settlements and tend to be on alluvial or aeolian sand deposits;

- We are unlikely to have identified all graves in the study area;
- Graves may be impacted by access roads and associated infrastructure;
- A more detailed survey must be conducted along the proposed access roads and connecting cable routes and turbine sites to ensure graves are not disturbed;
- If unmarked graves are uncovered during construction, work should cease in that area and either SAHRA or HWC must be notified, depending on the location. A protocol to deal with accidentally discovered burials must be compiled for the construction phase.

Cultural Landscape:

- The proposed energy facility will not be visible from any major transport routes but there may be some marginal visibility from the R354 (N1 - Sutherland) and will be visible from the secondary road which loops through the farmlands to the east from the R354;
- The cultural landscape is agricultural in nature, stock farming with occasional agriculture and marked by distinctive stone structures and features. Large areas still maintain a predominantly wilderness character;
- The visual impact of the turbine positions will be assessed by a separate Visual Impact Assessment.

1. INTRODUCTION

ACO Associates CC have been appointed by ERM on behalf of the proponent, Mainstream SA, to undertake a Heritage Impact Assessment, as part of the EIA process, for the establishment of a wind energy facility on Portion 0 of Farm 30 (Klipfontein Extension), Portion 1 of Nootgedaght 148, Portion 1 and Portion 6 (subdivision of portion 2) of Tonteldoosfontein 152, Portion 1 (Scholtzenhof) of Beerenvallei 150, Portion 1 and portion 2 (Subdivision of portion 2) of Schietfontein 179, Portions 1 and 2 of Vanwykskraal 178, Remainder of Welgemoed 268, Remainder of Schalkwykskraal 204, Remainder and Portions 1 and 2 (subdivisions of Portion 2) of Drie Roode Heuwels 180 and Botmashoek 10 to the south east of Sutherland. Figure 1 shows the site in local geographical context. Most of the proposed facility lies in the northern Cape province with a small portion in the western Cape province. The study area straddles the edge of the great escarpment between the upper and lower Karoo (Fig 1) and includes farms on top of, and below the escarpment.

The closest towns are Sutherland (40 km to the northwest), Matjiesfontein (south), Laingsburg (south east) and Merweville directly east. The proposed location may be described as remote and is more than 20 km from any regional roads of significance (Figure 1).

Up to 400 wind turbines are planned for the 286km² site as well as the following associated infrastructure:.....

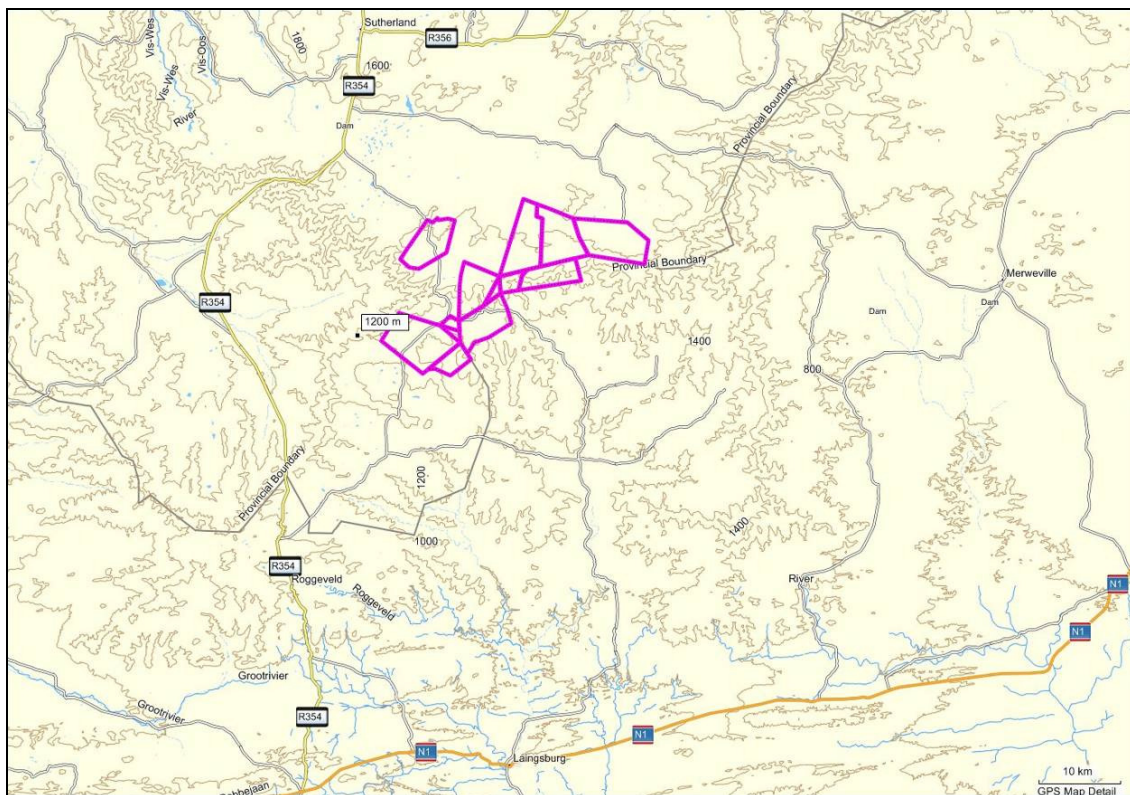


Figure 1: The location of the farms (purple polygons) in regional context (Mapsourc). The edge of the escarpment is represented by the band of steep contours

1.1 Development Proposals

It is proposed to construct a renewable energy facility at Sutherland with a generation capacity of between 310MW-468MW, using both wind turbines and photovoltaic cells. The proposed turbine layout is shown in Figure 2.

- It is proposed to construct between 169 – 223 wind turbines;
- The turbines will be between 80m and 120m high, with a concrete foundation base of 5 m x 5 m;
- There will be a gravel standing area adjacent to each turbine of approximately 2500 m² that will be used during the construction and maintenance phase;
- Approximately 2km² of solar PV arrays;
- Access roads will involve the up-grading of existing farm tracks but new tracks (with a maximum width of 6 m) may also need to be constructed;

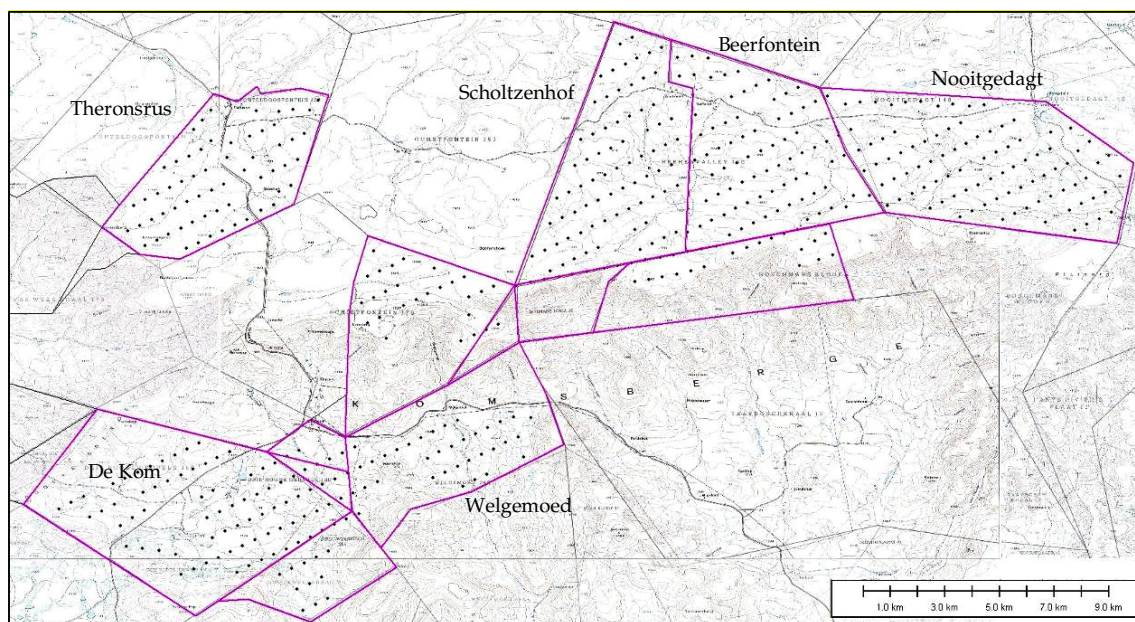


Figure 2: Proposed turbine and PV array positions 1 (dots) superimposed on the 1:50 000 maps. Affected properties are shown in purple.

- Turbines and PV arrays will be connected to each other via underground electrical cables;
- The site will connect to the Eskom national grid via the ----- sub-station, or connect to the grid on site via a 400kV transmission line.

The final design of the facility including the layout, size and type of wind turbine and solar array will be determined using information gathered from the wind testing mast and solar resource measuring station. The operational lifespan of the facility is expected to be 25 years, after which the site will be refurbished or decommissioned and rehabilitated.

1.2 The heritage team

Mr David Halkett and Dr Lita Webley are independent specialist consultants who are in no

way connected with the proponent, other than delivery of consulting services.

Lita Webley (PhD) is an archaeologist with 14 years of working experience in heritage consultancy. She is also accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

David Halkett (MA) is an archaeologist with 22 years of working experience in heritage consultancy. He is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

Field assistance was provided by Mr Hugo Pinto and Ms Kyla Bluff (Postgraduate archaeology students)

2. METHODOLOGY

This study has been commissioned as the heritage component of an EIA. It assesses the identified range of impacts in terms of accumulated knowledge of the area from previous field studies, published and unpublished material related to archaeological work and history of the region. A field survey of heritage resources has been conducted and heritage indicators (conservation-worthy buildings, archaeological sites and places celebrated as heritage) identified and mapped where appropriate. Definitions of heritage and criteria for assessment of heritage are indicated in the National Heritage Resources Act while the Provincial Guidelines for assessing heritage in the Western Cape applies. Both the NHRA and Provincial Guidelines require that cultural landscapes and areas of particular aesthetic and/or cultural heritage significance are considered in the assessment.

Independent Visual and Palaeontological Assessments form part of the EIA process.

2.1 Assessing heritage in the context of wind energy developments

Wind energy facilities have grown exponentially throughout the world in response to the international energy crisis and climate change. Initially communities enthusiastically accepted the presence of wind energy facilities, however web-based research of international experience has indicated that they are not without controversy. The impacts of clusters of massive wind turbines on cultural landscape can be severe, both in physical terms and with respect to the intangible and aesthetic qualities of a given locality. A pilot study commissioned by the Provincial Government of the Western Cape as part of its Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape and Report 6 in the series titled "Towards a Regional Methodology for Wind Energy Site Selection in the West Coast region" (CNdV 2006) considered landscape character rather than the cultural landscape concluded that wind energy facilities have an impact on the surrounding landscape in terms of the natural qualities of places. In terms of landscapes and heritage, there are no pro-active detailed local regional studies that can be consulted, however the pilot study recognises that impacts can occur and suggested a setback of 500 m for roads, communication towers, mountain catchments, private nature reserves, rivers wetlands and heritage sites to avoid physical impacts.

Wind energy facilities are often large developments. Turbines can be up to 100m high with blades up to 50m in radius. The structure has to be counterweighted by a concrete block (up to 675 cubic meters) sunk deep into the ground. Each turbine location must be on an access road with gradients that can be negotiated by a heavy lift crane. Turbines can be visible from 10 km depending on the landscape. Indications are that they are perceived to be aesthetically more acceptable in agricultural or manicured landscapes than in natural environments (PGWC 2006).

The point at which a wind turbine may be perceived as being “intrusive” in terms of the aesthetics of an area is a subjective judgment, but it can be anticipated that the presence of such facilities close to wilderness and heritage areas will destroy many of the intangible and aesthetic qualities for which those areas may valued, or could be potentially be valued in the future. In some contexts however, the graceful shapes of the turbines and the sculptured twist of the rotors is perceived to be aesthetically pleasing.

The degree of physical landscape disturbance caused during the construction process of a wind and solar facility means that the destruction of archaeological and palaeontological and historical heritage is a very likely. Impacts of wind energy facilities can therefore cause direct physical damage to heritage resources through the establishment of infrastructure, and by their presence can change the aesthetic and intangible values of the broader cultural landscapes in which the heritage resources exist.

2.2 The Sutherland site/s

The notional locations of the proposed turbines were loaded onto handheld GPS receivers (set to the WGS84 datum) to facilitate the identification of the search area during field work component of the study that was undertaken between 21st February - 01st March 2011. Walk and drive paths as well as site locations were recorded with GPS as were locations of heritage resources. Heritage resources were photographed and described.

Access roads, substations and laydown areas were not available at the time of the field work and could therefore not be examined specifically. Since the turbine positions remain notional until the findings of the various specialist studies are assessed, it is quite likely that all other infrastructure will also not be final. These components will therefore be assessed during the EMP stage if necessary.

2.3 Limitations

There is little published archaeological information for the area and the remote location has meant that little development has occurred there that required commercial archaeological and heritage impact assessments, but additional proposals for other wind farms in the area has meant that some information has been accumulated.

Fieldwork was undertaken in the summer, after a number of heavy thunderstorms had swept across the Karoo region. Some of the gravel roads had become impassable, and this

made access difficult or impossible to certain areas, although overall, access was not restricted and there was a reasonable network of farm roads providing access to most areas of the properties

We have not visited the notional position of each and every turbine, and it is accepted that many will fall away or change in the future. We were not provided with infrastructure layout and so cannot comment on these. We have however examined all but one of the farms, representing the various landscape types present in the wef site. Consequently, we would probably be able to make some informed statements about infrastructure positioning on the site as a whole.

3. REGULATORY AND LEGISLATIVE OVERVIEW

The basis for all heritage impact assessment is the National Heritage Resources Act 25 (NHRA) of 1999, which in turn prescribes the manner in which heritage is assessed and managed. The National Heritage Resources Act 25 of 1999 has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

Cultural landscapes (described below), Buildings and structures (greater than 60 years of age), Archaeological sites (greater than 100 years of age), Palaeontological sites and specimens, Shipwrecks and aircraft wrecks, Graves and grave yards.

Section 38 of the NHRA requires that Heritage Impact Assessments (HIA's) are required for certain kinds of development such as rezoning of land greater than 10 000 sq m in extent or exceeding 3 or more sub-divisions, or for any activity that will alter the character of a site greater than 5000 sq m.

3.1 Cultural Landscapes

Section 3(3) of the NHRA, No 25 of 1999 defines the cultural significance of a place or objects with regard to the following criteria:

- (a) its importance in the community or pattern of South Africa's history;
- (b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- (c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
- (h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- (i) sites of significance relating to the history of slavery in South Africa.

3.2 Scenic Routes

While not specifically mentioned in the NHRA (Act 25 of 1999), “scenic routes” are recognised by DEA&DP as a category of heritage resource. In the DEA&DP Guidelines for involving heritage specialists in the EIA process, Baumann & Winter (2005) comment that the visual intrusion of development on a scenic route should be considered a heritage issue. This is also given recognition in the Notice of Intent to Develop (NID) application which is used by Heritage Western Cape.

3.3 Heritage Grading

Heritage resources are graded following the system established by Winter and Baumann (2005) in the guidelines for involving heritage practitioners in EIA’s (Table 1).

Table 1: Grading of heritage resources (Source: Winter & Baumann 2005: Box 5).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

3.4 Wind Energy Guidelines

A pilot study commissioned by the Provincial Government of the Western Cape “Towards a Regional Methodology for Wind Energy Site Selection in the West Cape region” (May 2006)

is the only locally available draft policy guideline. The study looked at landscape character rather than at the “cultural landscape” or “heritage” but concluded that wind energy facilities can have an impact on the landscape in terms of quality of place. In general terms we would expect a setback of at least 500 m from heritage sites but this may be more or less as determined by local conditions/sensitivities. Neither SAHRA nor HWC have developed policies with respect to heritage and renewable energy and therefore the issue of distance of wind turbines from heritage resources has not been resolved.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Study Area is located some 35 km south east of Sutherland in the Karoo. It is a semi-arid region with rainfall mainly in the form of summer thunderstorms. The vegetation is characteristic of the Succulent Karoo biome. The “site” straddles the great escarpment with some farms located on the plateaux and others on the plains below. The old road to Sutherland including the Komsberg pass bisects part of the study area and provides access to the plateaux.

Although myriad streams are to be found on the farms, The Venters, Komsberg and Riet Rivers are the main channels draining the plateaux (Figure 2). A number of springs are also present. Old settlements tend to focus on the water resources and the Venters River, particularly at the base of the escarpment contains numerous kraals, located next to pools and built against the rocky ridgelines along the valley sides. Exotic vegetation is often present around settlements but otherwise is low scrub. Common trees include bluegums, willow and brazilian pepper Typical landforms are wide plains, surrounded by hills and koppies both above and below the escarpment. The dramatic edge of the escarpment is a dominant feature especially viewed from the south, and even in this day and age, creates a serious restriction on movement.

There are a number of farm tracks which cross the study area to service fenced stock camps and associated small dams and their accompanying wind pumps. Despite human intervention related to farming, the site remains predominantly natural and isolated.

Some typical landscape views are presented in plates 1 - 7.



Plate 1: Landscape view looking south east on Beerfontein. Typical wide plains surrounded by low hills and koppies. Low scrub vegetation showing lack of trees.



Plate 2: Landscape view looking south west along the Komsberg road with the farm De Kom in the distance at left. The bluegum trees in the distance are growing next to a large dam.

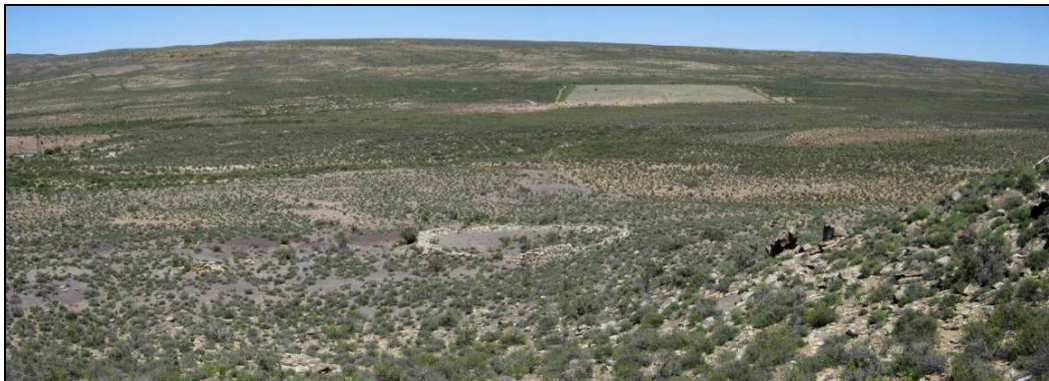


Plate 3: The wide valley on the north western section of Nooitgedacht. A circular stone kraal can be seen in the foreground and newer agricultural fields behind. This view is looking to the south.



Plate 4: Typical topography along the Venters River, old river terraces and exposed base rock forming sharp ridgelines. Kraals are often built up against rocky ridgelines.



Plate 5: On the farm Welgemoed looking north to the escarpment. Komsberg Pass at the left off photo.



Plate 6: Exotic vegetation marks numerous small settlements along the Venters River. Plate 7: Typical stockposts, marked by windpumps and small reservoirs, are scattered across the site.

4.1 Palaeontological heritage of the area

A palaeontological impact assessment (PIA) of the site was commissioned as part of a comprehensive HIA for the Mainstream wind farm project by Ms Mary Patrick (Cape Archaeological Survey cc) who undertook the scoping phase of the study.

Dr Almond notes in his introduction that his report is a pre-scoping desktop study for inclusion in the EIA for the Sutherland wind and solar energy project and that, as the layout of the turbines, road network, transmission lines and other associated infrastructure had not been finalised, these development components have not been considered during this preliminary palaeontological assessment.

His detailed report will be included in the EIA document, although a summary will be found in Section 5.1 of this report.

4.2 Pre-colonial Heritage of the area

Little was known of the archaeology of the study area until recently and in fact no commercial heritage impact assessments are listed on the SAHRA database for this area (at least up to 2009). Despite the official record, there has been some limited commercial and research work around Sutherland (for example: Lloyd Evans et al. 1985; Hart 2005). Lloyd Evans et al. (1985) excavated a small rock shelter on the grounds of the South African Astronomical Observatory in Sutherland. It contained a Later Stone Age assemblage with a relatively high proportion of small convex scrapers and thin-walled potsherds of indigenous manufacture, ostrich eggshell and some *Nassarius kraussianus* (a type of marine shell) beads. They comment (1985: 108) that the presence of the shell beads points to cultural ties with people along the Cape coast while the small scrapers can be assigned to the Wilton industry, distinct from the large elongated scrapers typically associated with the interior sites along the Orange River as described by Sampson (et al. 1989).

Hart (2005) undertook a survey for a golf course to the south of the Sutherland urban edge. The most significant find was a complex of 13 stone enclosures which are typical of the *Khoekhoen kraals* that were mapped and described by the author in the eastern Karoo (Hart

1989, Sampson 2008). A single highly dispersed artefact scatter consisting of mainly waste material (flakes made from *hornfels* or indurated shale) was also found. Hart (2005) reported finding a dense artefact scatter associated with a shallow rock shelter outside the study area indicating that archaeological sites may be found in areas that were sheltered from the wind (an important consideration given Sutherland's extreme temperature ranges).

Recent work on another wind farm to the east, the so-called Zuurplaats WEF (Hart et al 2010) as well as archaeological specialist studies of the Gamma-Omega 765 kV powerline passing to the south of the escarpment (Patrick 2009) has overcome the information vacuum to a degree. The Zuurplaats project is of particular relevance given that it occupies a similar geographical position to the facility under discussion here, whereas the linearity of the powerline and its context make the archaeological observations moderately less useful.

Hart (et al's 2010:22-23) observations, included below, are in most respects similar to those made during this project with some differences, particularly pertaining to LSA sites:

Pre-colonial archaeological material: As expected includes Early Stone Age (ESA), Middle Stone Age (MSA) and Later Stone Age (LSA) artefact scatters. Open sites are extremely sparse on the upper plateau with only one MSA site being recorded – a scatter associated with a dry pan. The most common raw materials are hornfels, quartzite, chert, and also quartz and Karoo shale. Occasional flakes were noted randomly on the landscape lie scattered on the land surface which represents the "litter" of the Stone Age. On the upper plateau even incidental artefacts were scarce. In the southern portion of the study area a significant and well preserved Early Stone Age site containing complete and highly refined bifaces (hand axes) attributable to the Fauresmith industry was found on the farm Klipfontein.

Stone kraals: The most common form of pre-colonial site on the upper plateau were stone kraals or kraal clusters, which according to Sampson's (2008) figures from the Eastern Karoo, could be between 300 and just over 1000 years of age. The kraal complexes (which are distinctly different from colonial period stock kraals) tend to be found along the leeward slopes of low ridges (or where minimal wind affects the area). These typically consist of dry stone piled wall enclosures in a roughly circular configuration, sometimes interlocking but not more than half a meter high, and ranging from 3 - 4 meters to 9 m in diameter. In the past they are likely to have been associated with reed mat huts or brush shelter(s), probably erected a few meters away from the main 'kraal' where small stock such as fat tailed sheep and goats were kept. Often found in proximity to the larger 'kraals' are lammerkraals (lambs' kraals), which are much smaller (about 1m in diameter) and a bit higher (usually a few more layers of stones added to the wall) than the adjoining larger 'kraal'. These small kraals are known to have been used to keep new born lambs or goats separate from their mothers so that the milk could be used rather by the people (Webley 1986). It was noted that kraals are arranged in complexes of up to 13 interlocking enclosures with adjoining lammerkraals. Notable complexes were recorded in the area of Hartebeestfontein and at Vinkekuil. Also associated with these 'kraals' is artefactual material, fine thin red burnished pottery, and ostrich egg shell. At a site alongside the access road to Waterval there is a remarkable complex of 'kraals' below and on top of a ridge.

Below the escarpment in the southern section of the study area, another form of archaeological site was identified. These are what we interpret to be open Khoekhoen encampments situated among the Kameeldoring trees along the dry river beds in the bottom of valleys. The sites are typically quite

large (60 – 80m in diameter), artefactually rich with very fine thin walled and burnished Cape Coastal pottery noted. There are numerous stone features, informal stone artefacts, grinding surfaces as well as a number of graves, some of which have broken grinding stones placed on top. Also evident were discreet ash middens and animal bone. On two of the sites there is evidence of European goods (19th century glass and ceramics) which may indicate some form of continuous use of the sites by Khoekhoen herders into the colonial period.

The 3 sites of this kind which were identified lie on the main track from Klipfontein to Modderfontein. Archaeological sites of this kind are very rare in the Western Cape, having been only previously recorded in the Richtersveld.

4.3 Colonial Heritage

Schoeman (1986) has described the early settlement of the Roggeveld and Sutherland area which commenced around 1750. The early farmers found the escarpment, which enjoys the highest rainfall, particularly suitable for small stock farming during the summer months but they moved down into the valleys and plains of the Karoo to escape the extreme winters. In addition, the escarpment seems to have been where most of the springs were found, and from where they were able to exploit the vegetation of both the *Onder Karoo* as well as the Sak River region in Bushmanland. Each *Trekboer* usually had in addition to a loan farm on the plateaux, a farm in the Karoo known as a *legplaats* (outpost). Initially, the population of the area remained small, because many of the early loan farms were merely “stock posts” and the owners lived elsewhere. Drought, poor grazing and attacks by the San caused many farms to be abandoned. Disputes over farm boundaries were intense. According to Penn (2005), in the 18th century there were numerous independent Khoekhoen kraals located amongst the *Trekboer* farms in the Roggeveld.

The first recorded loan farms in the Roggeveld date to 1743, and by 1750 there were 31 registrations (Penn 2005). Robert Jacob Gordon travelled through the Roggeveld in 1786 and he mentions farms belonging to the Van Wyks and the Louws (both are families who have lived in the area for generations) as well as a farm on the edge of the “Comsberg” (sic) that belonged to a Cloete (in Schoeman 1986). Many farmers seem to have had more than one loan farm.

Resistance to the *Trekboers* in the Roggeveld came initially from the San who resisted fiercely throughout the great Karoo, at times beating back the vanguard of *Trekboer* farmers. In 1754, attacks from the Khoisan are reported to have increased and flocks of sheep and herds of cattle belonging to the *Trekboers* were driven out of the area. This increased to the extent that it is described by Schoeman as a type of guerrilla warfare. Livestock was stolen, Khoisan herders and slaves killed, and *Trekboer* farms attacked. The colonists fought back by establishing the *Kommando* system – and leading to the officially sanctioned “hunting” of San was in 1777 (Adhikari 2011, Dooling 2007) In some instances, bounties were obtainable from the local *landdrost*. There was apparently a massacre of 186 San in the Roggeveld in 1765. The only confirmation of this is from the farm Oorlogskloof near Sutherland. There are a great many graves, some 30, laid out in three groups, with piles of rocks above them. There is also a separate gravestone with the date 1768. Both Penn and Schoeman refer to another

mass grave on the farm Gunsfontein (to the west of Schietfontein (Scholtzenhof) - and now part of a private nature reserve), possibly dating to the rebellion of the 1770's. According to Penn (pers comm.), somewhere in the valleys of the escarpment is a large cave or shelter where some of the few surviving San made their last stand against the *kommando's*.

The Khoisan were gradually driven from the Roggeveld northward to the extent that by 1809 there is reported to have been only one settled "Bushmen" kraal left in the area.

Settlement became more permanent from the beginning of the 19th century. The farmers' main source of income was small stock, since wheat could only be grown with great difficulty in isolated and protected valleys when conditions permitted. There was very little grazing and standing water for cattle.

Schoeman (1986) notes that during the early years of settlement in the Roggeveld, many of the Trekboers lived in grass huts or *Matjieshuise* (mat covered houses), and in tents and some travellers found farmers living in *Matjieshuise* as late as 1839. Attempts at constructing more permanent structures were inhibited by the lack of suitable wood for roofs. The generic house comprised a "small oblong low hut" built of slabs of *leiklip* piled on top of each other, unplastered, with a reed roof. A single window was covered with white linen and a doorway covered with panel of reeds. The floor was of clay smeared with dung. Generally houses comprised two rooms, with an entrance into living room/kitchen and a second room serving as a communal sleeping/storeroom. Some had a free standing *kookhuis*. Associated farm buildings also included the houses of the workers.

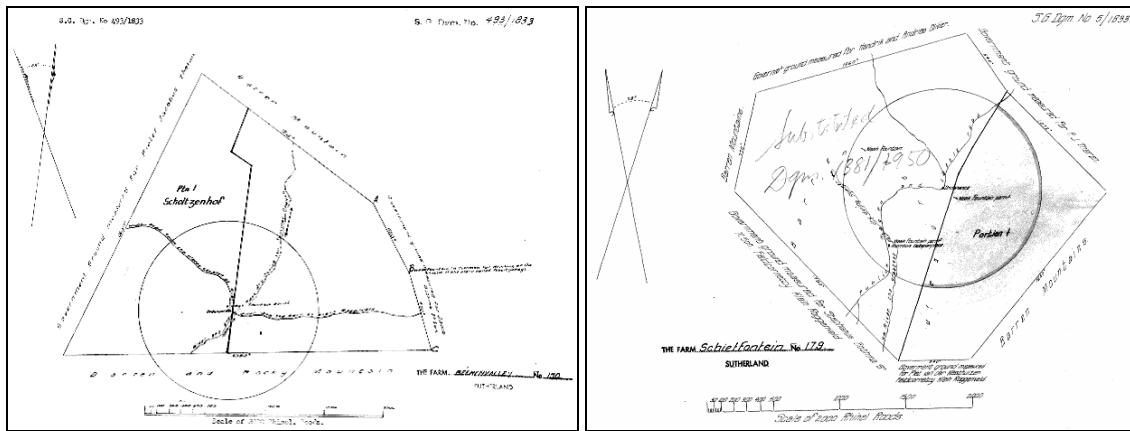
There were also a number of kraals, with seven to eight not uncommon. A number of farm workers were slaves, brought by their owners from the Cape, but also included local Khoisan (Busmen and Khoekhoen) who for one reason or another were no longer pursuing their traditional lifestyles.

During the South African War, the threat of Boer incursions led British forces to build fortifications at a number of strategic passes through the Roggeveld. A stone redoubt was constructed on the farm Gunsfontein (adjoining the proposed wef) at the top of the Brandkloof and Maleishoek passes. With the Boer leader Manie Maritz active in the Calvinia District, many young men from the Roggeveld joined the Boer cause. One of the followers was Jan Fourie of Welgemoed (Schoeman 1986:98). There appears to have been some skirmishes in the vicinity of Skietfontein (Komsberg) in 1901. One of the stone structures located on Beerenvallei during the survey may relate to the Anglo Boer war.

4.4 History of the farms

The archival history of the properties by Ms Harriet Clift is included in Appendix 2. A brief synopsis, with supplementary information from Schoeman (1986) is provided below.

The farms Drie Roode Heuwels, Beerenvallei, Nooitgedacht, Schietfontein, Schalkswykskraal and possibly Tonteldoos have the circular shapes of earlier loan farms included in the 1833 surveys (see Figures 3 and 4 below for examples).



Figures 3 & 4: 1833 survey diagrams of Beerenvallei and Schietfontein showing earlier circular loan farms

A loan farm was given out after a person petitioned the government for permission to use a piece of land. They paid tithes to the government for the use but it was not generally recorded in title deeds with surveyor's diagrams. Many of these loan farms were circular in shape because of a custom that allowed the farmer to take a measurement from a central spot, such as a homestead, spring or rock formation. The walking off distance was regarded as about 750 roods, amounting to an area of around 3000 morgen. Weak springs are at the centres of most of loan farms mentioned above and indicates the importance of even the most meagre water resources on this landscape. Only one spring was identified as being permanent. Hopkins and Marais (2005) list Tonteldoosfontein (1751) and Schietfontein (1758) as two of the early loan farms in the Roggeveld.

Beerenvallei 150 - Portion 1 (Scholtzenhof): Beerenvallei (previously Beerfontein): An early circular loan farm granted to DJ Theron in 1838. It then passed through the hands of a du Plessis and Esterhuysen until the property was subdivided in the 1950's. The survey diagram shows the alignment of the old wagon route linking the farms along the Riet and Keur Rivers with the Klein Roggeveld. The centre of the loan farm was situated at the junction of the wagon route and stream (dry in summer). A weak spring is also situated at the centre of the old loan farm. The farmhouse at Beerfontein is in the process of being restored (Clift pers comm.). It is not shown on the survey diagram, but may date to the early 19th century.

Drie Roode Heuwels 180 - Remainder, Portions 1 and 2 (subdivisions of Portion 2): An earlier circular loan farm granted to SJ Botma (who also owned Schalkwykskraal) in 1838. It then passed into the hands of a Maritz, Moller and de Vos. It was subdivided in the 1930's.

Annex Drie Roode Heuwels 181 – Remainder: Granted to Abraham le Roux (who also owned Schalkwykskraal, Wolvenhoek and Schietfontein) in 1893. This portion of land was originally part of Wolvenhoek and subsequently incorporated into Drie Roode Heuwels.

Nooitgedaght 148: Granted to Jacobus Botma in 1838. In 1889 it passed into the hands of the Marais family. There is a fine old house, a horse mill and several substantial stone kraals at

the werf. An outspan place is also indicated on the survey diagram at the convergence of a number of wagon tracks. The presence of the outspan probably indicates some permanent water. The number of kraals (both extant and old) as seen on the aerial photos would seem to reinforce this conclusion.

Schalkwykskraal 204 – Remainder: Surveyed and granted in 1838 to SJ Botma and JA Victor. It then passed through the hands of Meiring, Paulsen, Esterhuysen, Roussouw, Moller and de Vos. At one stage it was also owned by Abraham le Roux (of Wolvenhoek and Schietfontein).

Schietfontein 179 - Portion 1 and portion 2 (Subdivision of portion 2): Schietfontein was an early loan farm granted to Pieter Hugo in 1758. The survey diagram shows the original circular loan farm centred on a weak fountain and also indicates the position of “Koornhuis Outspanplace” next to another weak fountain. The “publick wagen and cattle road” heading northward to the escarpment crossed the farm. It was first surveyed in 1833 and granted to Petrus Theron. It subsequently passed through a number of hands, including Abraham le Roux (of Wolvenhoek) and Wouter de Vos (of Vanwykskraal) before ending in the hands of the Muller family (who also owned Vanwykskraal). Interestingly, Schoeman (1986) describes “Skietfontein” as originally being called “Komsberg Plaas” logical given its position in relation to the Koms Berg. The portions of Schietfontein identified for the wef is situated to the east of the old wagon road and Outspan.

Tonteldoos fontein 152 - Portion 1 and Portion 6 (subdivision of portion 2): Originally an early loan farm given to Cornelius Coetzee in 1751, it soon passed to Jacob Kruger in 1755. There is a gap in our information until 1838 when it was acquired by Hendrik Olivier. It passed to the Theron family in 1883.

Vanwykskraal 178 – Portions 1 and 2: Only surveyed in 1894, it was granted to Wouter de Vos. It then passed to the Muller family who also owned Schietfontein. The name of the farm suggests that it had links to the Van Wyk family who were one of the earliest families to settle in the Roggeveld in the 1750’s. The farm was sub-divided in 1949 into equal shares amongst all the descendants. The survey diagram for Vanwykskraal (Appendix 1) shows the alignment of the old wagon route to the Roggeveld from Boschmanshoek towards Tonteldoosfontein.

Welgemoed 268 – Remainder: It was surveyed in 1834 and granted to Stephanus Botma, and was retained in the family until 1905 when it is listed as part of the deceased estate of Johannes Botma. Schoeman (1986) describes how a Jan Fourie of Welgemoed joined the commando of Manie Maritz in 1901 and became active during the South African War.

Wolvenhoek 182 - Portions 1 and 2: Surveyed in 1893 and originally granted to Abraham le Roux. Thereafter the property was owned by a number of different families including Theron, Brink and van Wyk. It was subdivided in 1939.

5. FINDINGS

5.1 Palaeontology

The report by Dr J Almond (2010) is a pre-scoping desktop study, originally commissioned by Ms Mary Patrick of Cape Archaeological Survey cc, for inclusion in an EIA for the Mainstream Sutherland wind farm project. Dr Almond states that as the layout of the turbines, road network, transmission lines and other associated infrastructure has not been finalised, these development components have not been considered specifically during this preliminary palaeontological assessment.

The PIA pre-scoping desktop study concluded that: “bedrock excavations made during construction of the proposed wind energy facility southeast of Sutherland will primarily affect continental sediments of the Middle Permian Beaufort Group. These sediments underlie the great majority of the study area and are renowned for their rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (e.g. trackways) and plants (e.g. petrified wood). The upper Abrahamskraal Formation stratigraphic interval represented in the study area is of special palaeontological significance in that it contains a record of extinctions among continental biotas preceding the disastrous End-Guadalupian Mass Extinction Event in the marine realm some 260.4 million years ago. The palaeontological sensitivity of these Beaufort Group rocks is therefore considered to be very high. Caenozoic surface sediments in the study area (e.g. alluvium, colluvium) are generally of low palaeontological sensitivity, but local concentrations of scientifically valuable fossils (e.g. mammalian bones, teeth) may also occur here.

Excavations and other construction work undertaken into Beaufort Group bedrock in order to install the wind turbines and associated infrastructure are likely to expose, disturb, destroy or seal-in valuable fossil heritage. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events. Consequently, the impact from disturbance and/or destruction of valuable fossil heritage of the Beaufort Group bedrock is of high significance, at both local and regional levels”. (Almond 2010).

5.2 Pre-colonial Archaeology

5.2.1 Stone age artefactual material

While scatters of stone artefacts were recorded across the study area, they represent the minority of the heritage sites that we recorded the majority of which are from the historical period. (Figures 5-8 and Appendix 1). All of our conclusions relate to surface observations of heritage material primarily in areas that have been selected as potential turbine sites. We saw no indication, in the form of caves or shelters in the areas that we were able to examine that would lead us to expect significant deeply stratified material anywhere within the wef site. One historic domestic dump associated with a farm and kraal complex on Scholtzenhof boundary may be the exception.

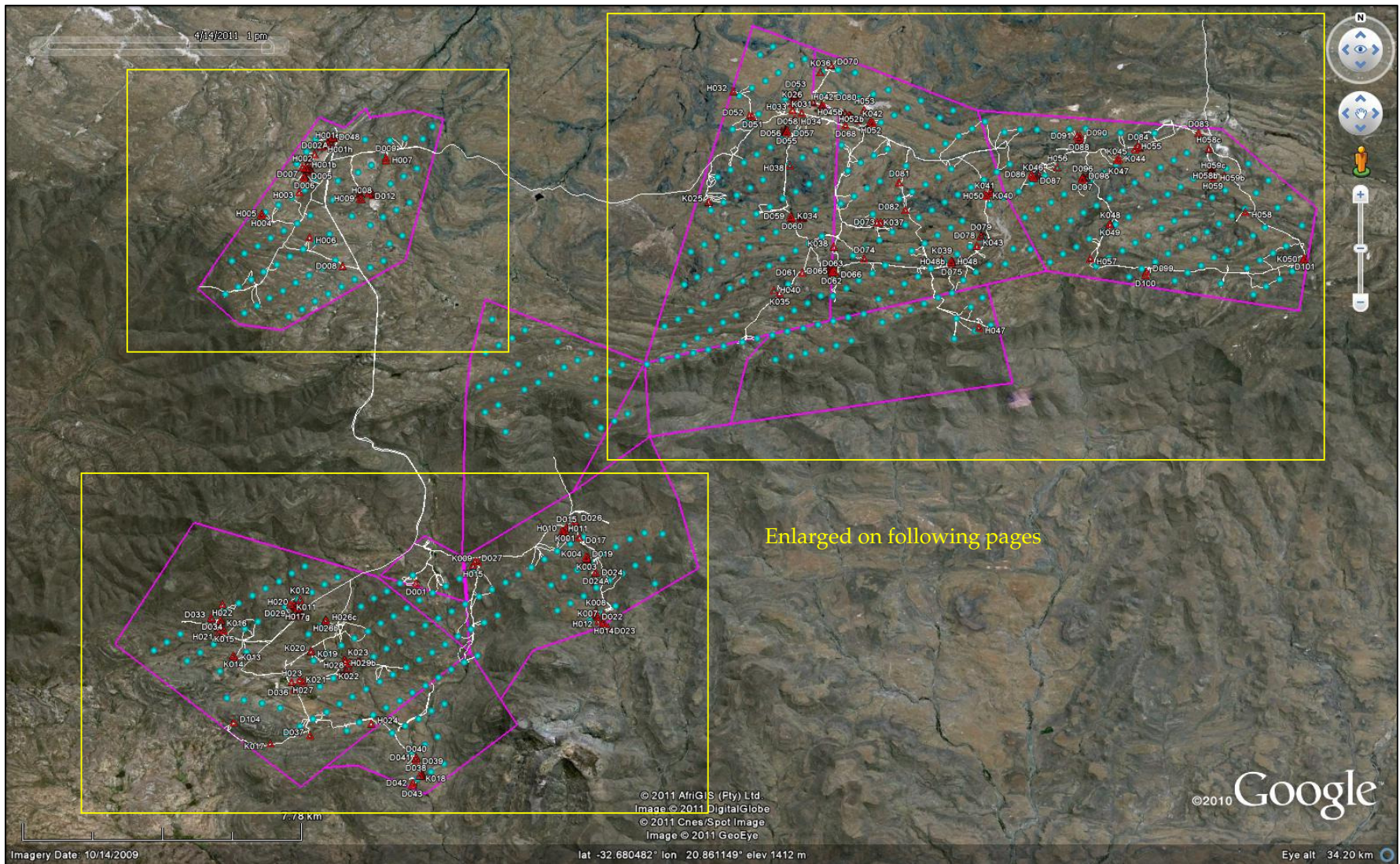


Figure 5: Overall map of property boundaries (purple), survey tracks (white), archaeological sites (red triangles), proposed turbines (blue circles).

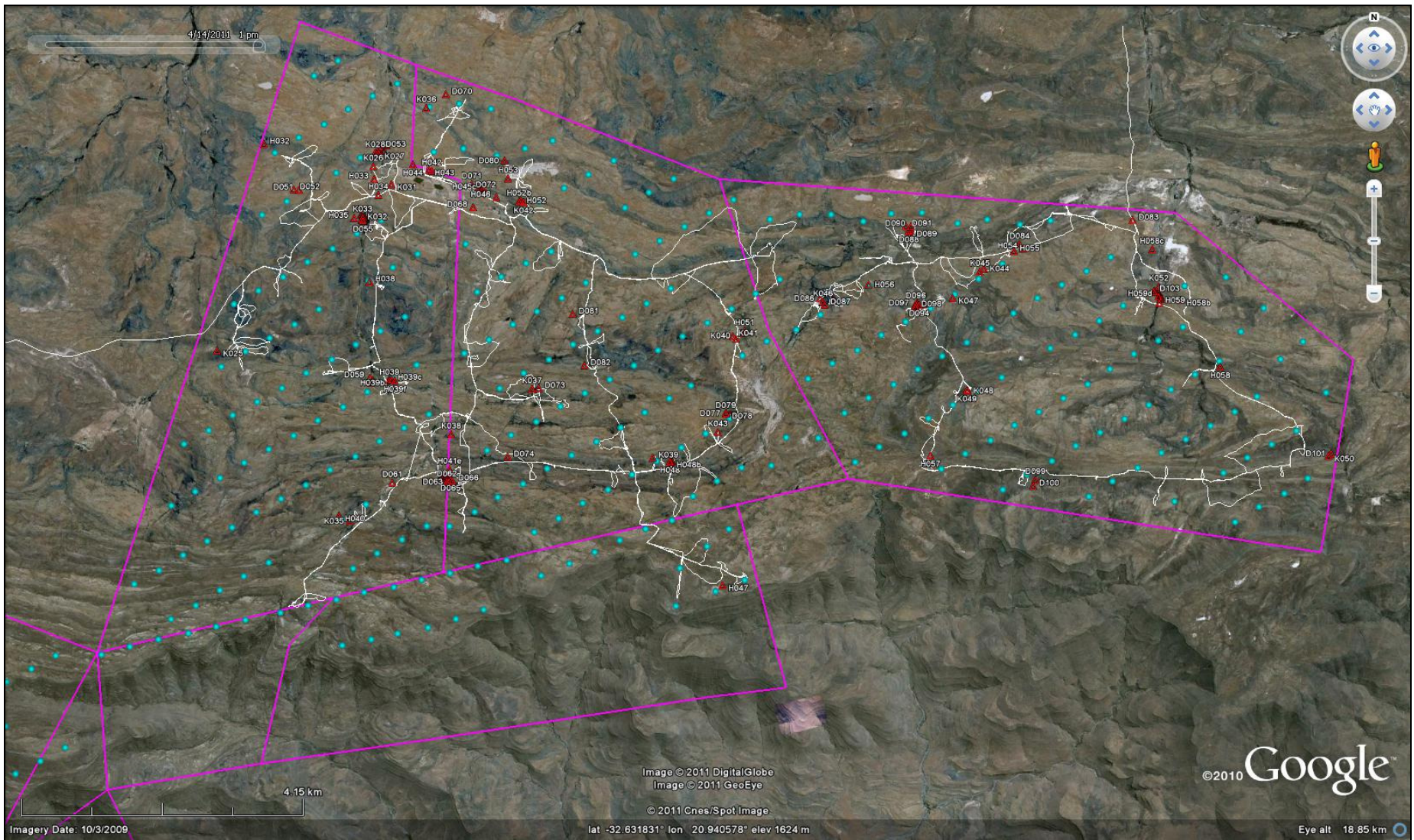


Figure 6: Detail of Scholtzenhof, Buurfontein and Nooitgedagt (upper 3 farms), and Boschmanskloof (lower).



Figure 7: Detail of Theronrus

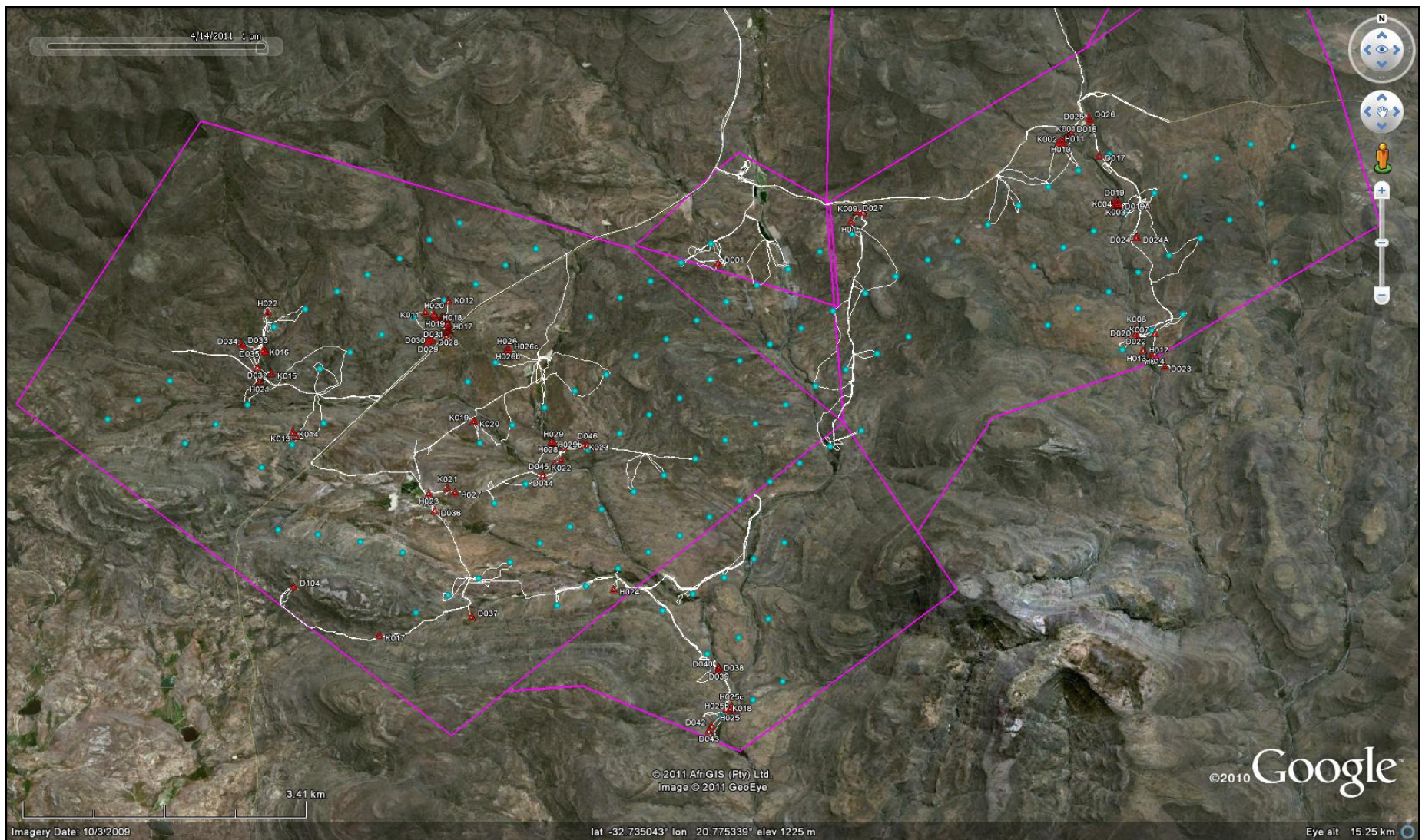


Figure 8: Detail of De Kom (left), Schalkwyskraal (lower m), Welgemoed (upper r)

No associated organic remains were noted with any of the earlier stone scatters, while occasional bone and ostrich eggshell was found with ceramic period sites, believed to date to the last thousand years or so. The virtual absence of well formed caves or shelters is perhaps something of an explanation for the paucity of material, although having said that, we have observed material from the Early, Middle and Late Stone Ages. It must be noted that turbines tend to be on flatter parts of the landscape and may also confine the possibility of stone age observations.

Most of the stone artefactual material we observed can probably be ascribed to the Middle Stone Age (MSA), and include scatters of polished/patinated stone chunks, flakes and cores, (Plate 8) with occasional denticulation noted (Plate 9). Distinctive bifaces representative of the ESA were only seen on one site (Plate 7). Distinctive LSA "thumbnail" scrapers were recovered on only a few sites, but associated indigenous ceramics were also good indications of the presence of LSA material (Plates 10-13). We saw only a handful of well defined LSA sites with relatively abundant artefactual material. These tended to be associated with water sources (springs, pools) and seemed to include indigenous pottery. Raw material was almost exclusively hornfels of various colours in the grey to dark black band and there is a characteristic brown to red/orange patina evident on some of the older worked and unworked material. Yellow chert is also used to a lesser degree and we noted that it seems to have been favoured for thumbnail scrapers. As with other surveys, we found archaeological material around some of the many small pans. This tends to be older patinated material.



Plates 7-9: Weathered Early Stone Age handaxe (l) Characteristic MSA forms with distinctive reddish hornfels patination (m). An old flake with more recent retouch,



Plates 10-11: Late Stone Age material including cores and indigenous pottery found near a grave at D042 (l) and LSA stone artefacts, indigenous pottery and some historical material found at D013.



Plates 12-13: A distinctive perforated lug from the side of a Khoekhoen pot (D013). A large rim sherd from an indigenous pot (K004).

5.2.2 Other pre-colonial indicators

There are very few caves or shelters within the wef area that could have supported occupation (few exhibited any form of sediment trap), and those that do exist, are generally formed in soft rock strata resulting in constant exfoliation. As a result, rock paintings are generally not a heritage indicator of this particular area. We did however find 2 sites which contained “paintings”. The first on the farm De Kom (D104), is an isolated image in red pigment (possibly a human figure) on the side of a very prominent yet isolated aperture in a rock face (Plates 14-15). Open at the top and with signs of water running through it, this would not have been suitable for occupation and no artefactual material was in evidence. The rock here is moderately harder and may be the reason pigment has survived.

The second occurrence is in a shelter (D021) associated with a stone kraal complex (D022) on the farm Welgemoed (Plates 16-17). The rock overhang is alongside the Venter’s River and is probably the best we saw in our 10 days in the field. The “paintings”, though they appear human-like, are in fact vertical daubs of pigment. Virtually the whole rock face is covered with such images. They are probably very late in the painting sequence, possibly associated with Khoekhoen herders. (Smith & Ouzman 2004).



Plates 14-15: A pseudo shelter (D104) on De Kom contains some evidence of rock painting on the adjacent rock face



Plates 16-17: The rock shelter at D021 seen from the distance and a detail of some of the “painting” found on the rock surfaces inside

5.3 Graves

We observed graves at 23 localities, that contained one, or in some cases multiple graves (Appendix 1). Most of these are semi-formal (cairns or mounds with or without head and/or footstones) in groupings seldom exceeding 20 in number, while most contain less than 5. Others are found in formal family graveyards, although only one of these has been recorded on Nooitgedagt (Plate 19). Graves are commonly found near settlements and are usually located in softer soils on river terraces, or other alluvial or aeolian accumulations, a commonly repeated regional pattern. Formal graveyards are easily identified as they are either fenced or walled, whereas informal ones are usually unmarked and often overgrown by bush (Plate 20).



Plates 18-19: (l) A semi-formal graveyard (K021) on De Kom where only 2 of the approximately 6 graves are fenced. Some of these graves also have marine shell scattered on them. (r) The family graveyard near Nooitgedagt (D083)

The headstones on the 2 fenced graves (K021), are not well preserved but the names “Skiffer” and “Van Wyk” are visible (Plate 18). There are 6 other graves surrounding the fenced site. The family graveyard at Nooitgedagt contains the graves of Jacobus Marais 1853-1937; Jacoba Marais 1858-1942, Jacobus Marais 1890-1933; Johannes Marais 1909-1910; Jacoba Marais 1884-1902; Johannes Marais 1881-1902. An unusual stone pile and marker (D075) is believed to be a possible grave but is not a common style of the area (Plate 21). We speculate a possible military link.



Plates 20-21: Approximately 15 overgrown informal graves at (D031) are marked by stone cairns and head and footstones (l). A presumed grave at (D075). If indeed a burial, the style is not one typical in this area and we have speculated a possible military association?

5.4 Built Environment

5.4.1 Farm houses

There are several extant occupied homesteads scattered across the farms that make up the wef site. These include Buurfontein, Scholtzenhof, De Kom, Nooitgedagt, Theronsrust and Welgemoed. Some of these include original farm buildings. Welgemoed and De Kom are cases where newer houses have been erected away from the original werf. In these two cases the original buildings are still in existence and while the one at De Kom continues to be used (Plate 25) (though not as the farmhouse), the original Welgemoed farm buildings, although standing, are considerably neglected (Plates 22, 23).



Plates 22-24: (t) The “original” Welgemoed farm. There may have been an older building near the trees and dam. (l) The old farmhouse and (r) the newer (1960’s?) house.



Plates 25-26: (l) What is probably the original dwelling on De Kom and (r) one of the older outbuildings



Plates 27-28: (l) The farmhouse at Theronsrus and (r) outbuildings.



Plates 29-30: (l) The newer cottage and (r) older outbuildings on Beerfontein



Plates 31-34: (t) Nooitgedagt farm and its extensive stone walled kraal complex. (b-l, m, r) Old house and outbuildings. The building at lower right contains an old horse mill.

In addition to the buildings within the occupied werfs, there are the remains of numerous earlier stone cottages on the farms which for one reason or another, have long been abandoned, and are now in ruinous state (Plates 35, 36). Some of these, along with associated kraal complexes (for example the one at D062) no doubt identify original farm

settlements. In the case of D062, we have identified it as the dwelling of the original loan farm that can be seen on the Surveyor General’s diagram (SG 493/1833; See Figure 3). Other dwellings are less elaborate and may indicate a more transient use of the landscape, stockposts, shepherds huts, windbreaks and the like (for example H006).



Plates 35-36: (l) A small stone cottage with an external *kookskerm* on Theronsrust (H006) and (r) a larger, more formal 3 roomed *langhuis* (D062) on the Scholtzenhof/Buurfontein boundary is the original loan farm. It is associated with a large stone kraal complex.

5.4.2 Kraals

Stone kraals are by far the most distinctive and abundant of the heritage indicators on the wef site. They consist of two apparent types: Earlier types (thought to span the pre-colonial/colonial divide and associated with Khoekhoen herders), consist of low, crudely packed, semi circular walls made of boulders placed up against rock ledges (Hart et al 2010) (Plate 37). These walls seldom achieve any height, are never very large and are frequently associated with smaller enclosures, often attached, that are believed to represent *lammerkraals* (lamb kraals). Later kraals (colonial period) are often square/rectangular with well constructed walls using flatter rock slabs (Plate 36). These are often in excess of 1 - 1.5 meter and usually associated with identifiable settlements (eg Plate 38). In some cases kraals are 3 sided (Plate 40), placed up against natural rock ledges as with the earlier types although the majority are free standing (Plate 21). Smaller enclosures are often found within or attached to the outsides. Round free standing stone kraals are less common though a good example is to be found at D088 on Nooitgedagt (see Plate 3). Kraals of both types can be on sloping ground and this does not seem to have detracted from their purpose.



Plate 36-37: A large free-standing square stone kraal with well preserved walls on Welgemoed (H015); A semi circular stone kraal built against a ridgeline (K053). The informality of the wall/s is distinct. Since these are often against ridgelines, they often occur on angled scree slopes.

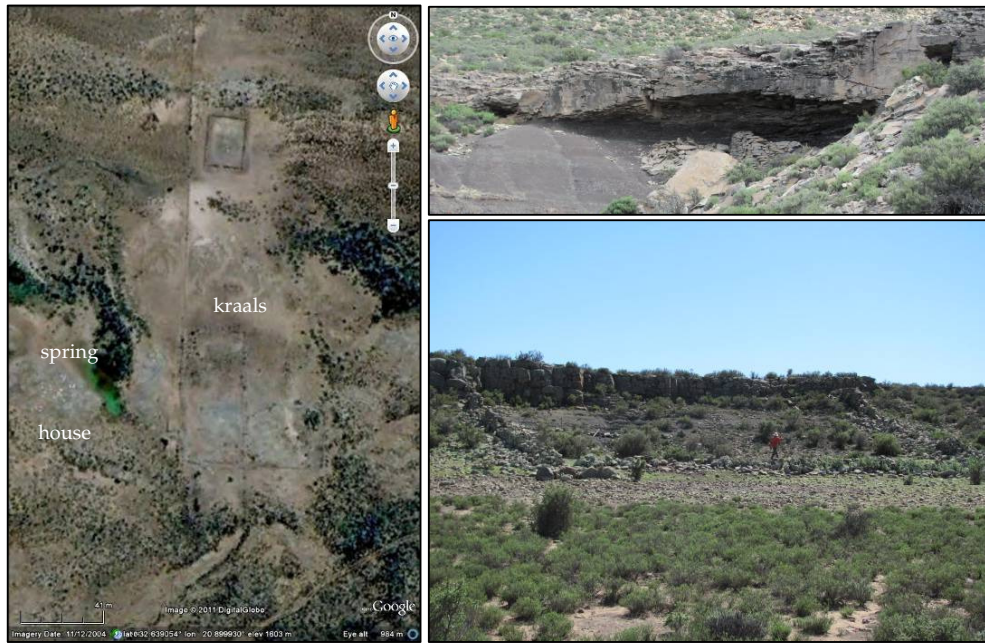


Plate 38-40: (l) An aerial view of the kraal complex, house (just south of the spring) and spring of the old loan farm (D062) on the Scholtzenhof/Buurfontein boundary; (ur) A small kraal/dwelling constructed within an overhang at (D100). This was the only example of such an “internal” structure that we observed. (lr) A large rectangular stone kraal (H046a) on Beerfontein is built up against a ridgeline.

5.4.3 Other stone structures

Boundary markers are relatively common and are reminders of the pre-fenced landscape. These can take the form of simple stone piles at strategic points, or can be quite elaborate structures (mostly square) but circular have also been observed (Plates 41, 44). In some cases they are built at regular intervals across the landscape, while in others they seem to mark corners of the old farms. An extensive wall alignment on Theronsrus seems to have been used to demarcate a section of the farm (Plates 43-45). This was the only observation of dry stone walls being used in this way, a very labour intensive undertaking. Some apparent boundary markers seem to have additional functionality and have cavities and openings in them. It is not clear if these are ovens or traps (eg. Plate 42) and not markers at all.



Plate 41-43: H033 property marker, K026 beacon/trap? Extensive boundary walls H001/D002 Theronsrus



Plate 44-45: D003 square boundary marker close to wall, boundary walls H001 /D002

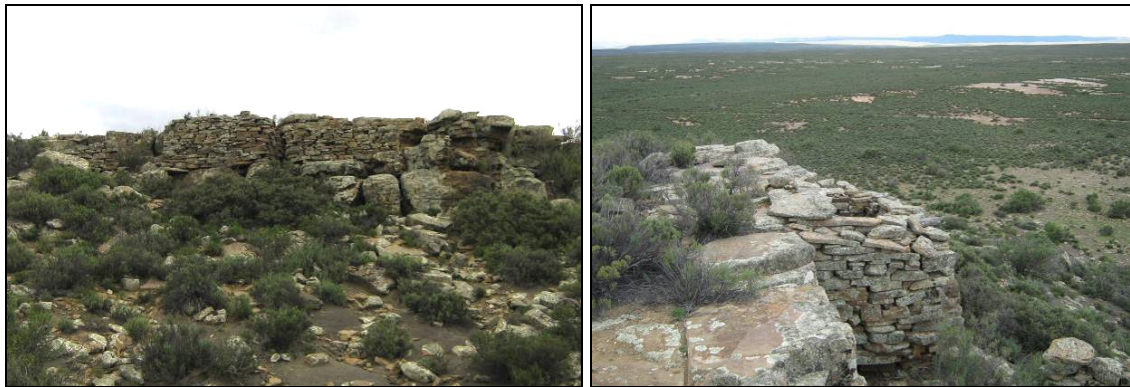


Plate 46-47: Well camouflaged stone structures as seen from below and above, built against ridgeline (D076) on Beerfontein. While we cannot say with certainty that this is a lookout post, it is unlike any other stone structure seen in the area, and its location and construction are in our opinion, moderately unusual.

Finally, we have observed a stone structure on the side of a cliff on Beerfontein, that is unlike any other location we have seen for such stone structures. Slabs of stone were carefully placed to span the gaps between boulders and rocks and these in turn formed a level surface on which to erect stone walls forming 2 small *skuilings* with a third walled area (more kraal-like on the southern end (Plates 46, 47). The stone is well laid with an almost formal bond, although no cement or mud has been used. While we cannot be absolutely sure of its intended use, its placement and construction could indicate a possible military connection (Anglo Boer War?), possibly used as a lookout post given its view out over the plains. Whether intended or not, when viewed from a distance or from below, no portions of the walls protrude onto the skyline and the walls blend with the surrounding rocks to effect perfect camouflage. We have not had time to research this fully, but we do know the area saw active conflict between forces of the two sides in the conflict. The site itself is not directly threatened and so this can be pursued later if necessary.

5.5 Cultural Landscape

The site, which straddles the great escarpment, lies entirely on privately owned farmland. Some farms are accessible from the old Komsberg secondary road, and the farms De Kom and Theronsrus in fact straddle that road. Most of the other farms are remote and only

accessible from dedicated farm roads, many of which are in poor condition, made worse by recent heavy rains.

Above the escarpment (the Komsberg) the Karoo is characterised by low hills, higher kopjes, shale ridges and broad plains. Human settlement is sparse, even today. Although technically all the land is zoned agricultural, in real terms it has the character of a wilderness. Occasional old farm houses, graves, stock posts with wind pumps and reservoirs, dry stone kraals, fences, boundary walls and beacons (property markers), clumps of exotic vegetation and tracks are the only apparent elements of human modification of the landscape and are the predominant heritage indicators. The treeless environment on the escarpment is windswept and harsh, with winter temperatures falling to well below freezing point. Game is present in the form of small herds of Vaal rhebok which are seen from time to time, as well as rock hyrax, steenbok, and judging by the spoor observed, several species of carnivore. The sense of solitude and wilderness is profound in places. The view from the edge of the escarpment to the south is dramatic, with vistas of distant hills, mountains and valleys.

Below the escarpment there are numerous small valleys where rivers have incised themselves into the landscape bringing, as they do, the runoff from the plateaux. The Venter's River traversing the farm Welgemoed, and the Komsberg River traversing the farms De Kom and Schalkwykskraal, along with many feeder channels, form major features on the landscape. The Venter's River seems to have been particularly favoured for small stockposts which by virtue of kraal construction type and associated artefacts may date to the transitional period following the earliest colonial incursion into the area. Exotic vegetation is found in more abundance along these rivers, with Acacia more prevalent along the banks of the Komsberg River, while stands of willow(?) and poplar can be seen intermittently along the Venter's marking the location of small settlements.

The cultural landscape of the study area is remarkably intact and deeply layered. The traces of Khoekhoen settlement as remarked on by Sampson and others is visible on both the upper and lower parts of the study area in the form of distributions of dry walled kraals and associated material as well as sites which do not appear to have associated kraals. The layering of colonial settlement is visible from farmyards complete with multiple phases of building ranging from early 18th - 19th century. The surveyor general diagrams further reinforce the layering often showing the positions of the original circular loan farms encapsulated within the more familiar polygonal outlines of the modern land parcels.

In terms of cultural landscape, the study area and environs is highly significant, and contains sites of academic research potential. Our experience with this and neighbouring projects has shown that there is a particular cultural landscape signature in this. One hesitates to say unique, although the particular landscapes have contributed to the particular signature. Parts of that signature are ephemeral and fragile.

6. IMPACT IDENTIFICATION AND ASSESSMENT

In assessing impacts it must be remembered that many of the locations are notional and will only be finalised after all the specialist studies are taken into account. Our assessment of

impact is therefore largely based on the turbine and solar array placements presented to us for the EIA study.

6.1 Turbines and solar arrays

Palaeontology: Any deep excavation has the potential to impact palaeontological material. Deep turbine foundations may well intersect fossil deposits but as there has been no specific field assessment of the wef site and so it is not clear how to gauge the potential impact.

Archaeology: Scatters of stone age implements were observed, mainly in proximity to water sources. Although some may be impacted by construction activities, in general, the stone scatters are for the most part considered to be of minor significance (with some exceptions - mainly more recent LSA sites). The older scatters are probably not in original context, and are not associated with organic remains such as bone, which could provide valuable information on prehistoric lifeways. However, it is important to note that little is known about the distribution of the Early and Middle Stone Age in the dry interior of South Africa and so in this regard, all field observations on the distribution of such material assists with the compilation of the national database. Stone artefact scatters associated with indigenous pottery probably mark the presence of Khoekhoen in the area in pre-colonial times. We observed very few such sites but they will enjoy moderately higher significance. Also of higher significance, are the scatters of colonial artefacts found around old settlements. Of particular importance are the few concentrated domestic dumps that are likely to contain significant artefact numbers. Analysis of such dumps will reveal possible clues to interaction with the distant colony and indigenous groups.

Built Environment: There are a number of extant buildings on the farms. Some are presently occupied and are not endangered by construction activities. A number of disused dwellings are also found. The old farm complex at Welgemoed is relatively intact though somewhat neglected. Other farm ruins are scattered throughout the affected area and range from simple shepherds huts, to the ruins of the house of the old loan farm on Beerfontein. These are all considered to have some heritage significance particularly if part of a complex of associated features, for example the ruins, kraals and boundary walls at Theronrus. There are quite a number of other collapsing stone structures, including kraals, property markers, walls, wind breaks, ovens that were recorded. They too have some heritage significance. All of these features will require some form of mitigation, in some cases avoidance, while in others documentation and recording.

Graves: Apart from the formal graveyard on Nooitgedagt with elaborate inscribed headstones, we recorded numerous informal graves marked either by stone cairns or by rough head/and or footstones of locally available rocks (Appendix 1). In some cases informal graves were found close to obvious settlements while in others, as far as we could determine, appeared to be somewhat isolated. On De Kom we found a small, mostly unfenced graveyard with cement headstones on 2 of the graves. Marine shell was observed on some of these graves, a fairly well documented practice amongst rural communities even to this day. Graves tend to be in softer sediments and so are often found along rivers or on alluvial fans. We can be sure that there will be more graves in the study area and there is a high

probability that unmarked graves will be uncovered during the construction phase, particularly when close to river beds and/or old settlements. Graves are considered of high significance in terms of the NHRA and their destruction needs to be avoided where possible.

Cultural Landscape: Although the turbines and solar arrays will not be visible from the N1 highway, they are located on either side of a minor gravel secondary farm road meaning that visual impacts, will occur, albeit limited. In our opinion, the wind turbines and associated infrastructure will have an overall negative impact on the cultural landscape of the Karoo in this area. The visual impact is being addressed as a separate specialist study. While the turbines may later be removed, the provision of associated infrastructure is likely to leave indelible scars on the landscape.

Final turbine and solar array layouts must be assessed during the EMP.

6.2 Substation/s

No layouts were provided at time of survey and could therefore no specific positions could be assessed. The range of potential impactable heritage would be as for the turbines and solar arrays. Final substation layouts must be assessed during the EMP.

6.3 Connecting electrical lines

No layouts were provided at time of survey and could therefore not be assessed specifically. It is not clear if the cable trenches will intersect any major fossil bearing strata or sediments, but this should be ratified by the palaeontologist. Final layouts must be assessed during the EMP.

6.4 Access Roads

No layouts were provided at the time of survey, and could not be assessed specifically. As turbine positions are notional, road layouts are in any event likely to change. Roads will certainly have the most significant impact on archaeological sites, graves and the built environment (as described in section 6.1 above), particularly where they cross or run closely parallel to river/stream courses. Final road layouts must be assessed during the EMP.

Table 2: The potential impact of construction of turbines, substation, access roads and power line/s on the palaeontological heritage of the study area (Dr Almond needs to formulate a table)

	Without Mitigation	With Mitigation
Nature/Type	Unknown	Unknown
Extent	Unknown	Unknown
Duration	Unknown	Unknown
Probability/likelihood	Unknown	Unknown
Significance	Unknown	Unknown
Irreplaceable loss of resources?	Unknown	Unknown
Can impacts be mitigated?	Unknown	

Mitigation: Mitigation of palaeontological heritage can be achieved by ensuring that trenches and deep rock excavations are checked by a palaeontologist. The collection of new scientific information is a positive impact. The palaeontologist should comment on the possibility of surface palaeontological occurrences.
Operational Phase: n/a
Decommissioning Phase: n/a
Cumulative impacts: n/a

Table 3: The potential impact of the construction of the turbines, substations, access roads and power line/s on the pre-colonial and colonial archaeology of the study area

	Without Mitigation	With Mitigation
Nature/Type	Negative & Direct	Neutral
Extent	On-site	On-site
Duration	Permanent	Permanent
Probability/likelihood	Definite	Unlikely
Significance	Major	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation of the pre-colonial and colonial archaeology should involve micro siting turbine positions during the EMP. If micro siting is not an option, then some physical mitigation may be required (excavation/collection). A permit may be required from HWC in order to undertake such mitigation		
Operational Phase: Unlikely		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 4: The potential impact of the construction of the turbines, substation, access roads and power line/s on the built environment of the study area

	Without Mitigation	With Mitigation
Nature/Type	Negative & Direct	Neutral
Extent	On-site	On-site
Duration	Permanent	Long-term
Probability/likelihood	Definite	Definite
Significance	Major	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Mitigation of the built environment should involve micro siting turbine positions during the EMP to avoid placing turbines or infrastructure directly over built environment features or bisect coherent settlement complexes.		
Operational Phase: Possible if re-use of old buildings (Welgemoed)		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 5: The potential impact of the construction of the turbines, substation, access roads and power line/s graves in the study area

	Without Mitigation	With Mitigation
Nature/Type	Negative & Direct	Neutral
Extent	On-site	On-site
Duration	Permanent	Long term
Probability/likelihood	Likely	Unlikely
Significance	Major	Minor
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	n/a
Mitigation: Once the exact positions of infrastructure is known, a more detailed assessment of the access and construction roads, laydown areas, substation positions and cable routes needs to be undertaken to identify all marked graves within the affected areas. In the case of unmarked graves, there will need to be a protocol in place in order to deal with them on a case by case basis if and when discovered in the course of construction. Heritage Western Cape would be notified immediately if a burial/human remains are uncovered during the construction phase. Work in the specific area must stop pending inspection and mitigation as required.		
Operational Phase: n/a		
Decommissioning Phase: Possible during rehabilitation activities		
Cumulative impacts: Minor		

Table 6: The potential impact of the construction of the turbines, substation, access roads and power line/s on the Cultural Landscape of the Study Area.

	Without Mitigation	With Mitigation
Nature/Type	Negative & Direct	Negative & Direct
Extent	Local	Local
Duration	Long term	Long term
Probability/likelihood	Definite (temporary)	Definite (temporary)
Significance	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	No
Mitigation: A suggestion may be for any required facilities on site to be placed in a way that avoids visual clutter		
Operational Phase: See above		
Decommissioning Phase: None		
Cumulative impacts: Although we have no definite information, we believe there are at least 6 applications for wind energy facilities in the Sutherland area. It is unclear which, if any will be constructed and so it is difficult to fully assess the cumulative impact. Logically though, the erosion of the cultural landscape would be progressive and possibly worsened by the clustering of facilities.		

7. CONCLUSION AND RECOMMENDATIONS

7.1 Palaeontology

Dr Almond made the following recommendations in his initial report:

1. Before any major construction (*i.e.* substantial bedrock excavation) commences a thorough field survey of representative natural and already existing artificial rock exposures (*e.g.* dams, road cuttings, quarries, streams, steeper hill slopes) within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of high palaeontological sensitivity on the ground.
2. On the basis of the initial field scoping, a realistic, collaborative mitigation programme and protocol should be drawn up by the palaeontologist in conjunction with the developer and SAHRA/Heritage Western Cape so that any important fossil heritage on site may be conserved cost-effectively. This mitigation would normally involve the recording and judicious collection of fossil material within the development area as well as the recording of relevant geological data, before or during the construction phase of the development. The palaeontologist involved in mitigation work will be required to obtain a palaeontological collection permit from SAHRA/Heritage Western Cape and to arrange a suitable repository for any fossils collected (*e.g.* MacGregor Museum, Kimberley or Iziko: South African Museum, Cape Town).

Note that for those sites or areas of inferred high palaeontological sensitivity, repositioning of infrastructure should not be necessary except in exceptional cases, but selective monitoring of substantial excavations during development by a specialist palaeontologist might be required.

Should further substantial fossil remains be exposed during construction, these should be recorded (*e.g.* photographed, with GPS location) and safeguarded by the responsible ECO, preferably *in situ*. Heritage Western Cape and/or a qualified palaeontologist should be alerted as soon as possible so that any appropriate mitigation measures can be considered.

7.2 Archaeology

The archaeological component spans 2 very different periods. On the one hand there are Stone Age sites, predominantly ephemeral scatters of stone artefacts from the Middle Stone Age, and scatters of stone artefacts sometimes with indigenous pottery from the Later Stone Age. We believe there is a tendency for these to be near water, but a true pattern will only be obvious at a much more detailed level of survey. On the other hand there are the colonial period sites (farm complexes, ruined stone structures, kraals, beacons, graves etc) that appear to be found in proximity to rivers or other types of water sources. The older kraals are often very specifically sited against rocky ridgelines whereas the angular types, probably more recent, can be found in almost any context. Associated cairns/graves are found in the soft soils on the margins of the river beds, or on other types of alluvial or aeolian sediment

accumulations.

While turbines may be micro sited to avoid impacts to heritage resources, the extensive road construction component probably poses the greatest risk to all forms of physical heritage sites within the project area and the proposed routes will need to be carefully assessed when finalised at the EMP stage.

Although some Stone Age artefactual material was found as seemingly discrete artefact scatters in the study area, a lot of it is likely to be of little scientific value given that they are probably no longer in primary context and not associated with associated organic remains. Nevertheless archaeologists have a very limited knowledge of the distribution of the ESA and MSA in the dry interior of South Africa and this must be taken into consideration. Mitigation is feasible for turbines and infrastructure components. If any mitigation, in the form of archaeological excavations or collection is required, then permits must be obtained from HWC or SAHRA depending on which province is affected.

As a general comment, areas along river banks, and valleys appear to have been the focus of settlement during the last two centuries (see Appendix 1). Graves also tend to be located close to settlements, and in addition to the identified ones with typical surface identifiers such as cairns and/or head stones, there are likely to be others that never had any, or which have been lost over time. There is a much greater possibility of encountering burials from the colonial period than those from the pre-colonial past given the perceived differences in population sizes. If human remains/burials are uncovered during the construction phase, work in the specific location should cease, and HWC/SAHRA should be notified. They would in all likelihood request an archaeologist to investigate and implement mitigation, in the form of exhumation. The mitigation of human remains from the colonial period requires a permit to be issued by the SAHRA Burials Unit. A protocol as to how to deal with burials if they are found during the construction phase must be in place prior to the commencement of construction activities.

7.3 Visual impact

The visual impact of the turbine and infrastructure will be assessed as part of the Visual Impact Assessment to be included within the EIA document.

8. LIST OF DEFINITIONS AND ABBREVIATIONS

Archaeology: *Remains resulting from human activity which is 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.*

Early Stone Age: *The archaeology of the Stone Age between ~700 000 and ~300 000 years ago.*

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).*

Holocene: *The most recent geological time period which commenced ~10 000 years ago.*

Late Stone Age: *The archaeology of the last ~20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between ~300 000 and ~20 000 years ago associated with early modern humans.*

National Estate: *The collective heritage assets of the Nation.*

Palaeontology: *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.*

SAHRA: *South African Heritage Resources Agency – the compliance authority which protects national heritage.*

Structure (historic): *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. Protected structures are those which are over 60 years old.*

Acronyms

BP	Before the Present
DEA	Department of Environmental Affairs
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act, No 25 of 1999
SAHRA	South African Heritage Resources Agency

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APPENDIX 1: HERITAGE SITES RECORDED DURING THE SURVEY

Buurfontein - BF; De Kom - DK; Theronsrust - TH; Boschmanskloof - BM; Nooitgedagt - NG; Schalkwyskraal - SK; Scholtzenhof - SF; Welgemoed - WG

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
TH	D003	-32.614626	20.745371	marker	Solid square stone structure: beacon/boundary marker?	med
TH	D004	-32.615818	20.743731	"	Stone marker, part of long line of similar	"
TH	D005	-32.615873	20.743638	"	Stone marker, long line part of long line of similar	"
TH	D006	-32.616012	20.743452	"	Stone marker, long line part of long line of similar	"
TH	D007	-32.616091	20.743353	"	Stone marker, long line part of long line of similar	"
TH	D008	-32.638279	20.75483	marker	Area with several stone "fence" posts.	med
TH	D009	-32.611112	20.7675	isolated artefact	Isolated stone artefact: core near T475.	low
TH	D010	-32.620008	20.763399	artefact	Small open area in front of rock wall/ledge. Three fragments of Khoekhoen pot (thumbnail size) but no other material (??)	med
TH	D011	-32.620525	20.763761	features	Dam, stone walls, furrow, etc.	med
TH	D012	-32.62005	20.762448	artefact scatter	Small scatter of patinated hornfels in open area next to "furrow". MSA (?). One chert/ccs thumbnail scraper (LSA). One chert flake, one chip, one hornfels flake with retouch.	med-high
TH	D002	-32.611697	20.744709	stone wall	Stone boundary wall, extensive curvilinear feature dry stone, double faced with large irregular blocks and small stone inner core; c0.6m wide, surviving to ~ 1.2m high in places	high
TH	D002a	-32.610359	20.746495	"	Another point on stone wall.	"
TH	D002b	-32.614344	20.745548	"	Another point on stone wall.	"
TH	H001	-32.612705	20.74444	"	Boundary wall:	"
TH	H001b	-32.613755	20.743807	"	Point on boundary wall	"
TH	H001c	-32.613948	20.7438	"	Point on boundary wall	"
TH	H001d	-32.614064	20.744336	"	Point on boundary wall	"
TH	H001e	-32.607817	20.750347	"	Boundary wall: continuation of 001; at 001h wall turns to SW to meet with point 001	"
TH	H001f	-32.608137	20.749503	"	Boundary wall: continuation of 001; at 001h wall turns to SW to meet with point 001	"
TH	H001g	-32.608433	20.748663	"	Boundary wall: continuation of 001; at 001h wall turns to SW to meet with point 001	"
TH	H001h	-32.608415	20.748506	"	Boundary wall: continuation of 001; at 001h wall turns to SW to meet with point 001	"
TH	H002	-32.613635	20.742925	isolated artefact	Quartzite core: several flakes removed, some hinged/stepped flake scars	low
TH	H003	-32.619813	20.742012	stone dwelling	Shepherds hut: round in plan, 2m diameter; dry stone, two faces of irregular stone blocks with a small stone core; 0.6m thick walls surviving to height of 0.8m; dry stone semi-circular windbreak running N-S immediately outside NE facing doorway	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
TH	H004	-32.625458	20.73073	marker	Beacon/ property marker: square in plan, 1m x 1m by 1.5m high; dry stone built with irregular sandstone(?) blocks	med
TH	H005	-32.625192	20.731092	marker	Beacon/ property marker: remnants of structure similar to H003; survives to less than 0.4m in height	med
TH	H006	-32.63113	20.74504	stone dwellings w assoc artefacts	2x shepherds dwellings, both built with selected tabular sandstone blocks: westernmost - oval in plan, 3m x 2m (internal dim.) by c. 2m high; walls built with mud mortar that only survives in wall-core; dry stone windbreak outside NE facing entrance; small kraal to W of windbreak. Easternmost - rectilinear room adjacent to semi-circular room to east, overall dimensions of 7.5m E-W by 3m N-S; dry stone built with similar blocks, 0.5m thick surviving to ~1.2m in height; internal niche and shelf part of construction. Associated finds include brown and white porcelain; metal tin; clear, green and purple glass; shotgun shell cap (Remington)	high
TH	H007	-32.61186	20.76756	isolated artefacts	3x chert flakes	low
TH	D013	-32.620341	20.76012	artefact scatter	LSA scatter in V-shaped area surrounded by rocky outcrops. Cores, flakes, hornfels chips, grey chert. One nice blade with possible bifacial retouch. Several Khoekhoen potsherds. Also some blue medicinal glass, white ref earthenware. Pottery ~5mm thickness, red outer, dark inner. Not very dense but area is on slope. Some material dug up by the furrow excavation at base of slope. Two ostrich egg shell fragments.	high
TH	D014	-32.62033	20.759672	stone walling	Small semi-circular stone wall up against rock face.	low
TH	H008	-32.621561	20.760401	artefact scatter	Stone artefacts and pottery scatter: 6 Khoekhoen sherds, small ccs flake and anvil stone – smooth facet with several pit marks; area to S of low E-W ridge, tool scatter to N of ridge recorded as D-013 and D-014	high
TH	H009	-32.621433	20.759996	“	Continuation of scatter H008. 7 pot sherds; 4 flakes	“
TH	H030	-32.606403	20.752237	stone kraal	Kraal: rectangular in plan with regular well defined right-angles, 40m x 17m; dry stone built with sub-soil foundations of large blocks; mainly foundation surviving	med
TH	H031	-32.607355	20.751325	stone kraal	Kraal: relatively large, ~40m N-S x 35m E-W; dry stone built with irregular blocks on SE facing slope; part of wall survives ~2m high	med
TH	K024	-32.605884	20.752254	stone kraal w artefacts	Stone kraal complex, eastern and southern walls collapsed. Overlooking road and Muller's farmhouse and dam. Lots of 18 th c (or later ginger jars) ceramics present, stoneware, pottery, glass, bone and other kraals nearby. Also lots of ostrich egg shell. Probably a house her at one time.	high
TH	D047	-32.606149	20.751899	kraal complex w artefacts	Scatter of bone, ceramics, ostrich egg shell, in amongst kraal complex. Ceramics included several 18 th c sherds (or later ginger jars), also salt glaze stoneware.	med-high
TH	D048	-32.606058	20.751824	stone kraal	Square/rectangular kraal with dividing wall.	high
TH	D049	-32.606504	20.751164	stone kraal	Big circular kraal on hill top.	high
TH	D050	-32.606208	20.750982	stone structure	Small stone structure on top of koppie.	high
WG	D001	-32.717572	20.776039	stone structure	Small stone windbreak 3 sided.	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
WG	H010	-32.704516	20.81971	marker	Property marker / beacon: dry stone built; rectangular in plan, 1m x 0.7m by 1.1m high	med
WG	H011	-32.704597	20.819465	marker	Property marker / beacon: dry stone built; similar to H-010 above but more substantial, 1m x 1m by 1.6m high	med
WG	H012	-32.727024	20.830344	stone kraal	Kraal: dry stone built with irregular sub-rounded boulders; rectangular in plan ~23m x 12m; west of river and south of D020 and D021	med
WG	H013	-32.727627	20.831495	stone dwelling	Shepherds hut: rectangular in plan; dry stone built with irregular sub-angular blocks, with windbreak immediately outside hut entrance to the East; associated white ceramic and glass; kraal H-014 to NE	med
WG	H014	-32.727355	20.831834	stone kraal	Kraal: dry stone built with irregular sub-angular boulders; rectangular in plan ~30m x 20m; entrance to S; further smaller kraal to SSE	med
WG	H015	-32.713094	20.793002	stone kraal	Kraal: dry stone built with irregular sub-angular blocks and selected tabular blocks; substantial in size with walls surviving to 1.7m in height, ~20m E-W x 13m N-S. Similar size kraal with less substantial walls immediately to N, with small hut and windbreak in its SW corner (adjacent to NW corner of main kraal)	med
WG	K001	-32.704117	20.820358	stone kraal	One wall of a kraal associated with farmstead at bottom of slope immediately above river. Rest of wall collapsed. White ceramic fragments. 20m above kraal.	med
WG	K002	-32.704638	20.820013	stone kraal	Large square kraal ~25m above river on opposite bank of K001.	med
WG	K003	-32.71126	20.826742	stone kraal	Circular kraal (~17m diam.) built against slope in river valley ~30m from river up the slope; wall 0.5m high. Adjacent to another larger kraal (D018) which has 18 th c ceramics (or later ginger jars). These both occur about 2km from farm up river. Not known whether these structures are associated with farm or not.	med
WG	K004	-32.710973	20.82702	artefact scatter	Further down slope just above river is Khoekhoen pottery, 19 th c ceramics, chert flake, glass and bone. Pottery finely made with rim and large fired pieces, possibly whole pot present. Also possible grindstone and ostrich egg shell fragments.	high
WG	K005	-32.71132	20.827059	grave	Mound of stones, probable grave marker. Also ceramics (annular ware) next to graves.	high
WG	K006	-32.711334	20.82703	grave	Mound of stones, probable grave marker. Also ceramics (annular ware) next to graves.	high
WG	K007	-32.725174	20.831874	stone dwelling?	Small stone walled structure 1x1m and 50cm high. Either boundary marker or small hut, has floor surface inside with wine bottle. About 7m from road.	med
WG	K008	-32.72463	20.82948	stone kraal w artefacts	Circular stone wall 2m diam. Probably small kraal, wall 0.5m high. Ceramic fragment - white, indistinguishable. Glass container with "zink-pyn specific (Handels Merk...)" written on it. Ceramics include annular ware.	med
WG	K009	-32.712086	20.794546	stone kraal w artefacts	Circular kraal 70cm high and 10m diam. Smaller <i>lammerkraal</i> within circle, White ceramic, high fired. Situated about 1km from Welgemoed farm.	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
WG	D015	-32.70371	20.820793	grave	Grave, single stone marker, near D016, hard ground though.	high
WG	D016	-32.703555	20.820985	stone structure w artefacts	<i>Trapvoel?</i> /circular kraal. Stone walls around it, collapsed. Low? Also small circular structure - windbreak? Semicircular, ~1.5m diameter with entrance. Some ceramics, glass and marine shell nearby. Simple enclosure. Looks like new structure on end of kraal, 8m long and 3m wide. Tins, clear glass, bone, but no apparent dump. Welgemoed farmstead nearby.	high
WG	D017	-32.706032	20.824617	marker	Stone markers, whole line, at least 6 to right hand side and at least one visible on left hand side.	med
WG	D018	-32.711583	20.827036	stone kraal w artefacts	Stone kraal on edge of stream in ravine. Two 19 th c (one annular), one 18 th c porcelain (or later ginger jars), also blue and purple glass shards.	med
WG	D019	-32.710988	20.826587	stone walling?	More crude stone walling - does not appear to be a kraal, incomplete.	med
WG	D019a	-32.711217	20.827155	grave w artefacts	Grave, with well packed stone covering. Bone (sheep?) and ceramics in vicinity. Another two graves about 15m to the right (K005-6). Nearby is an 18 th c ceramic pipe stem.	high
WG	D020	-32.725549	20.829521	stone kraal	Kraal (kraal 2) crude stone walling on 3 sides butting sheer rock wall. Rectangular rock packing in crevices, big rocks at base (foundation).	med
WG	D021	-32.725911	20.829601	rock "paintings"	Rock shelter/rock wall with "painting". Many vertical finger daubs. Rock wall about 15m wide. Almost no archaeology - some ostrich egg shell, no stone. Near kraal D022. Lots of animal bone. Very close to river.	high
WG	D022	-32.725209	20.829429	kraal complex w artefacts	Small structure (hut) nearby some ceramics (annular type) and some plain porcelain. Small circular kraal attached. Downstream are other kraals (large) and in distance are thick tree groves and what look like stone ruins. Absence of stone age is surprising!	high
WG	D023	-32.728761	20.833163	stone kraal	Kraal against ridge, small circular, 4m diam.	med
WG	D024	-32.714833	20.829412	stone structure	Small circular structure (stone), 1.5m diam. Opening to south.	med
WG	D024a	-32.714842	20.829484	stone structure	Very small circular stone structure, about 800mm diam.	med
WG	D025	-32.702199	20.823451	stone dwelling? w artefacts	Possible structure (house) and dump on edge of river. Ceramics (willow pattern), glass, bone, metal. Blue glass, aqua, late 19 th c transfer print. Right next to road. Also: lunch spot tree, how would turbine roads get through here, too narrow, too much heritage.	high
WG	D026	-32.701961	20.823292	grave?	Grave? With dump material all around - after grave? 19 th c ceramics with more recent stuff.	high
WG	D027	-32.712021	20.793699	kraal complex w artefacts	Stone structure complex. Round with two attached square/rectangular add-ons. Glass, ceramics, collapsed oven. Aqua glass, purple, blue, possible 18 th c porcelain (or later ginger jars), but most is ref earthenware. Same stuff seen elsewhere - variety of transfer printed wares, Metal cans, rubber. Poplar grove below house about 50m. Recent rubbish - wine bottles with screw caps. Kraal over ravine.	med-high

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
DK	H016	-32.72504	20.74123	stone kraal w artefacts	Kraal: dry stone built with irregular sub-rounded to sub-angular sandstone boulders, two faces with small stone core; substantial in size with walls surviving to ~1m in height; associated finds include clear and green glass; small metal plate	high
DK	H016b	-32.724735	20.74142	"	Point on kraal wall described above	"
DK	H016c	-32.724621	20.741623	"	Point on kraal wall described above	"
DK	H016d	-32.72479	20.741739	"	Point on kraal wall described above	"
DK	H017	-32.724082	20.741413	stone kraal	Kraal: dry stone built with large sub-rounded boulders and irregular sub-angular blocks; substantial in size and built across N-S stream	med
DK	H017b	-32.723957	20.741511	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H017c	-32.723602	20.741307	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H017d	-32.723279	20.741113	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H017e	-32.723337	20.740744	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H017f	-32.723665	20.740532	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H017g	-32.723795	20.740835	"	Point along kraal wall; point H017g and H017 are joined by natural near vertical escarpment along western edge of stream	"
DK	H018	-32.723444	20.740081	stone kraal	Kraal: dry stone built with boulders and blocks; sub-circular in plan, ~12m x 5m	med
DK	H019	-32.723215	20.739853	stone kraal	Kraal: walls very deteriorated but similar to ones described above	med
DK	H020	-32.723046	20.739745	stone kraal	Kraal: similar construction to those above; ~20m in diameter. Probably other kraals to the North along eastern side of escarpment. Also some shepherd huts on top of escarpment associated with kraals H016-H020	med
DK	H021	-32.730237	20.717432	artefact scatter	Stone artefact scatter: mainly quartzite with one ccs flake; relatively extensive, at least 30m in diameter; situated within natural large solution hollow to South of a windmill and 2 willow trees	low-med
DK	H022	-32.722798	20.718571	artefact scatter	Stone tool and pottery scatter: prehistoric pottery; not very dense in number of artefacts, but spread at least over 50m diameter	med-high
DK	H023	-32.742395	20.738971	historic building	Farmstead: original De Kom farmhouse and ancillary building; farmhouse probably Victorian in date, originally L-shaped with 'wing' at rear of house since demolished but footings still visible; stoep probably later addition	high
DK	H024	-32.752859	20.762579	isolated artefacts	2 sherds of Khoekhoen pottery	low

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
DK	K010	-32.725453	20.740829	Stone feature w artefacts	Possible <i>trapvloer</i> and circular kraal. <i>Trapvloer</i> raised above prevailing level. Ceramics (sponge ware and print) on slopes surrounding structure.	med
DK	K011	-32.722831	20.738649	marker	Pile of rocks, probable boundary marker, 100m south of river and 300m west of road.	med
DK	K012	-32.721603	20.74157	marker	Probable boundary marker, very low pile, not easily visible from a distance, could be another kind of marker. Unlikely to be grave because solitary and relatively far from any other structures.	med
DK	K013	-32.736182	20.722085	stone kraal	Small old <i>lammerkraal</i> , one layer high, overgrown with grass. On grassy terrace below rocky outcrop with stone hut.	med
DK	K014	-32.735722	20.721682	stone dwelling	Small circular hut, well-packed with adjacent circular section. Main room has window openings. Situated on rocky outcrop out of wind. Only visible artefacts are piece of clear glass and a metal knife about 10cm long; very rusted.	med
DK	K015	-32.729404	20.718984	stone kraal w artefacts	Kraal situated near water tank and windmill along river, sheltered from wind. 10x5m with smaller kraal attached to it (1x1m) which is a few layers higher. One white ceramic fragment. And a few shards of clear glass.	med
DK	K016	-32.726841	20.71798	stone kraal	Small kraal 2x2m near D035 across river bank.	med
DK	K017	-32.757746	20.732677	marker	Boundary marker, 1m high with another one on opposite ridge.	med
DK	D028	-32.725803	20.739456	stone kraal w artefacts	Part of kraal complex, first is 20x20m, stoneware nearby (salt glaze)	med
DK	D029	-32.725939	20.738937	stone kraal	Part of kraal complex, second is square, 25x25m.	med
DK	D030	-32.725574	20.739358	stone kraal w artefacts	Part of kraal complex, third is big rectangular kraal with small square enclosure in one corner, 40x25m, small enclosure 4x3m. Another small rectangle on upper right hand side. Some aqua glass and metal around. <i>Trapvloer</i> (K010) has lots of ceramics and glass around. Transfer print 19 th c, dark green, purple, aqua, blue and clear glass. Willow, annular ware. Also one fragment of eastern porcelain (possible ginger jar).	high
DK	D031	-32.725561	20.741644	graves	Graves next to stream in soft silts, raised, overgrown. 12-15? Christian style. Rock packing. Walling on one side. Quite a notable complex of historic features, Some ceramic and glass around but not necessarily on graves. <i>Trapvloer</i> is raised and filled interior to level. Willow trees next to stream. Walling - unknown use - two sides on opposite side of road from graves. big buffer required. The main road cuts the graves off from the main settlement area.	high
DK	D032	-32.728749	20.717175	artefact scatter	Minor glass and refined earthenware ceramic scatter. Possible small stone structure. Near willow trees and stock post with wind pump and dam.	med
DK	D033	-32.726178	20.715229	isolated artefact	Isolated broken silcrete bifacial blade (Stillbay-like?) with prepared platform.	low
DK	D034	-32.726301	20.715441	stone quarry	Old quarrying activity for stone on koppie (east side).	low

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
DK	D035	-32.727018	20.718209	stone structure	Small structure next to slab rock outcrop on river. Made out of slabs standing on end. Rectangular, 10x8m. One ceramic fragment, recent. Up river from willow tree stock post next to dam.	med
DK	D036	-32.744279	20.739732	Historic building	Small vernacular barn, trapdoor to upper story, stone, timber rafters, buttressing holding up collapsing far corner. Stone lower, brick upper.	high
DK	D037	-32.755789	20.744415	stone kraal	Active kraal, windmill, stone wall, water tank.	med
DK	D104	-32.75252	20.72174	rock painting	Natural cave-like feature with a waterfall that runs through it. Possible rock painting (human figure?) on left in small sub-overhang. No artefactual material seen at, or in, vicinity.	med-high
DK	H026	-32.726903	20.749044	stone kraal	Kraal: circular in plan, ~9m diameter; very ephemeral with only lowest course of boulders surviving; located S of low ridge	med
DK	H026b	-32.726738	20.749176	stone kraal	Kraal: better preserved than H026; built with selected tabular blocks	med
DK	H026c	-32.726884	20.7492	stone kraal	Kraal: similar to H026b	med
DK	H027	-32.742297	20.742348	stone dwelling w artefacts	Hut: sub-circular in plan; dry stone built with sub-angular boulders and selected tabular blocks; surviving to 0.7m in height; associated finds of clear glass, white porcelain and metal tins	med
DK	H028	-32.737436	20.756236	stone dwelling	Hut: circular in plan, 3m diameter; dry stone built with irregular blocks; surviving to ~0.4m in height	med
DK	H029	-32.736976	20.754924	stone kraal w artefacts	Kraal: square in plan, ~14x14m; dry stone built with irregular and selected tabular blocks, surviving to ~1.5m in height; associated finds of white and flower pattern ceramic sherds	med
DK	H029b	-32.736887	20.754693	stone dwelling	Hut: circular in plan, 4m diameter; dry stone built with selected tabular blocks; door facing NNE; associated finds of white porcelain and glass	med
DK	K019	-32.734592	20.744837	marker	Collapsed pile of rocks about 7m from another pile (K020) on a small hill next to road. Possible boundary marker.	low
DK	K020	-32.734633	20.744715	marker	Collapsed pile of rocks about 7m from another pile (K019) on a small hill next to road. Possible boundary marker.	low
DK	K021	-32.741844	20.741366	graves	Graveyard of De Kom. Two formal graves that have been cemented over, one fenced in, other open adjacent to it. Six informal graves (piles of rock); one or two have headstones. Formal graves have headstones: name: Skiffers 1938-2000 and Van Wyk indeterminate dates. Cemented graves have marine shells (<i>S. argenvillei</i> and <i>C. granitina</i>) scattered around them and other grave decorations include white stones. More traditional graves have large rocks in the mounds.	high

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
DK	K022	-32.738811	20.755938	stone dwelling w artefacts	Stone house, 4x2m and (4x2m adjacent room/possible kraal or <i>kookskerm</i> extra) with stone flooring and possible grindstone. Located about 40m up slope of river bank, not very protected from wind. Another kraal about 50m up river and a beacon behind house 30m away. House has central packing with flat broad rocks like tiles. Natural rocky terrace in front of house that looks like a stoep. Ceramic and glass fragments. Another set of stone walling behind house but indeterminate size and shape.	med
DK	K023	-32.737173	20.758688	isolated artefacts	Scatter of three flakes, one silcrete, one chert, one hornfels, all MSA. And a quartzite blade core.	low
DK	D044	-32.740483	20.753561	graves?	Two possible graves on sandy outwash fan. Near prominent rock wall and stream.	high
DK	D045	-32.739259	20.755062	marker	Beacon/boundary cairn.	med
DK	D046	-32.737182	20.759275	isolated artefact	Isolated quartzite pebble core.	low
SK	D038	-32.761792	20.775913	stone kraal w artefacts	Large rectangular kraal, blue glass and ceramics in vicinity.	med
SK	D039	-32.7615	20.776016	stone structure	Associated small square stone structure, more ceramics (refined earthenware).	med
SK	D040	-32.761376	20.776005	stone structure	Small round stone structure with possible fireplace remains.	med
SK	D041	-32.76133	20.776019	grave	Possible grave. Some blue glass amongst packing stones as mound.	high
SK	D042	-32.767735	20.775105	graves w artefacts	Between 5-10 graves. Covered by flat slabs or large boulders. Some ceramics scattered about including 19 th c ref earthenware, 18 th c oriental porcelain (or later ginger jars), indigenous Khoekhoen pottery. Also a double sided lower grindstone near one grave. On silty area next to stream. Can't say if Christian pattern as erosion has caused re-arrangement of the cairns.	high
SK	D043	-32.768283	20.774756	stone kraal	Rectangular kraal against natural rock. Quite overgrown. Indigenous and refined earthenware nearby.	med
SK	K018	-32.765889	20.777011	artefact scatter	Lithic scatter with cores and large flakes (quartzite) as well as ceramic (willow pattern) and glass. Near to pottery scatter.	med
SK	H025	-32.765999	20.777449	artefact scatter	Stone tool and pottery scatter: mainly pottery, all indigenous, relatively high concentration with 6 out of 11 fragments within 5m diameter; 2 quartzite cores and 1 flake; all above within 20m diameter	med-high
SK	H025b	-32.765934	20.778144	"	Continuation of above scatter: 8 pot sherds including 1 rim; 2 quartzite flakes; 1 possible whet-stone or broken lower grindstone	"
SK	H025c	-32.765539	20.777705	"	Continuation of above scatter: point K018 also part of this scatter	"
SF	H032	-32.594506	20.870196	marker	Property marker: dry stone built with irregular sub-angular blocks; well preserved, circular in plan c. 3m diameter; located at convergence of 2 fences	med
SF	H033	-32.599193	20.887706	marker	Property marker: circular in plan, 3m diameter; identical to 032; point K-031 to the E in line with both 033 and 032	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
SF	H034	-32.60135	20.888344	artefact scatter	Stone artefact scatter: quartzite flakes; found along base of dry stream/ storm rivulet, probably secondary deposition from further uphill to S	low
SF	H037	-32.604255	20.885802	kiln	Kiln/ smelting furnace: sub-circular in plan, ~1.5m diameter; appears to be revetted with stone and is currently filled with soil, with black burnt soil eroding from surface at the centre of the feature	high
SF	H038	-32.612975	20.886939	artefact scatter	Stone artefact scatter: quartzite flakes with 1 radial core; situated in a sandy deflation hollow, sparse vegetation cover	med
SF	H039	-32.626186	20.890132	stone kraal	Kraal: oval in plan, 15x11m; dry stone built with irregular boulders; considerably deteriorated with walls surviving as low stone mounds	med
SF	H039b	-32.626092	20.890373	stone kraal	Kraal: similar in construction and conservation to H039; 8m diameter	med
SF	H039c	-32.62612	20.890545	stone kraal	Kraal: similar to H039; ~10m diameter	med
SF	H039d	-32.625701	20.890326	stone kraal	Kraal: similar to H039; part of same complex	med
SF	H039e	-32.625598	20.890455	stone kraal	Kraal: similar to H039; part of same complex	med
SF	H039f	-32.626201	20.890983	stone kraal	Kraal: similar to H039; part of same complex	med
SF	H040	-32.644228	20.882224	marker	Property marker: dry stone built with selected tabular blocks; rectangular in plan, 1m x 0.7m; located on edge of summit, on SE facing slope	med
SF	K025	-32.622159	20.862914	artefact scatter	Very ephemeral reddish indurated mudstone, as well as quartzite, flakes with retouch, MSA scatter. Four retouched flakes.	low
SF	K026	-32.597534	20.88755	marker	Stone beacon, hollowed inside, like small narrow hut. Probable boundary marker, close to farm (300m).	med
SF	K027	-32.595782	20.888406	stone dwelling	Stone house, two rooms (2x1m and 2x1m) and a middle wall. Second room circular. Square room has niche in wall, like shelf, with sheep bones inside it. One ceramic fragment. 19 th c, annular ware.	med
SF	K028	-32.595708	20.887856	stone dwelling	Seemingly a small shepherd's hut, circular, 2m diam. With small opening for window. On slope above river.	med
SF	K029	-32.595412	20.888254	stone kraal	Circular kraal, small <i>lammerkraal</i> 2m diam. Also on slope above river and above K027 stone house.	med
SF	K030	-32.595467	20.889181	stone dam?	Possible collapsed dam wall.	low
SF	K031	-32.599932	20.890405	marker	Boundary marker in line with H032 and H033.	med
SF	K032	-32.604661	20.88569	farm and kraal complex w artefacts	Stone walled house and kraal complex/farm complex. Stone marker (boundary or cairn). Ceramics: Delft, Mocha, stoneware, sponge ware, indigenous ceramics. Large and extensive dump site about 10m diam. Near stone house. Small dwelling between house and dump site: 3m diam. with fire place. Square 'house' 4x3m with stone flooring. Quartzite and silcrete flakes scattered around. Circular <i>lammerkraal</i> next to house opposite fireplace room. Ceramics scattered all over site but concentrated at dump. Important site see also D055	high
SF	K033	-32.604357	20.885842	grave	Possible grave.	high

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
SF	D055	-32.604785	20.885903	domestic dump (historical)	Historical dump - dense. Rich in ceramics - 19 th c and indigenous. Bone material, glass, marine shell. Related to small structure to NW. Also very big kraal about 200m west and another smaller 100m north. Richest dump seen this trip. Ostrich egg shell, lots of bone, some stone flakes.	v-high
SF	D056	-32.604275	20.886076	grave?	Possible grave.	high
SF	D057	-32.604288	20.886086	grave?	Possible grave.	high
SF	D058	-32.604232	20.886153	grave?	Possible grave.	high
SF	H035	-32.60445	20.884517	stone kraal w artefacts	Kraal: dry stone built with irregular sub-angular blocks; rectangular in plan, 43m NE-SW x 31m NW-SE; 2 sherds of blue and white porcelain. Smaller rectangular kraal abutting to N, ~13x13m. Small rectangular hut abutting to N of smaller kraal; 5m NW-SE x 3m NE-SW	high
SF	H036	-32.604009	20.885585	stone kraal	Kraal: irregular sub-rectangular shape, 14m NW-SE x 12m NE-SW; entrance to west; less substantial and built with more rounded boulders than kraal H035 to the west	high
SF	K034	-32.626477	20.887276	stone dwelling w artefacts	Small shepherd's hut on slope of river valley, glass, ostrich egg shell, bone. About 100m away down slope next to river are grave mounds (D059). Also more modern fenced kraals and water tank/windmill present in same area.	med
SF	K035	-32.64495	20.883893	marker	Collapsed pile of rocks with hole in centre, likely just a large boundary marker, 3x2m. Made with very large, naturally occurring boulders with smaller rocks placed on top.	med
SF	D051	-32.600684	20.875782	stone dam	Earth and rock, low dam. Age(?) on rocky platform.	low
SF	D052	-32.600613	20.874956	Isolated artefact	Scraper, retouch, yellow chert (LSA).	low
SF	D053	-32.594928	20.888554	stone kraal	Small rock overhang with stone walling to SW side. Looks like might have been a kraal? Bit of a terrace built up in front, no archaeological material seen.	med
SF	D053a	?	?	stone walling	Small overhang with walling.	med
SF	D054	-32.594718	20.889654	stone walling	Opposite, small overhang on boulder with walling.	med
SF	D059	-32.625789	20.887084	graves	Area of about 6 graves next to recent stock post. Old walling nearby (K034). Large rocks covering, quite disturbed. One lies to right hand side of jeep track, has head and foot stones. Others not so formal.	high
SF	D060	-32.626107	20.887514	graves	Few more possible graves, about 4.	high
SF	D061	-32.639831	20.890623	rock dam	Rock and earth dam wall. Age(?)	med-low
SF	D062	-32.63975	20.899258	kraal/farm complex w ceramics	Large kraal complex (old loan farm). Specific to this point is a dwelling house - long house, 3 roomed, much collapse so difficult to see exactly. Later attempts to crudely form new walls (shepherd's?). ~30m long, ~3m wide. Some glass, 19 th c ceramics, OES (ostrich egg shell) scattered about particularly in nearby kraal (see also D063-D067 [on Buurfontein], and H041-H041e for other features of the complex). The complex is split by a boundary fence. Located at a spring	high

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
SF	H041	-32.639129	20.898381	stone dwelling	Round hut: part of extensive complex of huts, kraals and reservoirs (also H041b-H041f);	high
SF	H041b	-32.638934	20.89841	stone kraal	Kraal: 9m diameter; with smaller house abutting to North. On sandy surface. Smaller circular kraals attached to large kraal, probably <i>lammerkraal</i> .	high
SF	H041c	-32.639183	20.898687	stone dam	Rectangular stone reservoir, 10x5m. East of hut.	high
SF	H041d	-32.639146	20.898971	stone kraal	Kraal: rectangular in plan, stone, very deteriorated, with extra rectangular <i>lammerkraal</i> attached.	high
SF	H041f	?	?	stone kraal	Large, more modern kraal, square, 25x15m, very well preserved, flat square rocks, wall 2m high. Directly north is another stone wall of larger boulders, 10m long. Looks older than big kraal.	high
SF	H042	-32.598128	20.896815	marker	Property marker: dry stone built ; square in plan, 2x2m; NB. Situated ~12m to SSW of GPS point	med
SF	H043	-32.597983	20.896337	marker	Property marker: dry stone built; square in plan, ~2m x2m by 1.6m high; located on current fence line	med
SF	H044	-32.597265	20.893805	marker	Property markers: forming gate posts; similar in construction to H-042 and H-043	med
BF	D063	-32.639721	20.899547	stone structure	Small rectangular structure, opening on west, ~6m long, ~2m wide (part of larger complex see D062).	high
BF	D064	-32.639475	20.899605	stone structure	Rectangular stone structure, north-south, alongside two big kraals (unknown use) (part of larger complex see D062) .	high
BF	D065	-32.639441	20.899827	stone kraal w artefacts	Rectangular kraal ~50x30m, glass, willow pattern ceramics, other blue and white, stoneware, OES. Smaller crude enclosure to south, adjoining (part of larger complex see D062).	high
BF	D066	-32.639578	20.900138	stone kraal w artefacts	Adjoining kraal to east, irregular shape. Many ceramic pieces in one corner - lots of 19 th c but also a few flakes, and 18 th c oriental (or later ginger jars). Looks like may be a dump in SW corner. Lots of bone too (part of larger complex see D062).	high
BF	H041e	-32.638054	20.899695	stone kraal	Kraal: rectangular in plan ; close to horse-shoe shaped kraal with N-S alignment in the centre (part of larger complex see D062).	high
BF	D067	-32.639259	20.899388	domestic dump	OES and bone dump, some ceramics (part of larger complex see D062).	high
BF	H045	-32.600577	20.904637	stone irrigation channel	Irrigation channel: stone lined with sluices/outlets to south at regular intervals	med
BF	H045b	-32.600511	20.904342	"	Point along irrigation channel: at H045c channel turns 90 degrees to the north	"
BF	H045c	-32.600663	20.904875	"	Point along irrigation channel: at H-045c channel turns 90 degrees to the north	"
BF	H046	-32.601693	20.90705	stone gate posts/markers	Property markers: forming gate posts dry stone built with selected tabular blocks; square in plan, 2mx2m by ~1.8m high; entrance subsequently blocked by dry stone wall.	med
BF	H046a	-32.601693	20.90705	stone kraal	Kraal located ~40m to NNE of H046; 3-sided with N side formed by natural escarpment.	med
BF	H046b	-32.601693	20.90705	stone dwelling	Circular dry stone hut located ~50m to NW of H-046	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
BF	H050	-32.619871	20.945889	stone dwelling	Huts: total of 4 abutting each other; dry stone built with selected tabular blocks; double face walls; largest hut 4x2.5m	med
BF	H051	-32.619566	20.946351	stone dwelling?	Possible hut: collapsed structure surviving as mound of sub-angular blocks	low
BF	K036	-32.589687	20.895927	artefact scatter	Open pan/deflation surface: three indurated shale blades with retouch (MSA); two polished chert thumbnail scrapers (LSA). Some retouch with prepared platforms. Silcrete core.	low
BF	K037	-32.627319	20.912728	stone kraals w artefacts	Stone walling on slope above river to make small enclosures. Probably shepherd's hut adjacent to <i>lammerkraal</i> , which is adjacent to larger kraal (2x1m; 2x1m; 5x4m). Glass, metal, bullet casings, bone.	med
BF	K038	-32.633364	20.89993	marker	Boundary marker along fence.	med
BF	K039	-32.636517	20.931815	stone hut/marker	Square/rectangular stone structure with three walls and a roof of thin rock slabs. Open in centre, either strange boundary marker or very small sleeping hut. 2.5x1m.	med
BF	K040	-32.620614	20.944999	marker	Small stone marker (pile of rocks) near road, about 30cm high.	med
BF	K041	-32.620271	20.944438	marker	Same as above, about 30m away from K040. Also 30cm high.	med
BF	D068	-32.603	20.903374	marker	Boundary marker (big, square) stone.	med
BF	D069	-32.603	20.90338	marker	Boundary marker (big, square) stone.	med
BF	D070	-32.587886	20.899036	artefact scatter	Small pan with a most ephemeral scatter of MSA (heavily patinated, wind blasting?). One possible chert thumbnail scraper. About 6 flakes/blades in total. MSA stuff has been retouched, also another yellow chert piece with lots of retouch.	med
BF	D071	-32.599953	20.90314	graves	Area of possible graves, about 3 or 4 rock piles, possible rock headstones.	high
BF	D072	-32.601118	20.905416	graves	Area of about 6 graves, one has formal style headstone with engraving. Others cruder with typical head and foot stones.	high
BF	D073	-32.627221	20.913785	marker	Crude marker/beacon: two rocks/slabs balanced on top of a boulder.	low
BF	D074	-32.636373	20.908889	natural history feature	Porcupine lair. Excavated out from below rocks. Lots of bone on area outside. Sheep and porcupine. Possible rock quarry. Not far from big kraal complex recorded on D062-D067.	low
BF	D075	-32.637487	20.934705	grave?	Stone slabs with tall marker stone column. Seems to fill a hole. Could be a grave? Isolated spring/well? The marker seems to suggest visibility from a distance. Not the usual sort of headstone for this area if it is a vernacular grave. Military? See also H048a-d which are additional stone cairns in the vicinity	high
BF	H048	-32.637039	20.934545	grave?	Unknown feature/ possible grave: collection of irregular sandstone blocks in a heap, with no other stones in immediate vicinity; at least 2 more similar features within 20m radius	"
BF	H048b	-32.637054	20.934672	grave?	Similar feature to H048.	"
BF	H048c	-32.637014	20.934904	grave?	Similar feature to H048.	"

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
BF	H048d	-32.637099	20.934943	grave?	Similar feature to H048.	"
BF	D076 H049	-32.630726	20.944023	military structure?	Huts/hide: dry stone built on side of natural escarpment; possible lookout points for military scouting purpose? Good outlook over plains; location has commanding view of valley over 225 degrees, from N clockwise to SW; associated finds include white ceramic; metal can; blue glass; ointment container; ostrich eggshell; fragment of ointment jar: "...etholatum Reg. Trademark"	high
BF	D077	-32.630567	20.943452	marker	Stone marker behind <i>skuiling</i> on top of ridge about 40m away, definitely part of complex.	med
BF	D078	-32.630543	20.943399	marker	Stone marker behind <i>skuiling</i> on top of ridge about 40m away, definitely part of complex.	med
BF	D079	-32.630644	20.943338	marker	Stone marker behind <i>skuiling</i> on top of ridge about 40m away, definitely part of complex.	med
BF	H052	-32.602117	20.910926	stone dwelling w artefacts	Hut: dry stone built with irregular sub-angular blocks; rectangular in plan (3x2m) with western side of structure consisting of substantial NNE-SSW double faced wall (0.7m thick) with small stone core that extends to S of hut, forming a windbreak; other 3 sides of hut built abutting NNE-SSW wall and consist of only a single face; associated artefacts, clear and green glass; blue and white porcelain	med
BF	H052b	-32.602239	20.910684	stone dwelling	Hut: circular in plan, ~3m diameter; survives as low mound of stones	low
BF	H053	-32.599178	20.908915	stone dam	Dam wall: built with mud mortar	med
BF	K042	-32.602326	20.911365	stone walling	Free standing stone wall up on ridge next to road, about 3m in length and 1m high but tapering off at sides. 10m away is another stone wall in line with K042 but not joined and no evidence that it once was joined to K042. Second wall 6m long, 0.5m high, right next to road. Unknown use. Across the road is H052.	med
BF	K043	-32.633092	20.942103	stone feature	Circular stone shelter, 2m diam. On slope over road, in close proximity to D076, the <i>skuiling</i> or lookout post?. Probably a hut but no other associated structures or artefacts.	med
BF	D080	-32.59679	20.908359	stone walling	Rocky ridge above dam against rock face on ledge is some stone walling (age?). No ceramics/glass seen. Very good slab stone here. May be some evidence for quarrying.	low
BF	D081	-32.617306	20.919174	marker	Probably marker/cairn. Long rock shafts included with blocks.	med
BF	D082	-32.624178	20.921029	stone walling?	Possible walling against rock face (north facing?). Good rock slabs so maybe some quarrying activity. No issues really.	med
NG	H054	-32.608524	20.990502	marker	Property marker: dry stone built with irregular sub-angular blocks; partially collapsed	med
NG	H055	-32.608866	20.989024	isolated artefact	Retouched flake/ scraper: hornfels; retouched on proximal and lateral side; located within deflation hollow;	low

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
NG	H056	-32.61337	20.965987	marker/hut	Property marker/ sleeping shelter (?): dry stone built with irregular sub-angular blocks, partially collapsed; could be small sleeping shelter with a lintel and corbelled roof, now collapsed	med
NG	H057	-32.636212	20.975742	marker	Property marker/cairn: relatively small marker, 0.4x0.4m by 0.5m high; dry stone built with irregular sub-angular blocks	med
NG	H058	-32.62435	21.021706	markers	"Fence" line: marked with upright stones ~1.6m high (average 1.3m high)	med
NG	H058b	-32.615389	21.01543	"	"Fence" line: point along	"
NG	H058c	-32.608616	21.010924	"	"Fence" line: point along	"
NG	H059	-32.61581	21.012055	old road	Road: following eastern bank of N-S stream; built up with selected tabular blocks; washed away to south of H059	med-low
NG	H059b	-32.61521	21.012318	"	Point along road: washed away to the N of H059b	"
NG	H059c	-32.615019	21.012309	"	Points along road: points where road crosses stream; recorded to North as K051	"
NG	H059d	-32.61492	21.011909	"	Points along road: points where road crosses stream; recorded to North as K051	"
NG	K051	-32.61474	21.012148	"	Remains of old road with stone retaining wall. See also H059a-d.	"
NG	D103	-32.614246	21.01116	"	Retaining walling - old road?	"
NG	K044	-32.611222	20.984245	stone kraal	Pile of rocks in circular shape, hard to tell but possible kraal, 2.5m diam.	low
NG	K045	-32.61161	20.983618	marker	Pile of rocks 0.5m high, shaped as marker, probably boundary and another beacon up on hill in line with this one 60m away.	med
NG	K046	-32.615705	20.95875	stone dwelling w artefacts	Shepherd's hut with two circular rooms, 2.5 and 2m diam. Glass, metal, sponge ware ceramics. Possible stone lintel between two rooms. Windows. Very close to river. Poplar tree and other stone structures associated, D086. Dump north of hut 10m away, with salt-glazed stoneware, glass, lots of 19 th c ceramics, bone, piece of a mouth organ, spade. Kraal (D087) up against rock face SE of hut 30m away: semicircle, 20m diameter, split down the middle (Associated with D086, D087).	high
NG	D086	-32.615214	20.958304	modified seep	Small dam (or seep) cut into bedrock on one side. Rock and earth wall on one side. Some exotic trees about, also a stone structure nearby (K046). The "dam" is at the end of a "furrow" cut into bedrock and lined on west with stone retaining wall. Almost certainly a natural seep has been dug out and formalised - not sure about branching stone feature, purpose? overflow? Drinking trough for animals?	high
NG	D087	-32.616053	20.959	stone kraal	Ephemeral crude kraal up against ridge line in erosion gully. Boulders rather than flat stone.	med
NG	K047	-32.615142	20.979287	marker	Boundary marker 1m high.	med
NG	K048	-32.627553	20.98166	stone kraal	Small round kraal 2m diam.	med
NG	K049	-32.627517	20.981525	stone dwelling w artefacts	Round hut 2.5m diameter, 7m away from K047, with glass, metal, shoe sole, wire, with an extra short wall extending out (1m).	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
NG	K050	-32.636229	21.038777	stone dwelling	Shepherd's hut with wooden lintel and possibly two rooms but hard to tell due to rock collapse. 2m diam. Built into natural rock face. On slope above river gorge. 30m down slope is kraal (D101). No ceramics or anything else associated with hut.	med
NG	D101	-32.635913	21.039201	stone dwelling w artefacts	Stone structures, hut and kraals. Refined earthenware, tin, fragment of gramophone record, glass, one fragment of possible 19 th c refined earthenware, one fragment. blue glass, shoes, brown glass. Ephemeral.	med
NG	K052	-32.613604	21.011971	stone wall	Very large stone wall around a cultivated field. About 100m long and 50m wide with second portion adjacent but unfinished. Dam wall 20m away.	med
NG	K053	-32.614321	21.01166	stone kraal	Small kraal on slope facing NNE, 5m diam. Near D102. Early 19 th c liquor bottle, base found in river bed. Quartz/chalcedony flake.	med
NG	D102	-32.614194	21.011322	stone kraal	Square stone kraal built up against ridgeline, 15-20m wide, 15-20m long. Small kraal inside. Low boulder type walls.	med
NG	D083	-32.604681	21.007849	graveyard	Nooitgedagt farm cemetery: Jacobus Marais 1890-1933; Johannes Marais 1909-1910; Jacoba Marais 1884-1902; Johannes Marais 1881-1902; Jacobus Marais 1853-1937; Jacoba Marais 1858-1942. Fenced, long stone columns functioning as stone fence posts. No turbines planned in proximity.	high
NG	D084	-32.607959	20.989918	artefact scatter	Isolated ESA handaxe next to road and a second very sand-blasted handaxe nearby. Sandstone material and other possible hornfels. Small lithic scatter on other side of road: retouched flakes (hornfels) with prepared platforms. One quartzite flake and smaller Fauresmith(?) Handaxe (v weathered).	med
NG	D085	-32.615353	20.960499	stone dwelling w artefacts	Small stone structure: hut with kraal attached. Quite difficult to see exactly. One piece large 19 th c beer bottle, bit of bone, one ref earthenware ceramic, clear glass, metal fragments, shirt button. Very ephemeral scatter.	med
NG	D088	-32.606201	20.972357	stone kraal	Circular stone kraal, round stones and boulders rather than slabs, on moderate slope but not against ridge.	med
NG	D089	-32.606159	20.972668	stone dwelling	About 15m east of kraal is a small stone hut/windbreak opening to east. Circular, 1.8m diam.	med
NG	D090	-32.605549	20.972728	stone walling	Ephemeral walling against ridge/overhang above D088/089.	med-low
NG	D091	-32.605535	20.971889	stone walling	Ephemeral rock walling against rock face.	med-low
NG	D092	-32.606652	20.972451	grave?	Possible grave below kraal D088. Large slabs in cairn-like position.	high
NG	D093	-32.61599	20.974795	stone kraal	Small stone kraal/windbreak, 2.5m diam. Opens east, crude walling, boulder-like stuff. No artefacts.	med
NG	D094	-32.61609	20.973967	stone walling	Small windbreak? Crude boulder walling.	med
NG	D095	-32.615827	20.973643	stone feature?	Crude rock feature - marker/windbreak?	med-low
NG	D096	-32.615966	20.973443	stone walling	Small hut/kraal/windbreak against rock wall. Above previous "good" walling amongst big bedrock boulders, 3x1.3m. East facing ridge.	med

Farm	Site	Lat S (dec°)	Lon E (dec°)	Type	Description	Significance
NG	D097	-32.61621	20.973312	isolated artefact	Isolated chert thumbnail scraper.	low
NG	D098	-32.616335	20.973381	marker	Piled stone beacon/marker.	med
NG	D099	-32.639434	20.992264	graves	At least 3 graves on side of erosion donga, in old fluvial deposit. One 19 th c ceramic nearby.	high
NG	D100	-32.640252	20.991928	stone kraal?	Small stone structure inside overhang (waterfall). Level area inside forming platform. One metal paraffin can is only cultural item visible. Flat slab walling, rock is from right next to site. (previously recorded by L. Webley during coarse of accessing Zuurplaat wef project)	med
BM	H047	-32.653487	20.942835	stone dam	Dam wall: dry stone built on sandstone bedrock	low

APPENDIX 2: ARCHIVAL BACKGROUND - PREPARED BY HARRIET CLIFT

Sutherland farms

Portions of the following farms were investigated:

- Farm 148, Sutherland: Nooitgedaght
- Farm 152, Sutherland: Tonteldoos fontein (Theronsrus), Portion 1 and Portion 6 (subdivision of portion 2)
- Farm 150, Sutherland: Beerenvallei (Buurfontein), Portion 1 (Scholtzenhof)
- Farm 179, Sutherland: Schietfontein, Portion 1 and portion 2 (Subdivision of portion 2). Only Portion 1 is involved in the project.
- Farm 178, Sutherland: Vanwykskraal, Portions 1 and 2
- Farm 268, Laingsburg: Welgemoed, Remainder
- Farm 204, Sutherland: Schalkwykskraal, Remainder
- Farm 180, Sutherland: Drie Roode Heuwels (De Kom), Remainder, Portions 1 and 2 (subdivisions of Portion 2)
- Farm 181, Sutherland: Annex Drie Roode Heuwels, Remainder
- Farm 182, Sutherland: Wolvenhoek (De Kom), Portions 1 and 2

18th century:

The farms Nooitgedacht, Beerenvallei, Schietfontein, Schalkswykskraal, Drie Roode Heuwels and more than likely Tonteldoos have included in their 1833 surveys, the circular shapes of earlier loan farms. At the centre of most of these loan farms are springs, most weak, but one permanent. Stock farmers had already expanded into the Roggeveld mountains and the Karoo by the 1760's and it is very likely that some of these early loan farms date to this period.

19th century:

During the 19th century, under the British administration at the Cape, a tighter control on these remote loan farms was exercised. The farms were surveyed and new lease agreements drawn up. The majority of the new leases/grants date to the 1830's, with one in the 1850's and 3 'filler grants' dating to the late 19th century (Vanwykskraal, Wolvenhoek and Annex Drie Roode Heuwels).

Wagon routes:

A number of old wagon routes are indicated on the 1830 survey diagrams.

An old wagon route is indicated on the Nooitgedacht and Beerenvallei surveys, described as the old road linking the farms/places along the Riet and Keur rivers, on route to the Klein Roggeveld. The Schietfontein diagram indicates the public wagon route and cattle route and continues north-eastwards to Gunsfontein, north-westwards to Tonteldoosfontein and southwards across Drie Roode Heuwels (this appears to follow the present alignment of the secondary road).

Dwellings:

Schietfontein is the only farm that has a dwelling or house indicated on the survey diagram.

An outspan place is also indicated near the junction of the river and the wagon route.

20th century:

Farms generally stay fairly stable with regards to configuration up until the 20th century (Schalkwykskraal is an exception, subdividing in the 1870's). During the previous century, farms are 'divided' as shares, rather than cutting up the land itself. I suspect this is due to access to water, as a similar pattern is visible in the Namaqualand farms,

Comments

Dwelling and outspan place at Schietfontein could be potentially significant¹.

Lindsey Bugartz indicated the presence of an old farmhouse on Nooitgedaght as well as stone kraals. An outspan place is also indicated on this farm.

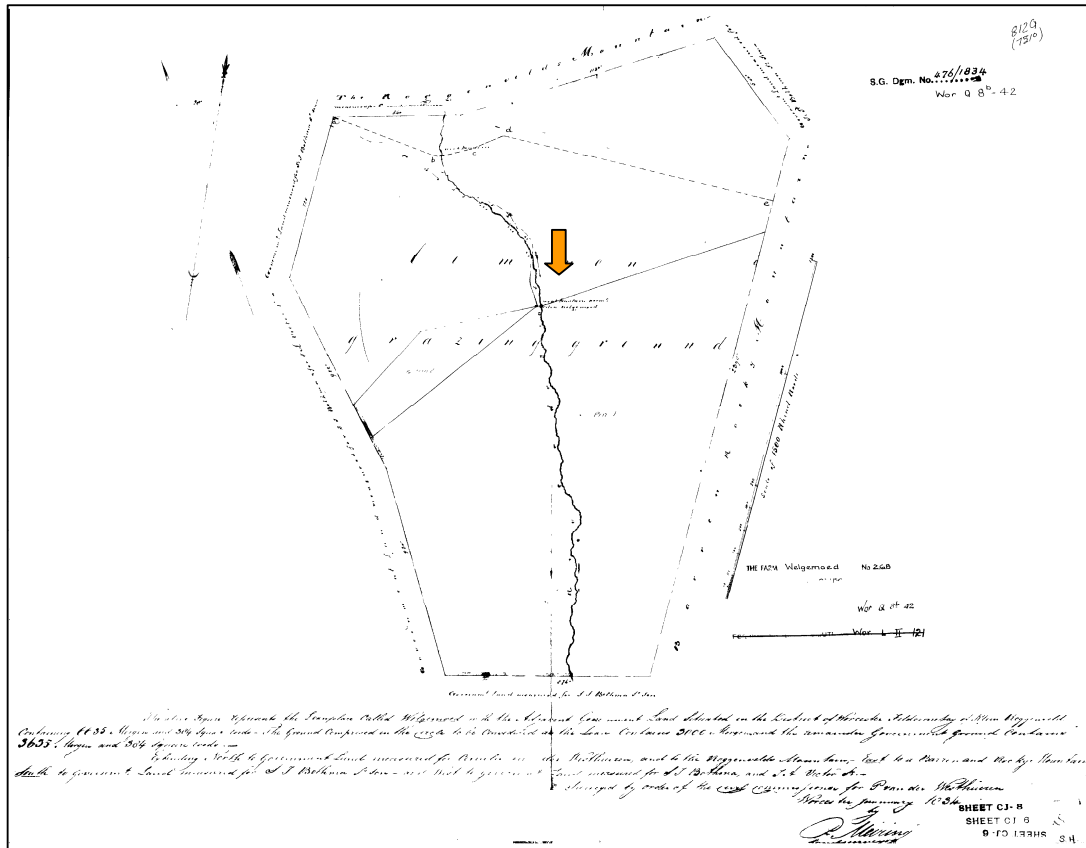
The farmhouse at Beerenfontein is in the process of being restored. It is not shown on the survey diagram, but may date to the early 19th century. The Scholtzenhof farmhouse appears to be pre-1950, which would fit with the date of subdivision of the two portions of Beerenvallei.

¹While we can identify the farm and kraals on Google Earth, we were unable to access the affected portion of Schietfontein due to the road having been washed away in places. Access must be gained up the side of the escarpment due to access from the Komsberg Road being prevented by the presence of an intervening nature reserve - DH

DEEDS SUMMARY

Welgemoed: Rem Farm 268, Laingsburg

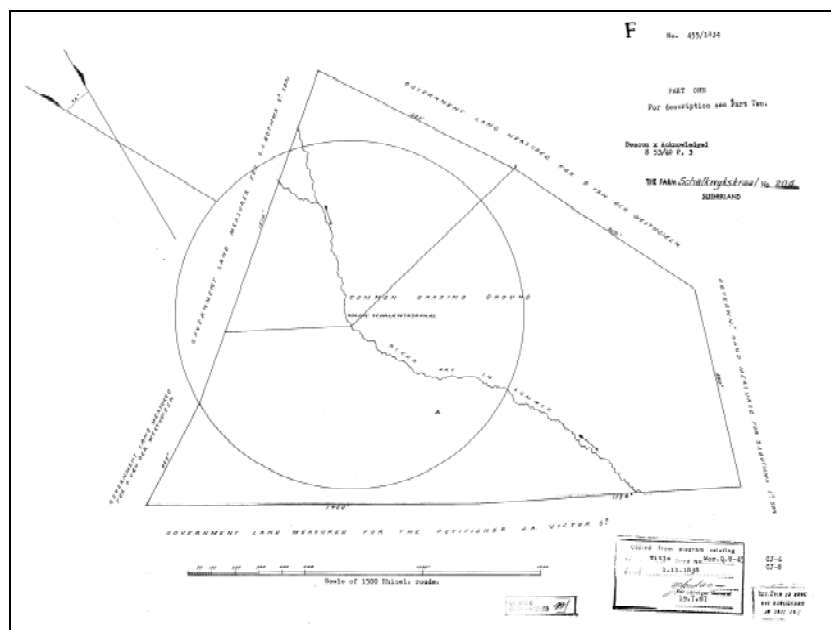
Farm No	Diagram	Deed	Date	Extent	From	To	Note
268	476/1834	Worcester Quitrent 8.42	1/01/1838	6635M 384SR	Grant	Stephanus Jacobus Botma	
268/1/1		120	7/06/1878	3317M 492 SR	JF Botma	Gert Johannes Lodewikus Botma	
Rem 268		3414	26/06/1893	3317M 492SR	Insol Est JF Botma	Gert Jacobus Esterhuysen	
268		3415	26/06/1893	3317M 492SR	GJ Esterhuysen	Johannes Christoffel Botma	
268		6612	20/07/1905	3317M 492SR	Est JC Botma	Est Johannes Abraham Christoffel Botma	



Survey diagram 476/1834: Location of permanent spring (underground)

Schalkwyskraal: Rem 204, Sutherland

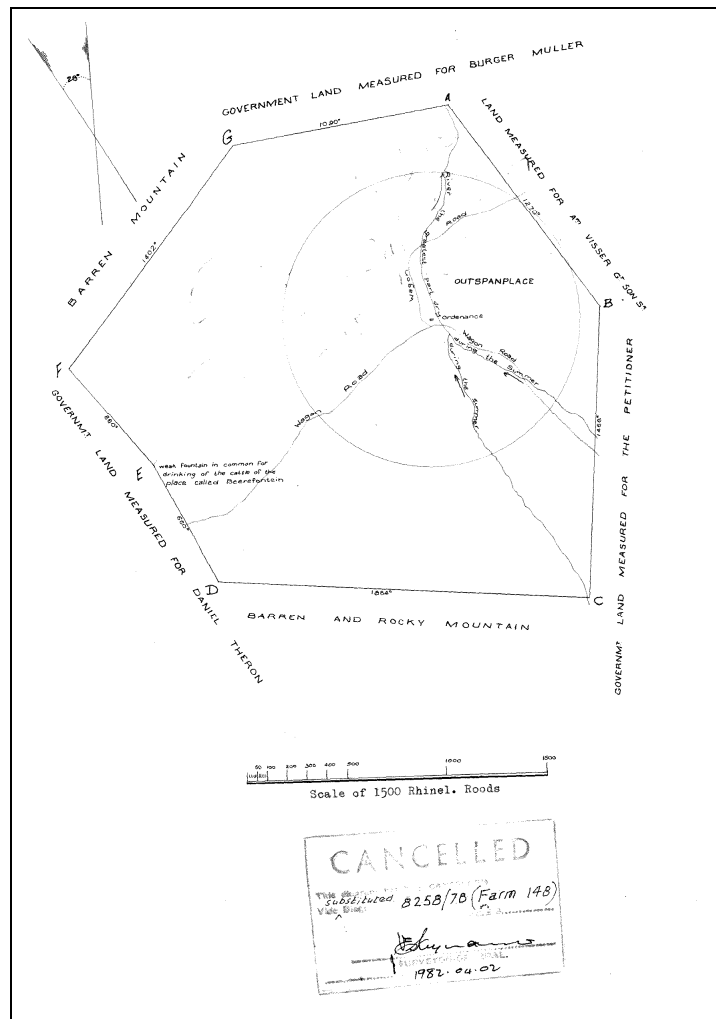
Farm No	Diagram	Deed	Date	Extent	From	To	Note
204	455/1834	Worcester Quitrent 8.45	1/01/1838	4936M 100SR	Grant	Stephans J Botma and Jacobus Adriaan Victor	Equal shares
204		29	3/10/1844	4936M 100SR	Est JA Victor	Jacob Botma	
204		47	4/10/1844	4936M 100SR	J Botma	Pieter Meiring	
204		153	20/03/1845	4936M 100SR	P Meiring	CH Paulsen	
204		13	7/12/1846	4936M 100SR	CH Paulsen	AJ Esterhuysen	
204		160	15/04/1869	4936M 100SR	Est AJ Esterhuysen	Gertruida Jacoba Ersterhuysen married to DJ Roussouw	
204/1		286	29/11/1871	3702M 529SR	Botma and Roussouw	Daniel Jacob Roussouw	
Rem 204		287	29/11/1871	1233M 173SR	Botma and Roussouw	Stephanus Jacob Botma	
204		391	16/02/1877	1233M 173SR	SJ Botma	Daniel Phillipus Maritz	
204		9	1/11/1884	1233M 173SR	Insolv est Daniel P Martiz	Abraham Andries le Rouw	
204		585	9/02/1894	1233M 173SR	AA le Roux	Anna Catharina Moller	
204		1857	4/02/1920	1233M 173SR	Est AC Moller	Thomas Johannes de Vos and Dirk Johannes Jacobus de Vos	
204		1858	4/02/1920	1233M 173SR	DJJ de Vos	Thomas Johannes de Vos	
204		1252	8/02/1950	1233M 173SR	TJ de Vos	Pieter Francois de Vos	



Survey diagram 455/1834: Circle shows the location of an earlier loan farm.

Nooitgedacht: Farm 148, Sutherland

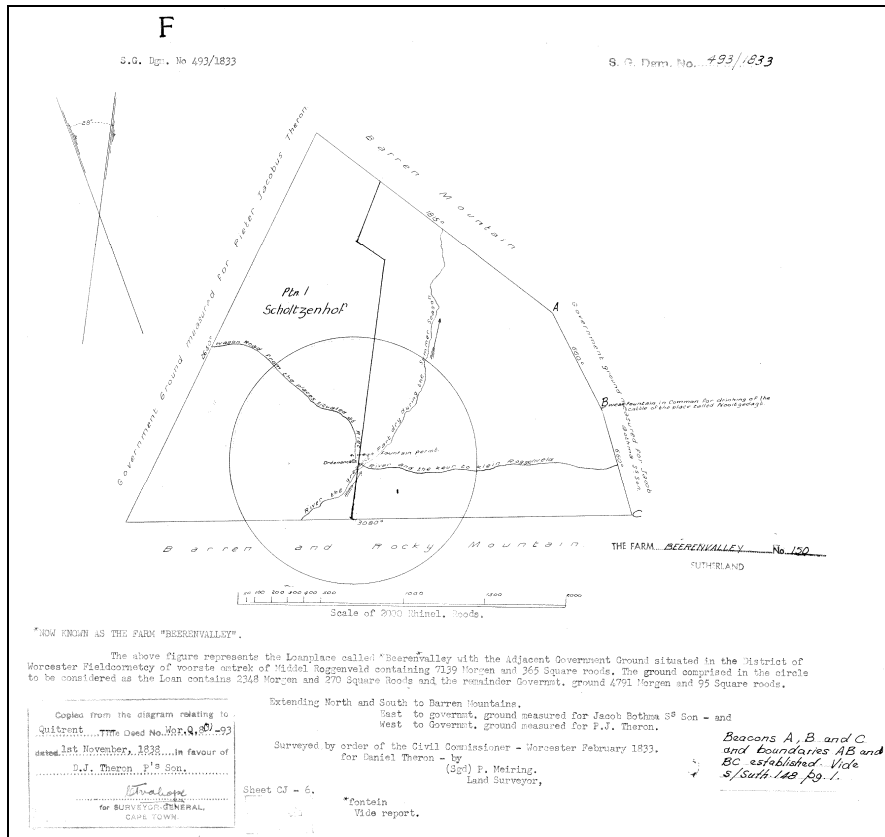
Farm No	Diagram	Deed	Date	Extent	From	To	Note
148	F483/1833	Worcester Quitrent 8.77	1/11/1838	8131M 557SR	Grant	Jacobus Botma	
148		136	11/07/1889	8131M 557SR	J Botma	JJ Marais	
148		7957	1/12/1933	8131M 557SR	JJ Marais	Andries Albertus Marais	
148/1	8258/1978	11541	30/03/1982		Boedel AA Marais	Gerrit Stephanus Marais	
Rem 148		11542	30/03/1982		Boedel AA Marais	AA Marais	



Survey diagram F483/1833 showing earlier circular quitrent grant. The centre of the quitrent grant is at the confluence of the wagon routes and a stream which is dry in summer. Of interest is the indication of an outspan place as well as a shared fountain for watering cattle on the boundary with Beerenvalley.

Beerenvallei: REM Farm 150, Sutherland

Farm No	Diagram	Deed	Date	Extent	From	To	Note
150	493/1833	Worcester Quitrent 8.93	1/01/1838	7139M 365SR	Grant	Daniel Johannes Theron	Previously Beerenvallei
150		48	11/12/1843	7139M 365SR	DJ Theron	Gerrit Stephanus Theron	
150			24/04/1873	7139M 365SR	GS Theron	Petrus Johannes du Plessis	
150		320	18/09/1882	7139M 365SR	PS du Plessis	Jaco Theron and Adriaan Theron	
150		290	16/06/1883	7139M 365SR	J Theron and another	Jan Abraham du Plessis	
150		4994	26/10/1899	7139M 365SR	JA du Plessis	Savings Bank Society Cape of Good Hope	
150		1873	6/06/1905	7139M 365SR	Savings Bank	Johannes Cornelius Esterhuysen	
150		20471	21/12/1949	7139M 365SR	JC Esterhuysen	Petrus Johannes Esterhuysen	
150		1347	10/02/1955	7139M 365SR	Estate PJ Esterhuysen	Andries Cornelius Esterhuysen	Farm subdivided in the 1950s.



Survey diagram 493/1833: Shows the alignment of the old wagon route linking the farms along the Riet and Keur rivers and leading to the Klein Roggeveld. The circle represents the extent of the old loan farm and it's centre is situated at the junction of the wagon route and the stream (dry in summer). The weak spring is also situated at the centre of the old loan farm.

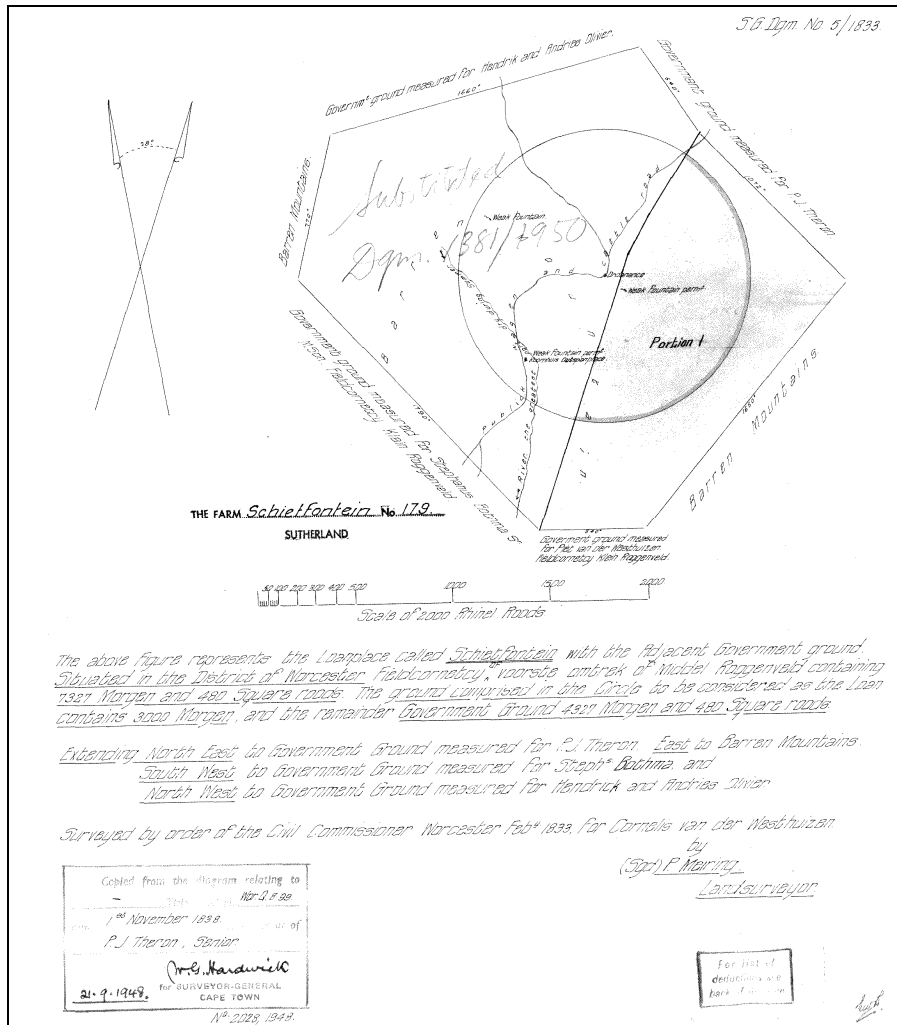
Tonteldoosfontein: **Farm 152, Sutherland**

Farm No	Diagram	Deed	Date	Extent	From	To	Note
152		Worcester Quitrent 8.97	1/11/1838	8539M 190SR	Grant	Hendrick Andries Olivier	Diagram missing
		273	29/04/1871	8539M 190SR	Est JC Theron	Andries Olivier and Hendrick Olivier	In shares
		391	27/01/1879	8539M 190SR	Est A Olivier	Johannes Christina Olivier	
		44	4/07/1883	8539M 190SR	JC Olivier	Petrus Jacobus Theron	
		124	10/11/1883	8539M 190SR	H Olivier	Petrus Jacobus Theron	
152/1		6622	30/08/1916	4074M 160SR	Est PJ Theron	Petrus Jacobus Theron	Portion 6 is a subdivision of this portion.
Rem 152		6623	30/08/1916	465M 30 SR	Est PJ Theron	Jasper Theron	

(The diagram has been requested from Surveyor General - not forthcoming yet)

Schietfontein : Farm 179

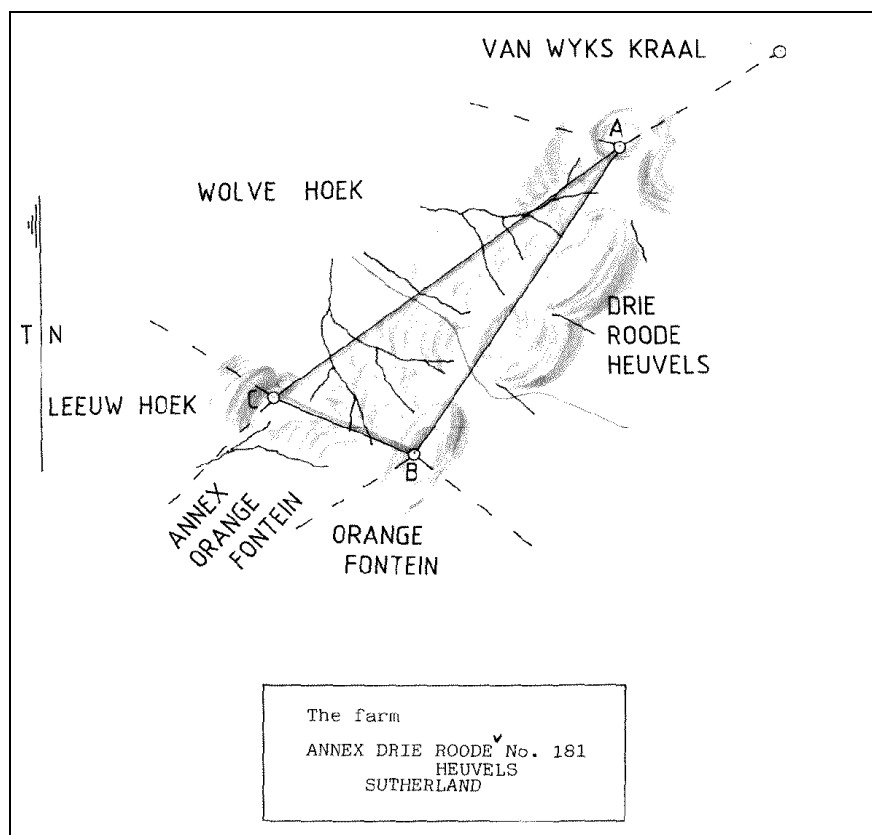
Farm No	Diagram	Deed	Date	Extent	From	To	Note
179	5/1833	Worcester Quitrent 8.99	1/11/1838	7327M 480SR	Grant	Petrus Jacobus Theron	
179		9	1/11/1884	7327M 480SR	PJ Theron	Abraham Andries Le Roux	
179		583	9/02/1894	7327M 480SR	AA le Roux	Wouter de Vos Meiring	
179		584	9/02/1894	7327M 480SR	AA le Roux	Wouter de Vos	
179		15426	16/01/1903	7327M 480SR	Wouter de Vos Meiring	Wouter de Vos	
179		1477	18/03/1909	7327M 480SR	Wouter de Vos	David Andries Muller	
179		15437	17/09/1949	7327M 480SR	DA Muller	David Andries Muller and Est Nicolaas Johannes Albertus Muller	
179		15438	17/09/1949	7327M 480SR	Est Nicolaas Johannes Albertus Muller	DA Muller	
179		15439	17/09/1949		Subdivision in shares as for Van Wykskraal		



Survey diagram 5/1833: Shows the alignment of the public wagon route as well as the cattle route. The circle indicates the location of the earlier loan farm. A house/dwelling is indicated near the junction of the wagon route and the stream (dry in summer). It appears as if this was also used as an outspan point. Two weak springs are indicated, both falling within the old loan farm extent.

Annex Drie Roode Heuwels: **Rem 181**

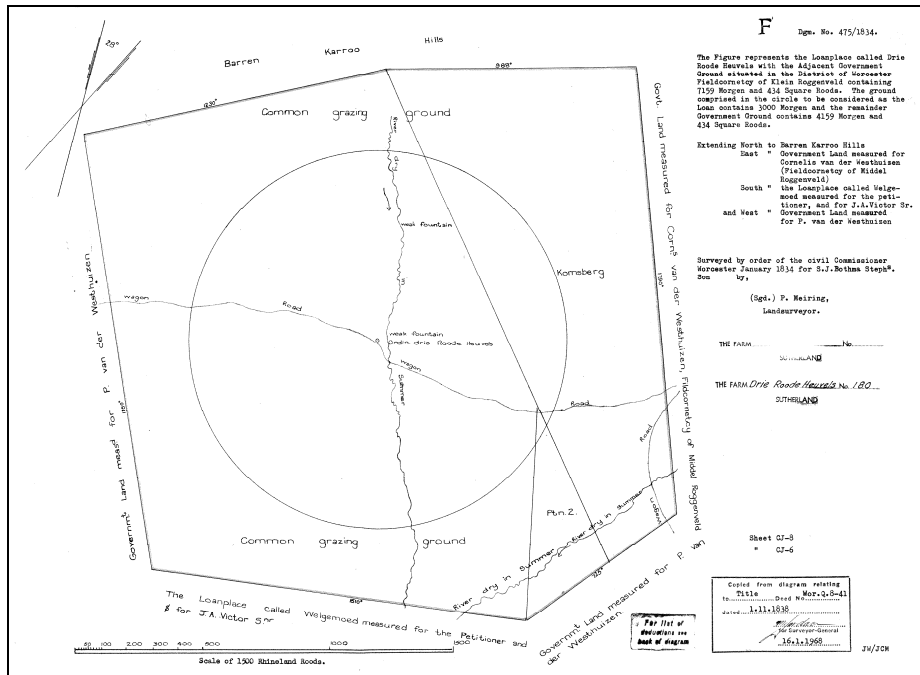
Farm No	Diagram	Deed	Date	Extent	From	To	Note
181	653/1885	Sutherland Quitrent 3.1	20/09/1893	385M 29SR	Grant	Abraham Andries Le Roux	Originally part of Wolvenhoek, subsequently incorporated into Drie Roode Heuwels



Survey diagram 653/1858: "Filler" grant between farms Wolvenhoek and Drie Roode Heuwels. Originally part of Wolvenhoek, but subsequently incorporated into Drie Roode Heuwels.

Drie Roode Heuwels: Farm 180, Sutherland

Farm No	Diagram	Deed	Date	Extent	From	To	Note
180	475/1834	Worcester Quitrent 8.41	1/11/1838	7159M 434SR	Grant	Stephanus Jacobus Botma	
180		252	13/06/1862	7159M 434SR	Est SJ Botma	Stephanus Jacobus Botma	
180		391	16/02/1877	7159M 434SR	SJ Botma	Daniel Phillipus Maritz	
180		9	1/11/1884	7159M 434SR	DP Maritz	Abraham Andries le Roux	
180		585	9/02/1894	7159M 434SR	AA le Roux	Anna Catharina Moller	
180		1857	14/02/1920	7159M 434SR	Est AC Moller	Thomas Johannes de Vos	In shares
180		1858	14/02/1920	7159M 434SR	Est AC Moller	Dirk Johannes de Vos and Thomas Johannes de Vos	In shares Farm subdivided in the 1930s.



Survey diagram 475/1834: Once again, circular earlier loan farm shown, with weak spring at its centre. No structures shown.

Botmashoek: **Farm 10, Sutherland**

Farm No	Diagram	Deed	Date	Extent	From	To	Note
10		Calvinia Quitrent 1.1	10/05/1858	8811M 300SR	Grant	Cornelius Jacobus Coetzee	Previously known as Van der Waltskraal
10		507	24/06/1882	8811M 300SR	Estate CJ Coetzee	JD Symington	
10		3236	12/03/1903	8811M 300SR	Estate JD Symington	Cornelius Jacobs Symington?	
10		3176	24/09/1928	8811M 300SR	Estate CJ Symington	Magdel Elizabeth Symington	
10				8811M 300SR	CUT	Estate ME Symington	

Awaiting diagram

PALAEONTOLOGICAL IMPACT ASSESSMENT: PRE-SCOPING DESKTOP STUDY

Proposed Mainstream wind farm to the southeast of Sutherland, Northern Cape and Western Cape Provinces

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September 2010

1. SUMMARY

Bedrock excavations during construction of the proposed wind energy facility straddling the Great Escarpment south-southeast of Sutherland will primarily impact continental sediments of the Abrahamskraal Formation of the Lower Beaufort Group (Karoo Supergroup). These Middle Permian sediments are renowned for their outstandingly rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (*e.g.* trackways) and plants (*e.g.* petrified wood). The upper Abrahamskraal stratigraphic interval is of special palaeontological significance in that it contains a record of extinction events among terrestrial vertebrates preceding the better-known catastrophic mass extinction event at the end of the Mid Permian Period, some 260.4 million years ago. The palaeontological sensitivity of the Beaufort Group sediments in the study area is consequently very high. Caenozoic surface sediments in the study area (*e.g.* alluvium, fluvial gravels, colluvium) are generally of low palaeontological sensitivity, although sparse fossil remains such as mammalian bones and teeth, or freshwater molluscs, may also occur here.

Construction work undertaken into Beaufort Group bedrock in order to install the wind turbines and associated infrastructure are likely to expose, disturb, destroy or seal-in valuable fossil heritage. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events. It is therefore recommended that :

1. Before any major construction commences a thorough field scoping survey of representative natural and artificial rock exposures within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of palaeontological sensitivity on the ground.
2. On the basis of the field scoping survey, a realistic, collaborative mitigation programme and protocol should be drawn up by the palaeontologist in conjunction with the developer and SAHRA *plus* Heritage Western Cape. This mitigation would normally involve the recording and judicious collection of fossil material within the development area as well as the recording of relevant geological data, before or during the construction phase of the development.

2. INTRODUCTION & BRIEF

Mainstream Renewable Power South Africa is considering a series of eight potential wind farm sites within South Africa. A 70 300ha site in the area of the Komsberg Pass some 30-40km south-southeast of Sutherland comprises the following land parcels of the farms Theronsrust, Scholtzenhof and De Kom within the Sutherland (N. Cape) and Laingsburg (W. Cape) magisterial districts: Portions 1 and 6, Farm 152; Portion 1, Farm 178; Portions 1 and 2, Farm 182; Remainder Farms 181,180,204, 268, Portion 2 Farm 180; Portion 2 Farm 179; Portion 1 and Farm 150 (Figs. 1, 2). The proposed wind farm development will have a total generating capacity of around 1280 MW and will comprise wind turbines, wind measuring masts and photo-voltaic panels as well as new access roads, transmission lines and associated infrastructure.

This wind farm development may well compromise important palaeontological heritage embedded within potentially fossil-rich bedrocks of the Lower Beaufort Group (Karoo Supergroup) in the development area. Significant impacts on palaeontological heritage normally occur during the construction phase and not in the operational phase of the development. Excavations made during the course of installing the proposed wind farm turbines and associated developments (e.g. roads, powerlines) may expose, damage, disturb or permanently seal-in scientifically valuable fossil heritage that is currently buried beneath the land surface, mantled by dense vegetation, or lying exposed on the surface.

The extent of the proposed wind farm development (over 5000 m²) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African Heritage Resources Act (Act No. 25 of 1999). The various categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance
- palaeontological sites
- palaeontological objects and material, meteorites and rare geological specimens

Minimum standards for the palaeontological component of heritage impact assessment reports are currently being developed by SAHRA. The latest version of the SAHRA guidelines is dated May 2007.

A palaeontological impact assessment (PIA) as part of a comprehensive HIA for the Mainstream wind farm projects has been commissioned by Ms Mary Patrick (Cape Archaeological Survey cc, Rondebosch) in accordance with the requirements of the National Heritage Resources Act, 1999. This report is a pre-scoping desktop study for inclusion in an EIA for the Mainstream Sutherland wind farm project. Please note that the layout of the turbines, road network, transmission lines and other associated infrastructure has not been finalised and these development components have therefore not been considered during this preliminary palaeontological assessment.

2.2. General approach used for palaeontological impact scoping studies

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations *etc*) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (Consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following scoping during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development (Provisional tabulations of palaeontological sensitivity of all formations in the Western, Eastern and Northern Cape have already been compiled by J. Almond and colleagues; *e.g.* Almond & Pether 2008). The likely impact of the proposed development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature of the development itself, most notably the extent of fresh bedrock excavation envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field scoping study by a professional palaeontologist is usually warranted.

The focus of palaeontological scoping work is *not* simply to survey the development footprint or even the development area as a whole (*e.g.* farms or other parcels of land concerned in the development). Rather, the palaeontologist seeks to assess or predict the diversity, density and distribution of fossils within and beneath the study area, as well as their heritage or scientific interest. This is primarily achieved through a careful field examination of one or more representative exposures of all the sedimentary rock units present (*N.B.* Metamorphic and igneous rocks rarely contain fossils). The best rock exposures are generally those that are easily accessible, extensive, fresh (*i.e.* unweathered) and include a large fraction of the stratigraphic unit concerned (*e.g.* formation). These exposures may be natural or artificial and include, for example, rocky outcrops in stream or river banks, cliffs, quarries, dams, dongas, open building excavations or road and railway cuttings. Uncemented superficial deposits, such as alluvium, scree or wind-blown sands, may occasionally contain fossils and should also be included in the scoping study where they are well-represented in the study area. It is normal practice for impact palaeontologists to collect representative, well-localized (*e.g.* GPS and stratigraphic data) samples of fossil material during scoping studies. All fossil material collected must be properly curated within an approved repository (usually a museum or university collection).

Note that while fossil localities recorded during scoping work within the study area itself are obviously highly relevant, most fossil heritage here is embedded within rocks beneath the land surface or obscured by surface deposits (soil, alluvium *etc*) and by vegetation cover. In many cases where levels of fresh (*i.e.* unweathered) bedrock exposure are low, the hidden fossil resources have to be *inferred* from palaeontological observations made from better exposures of the same formations elsewhere in the region but outside the immediate study area. Therefore a palaeontologist might reasonably spend far *more* time examining road cuts and borrow pits close to, but outside, the study area than within the study area itself. Field data from localities even further afield (*e.g.* an adjacent province) may also be adduced to build up a realistic picture of the likely fossil heritage within the study area.

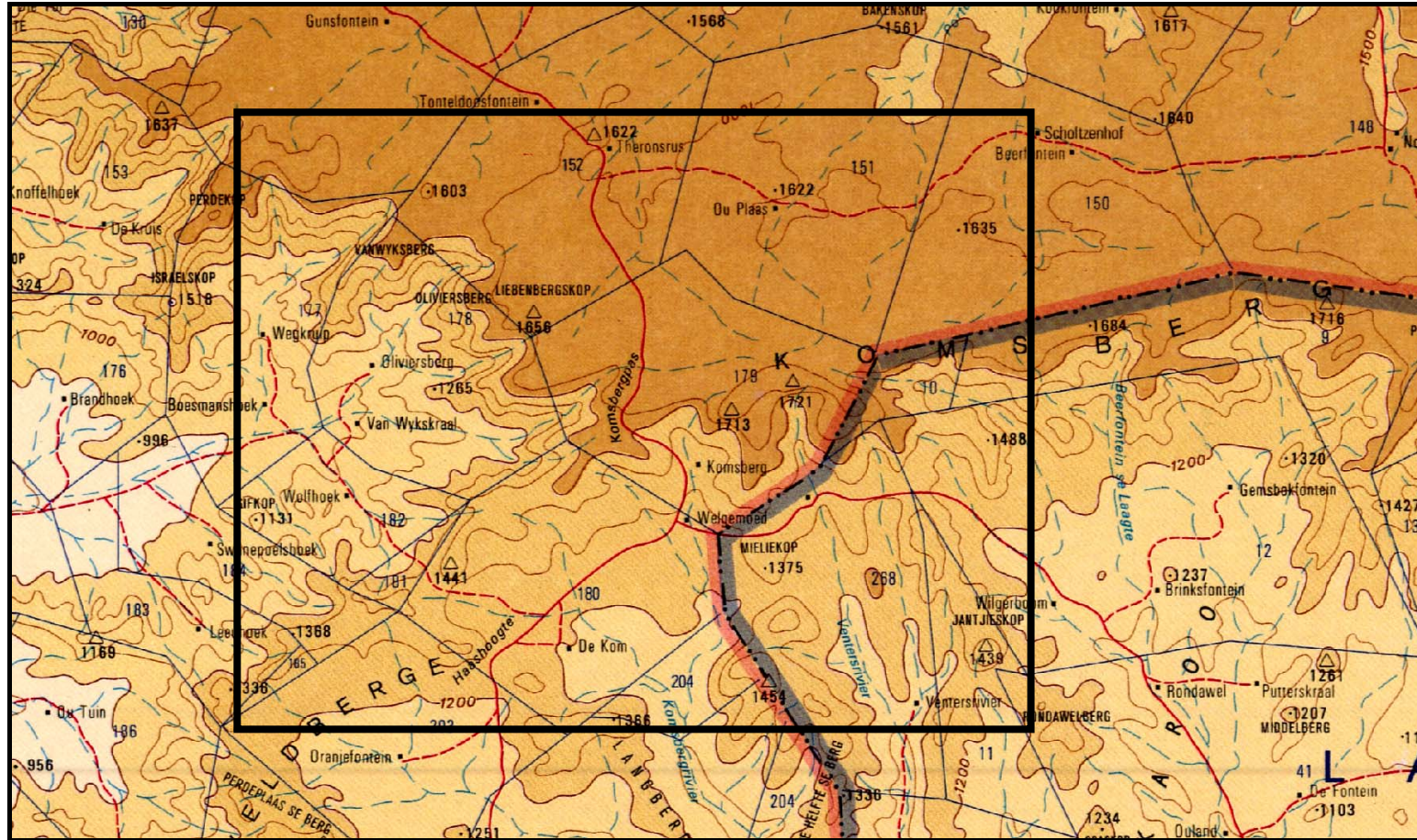
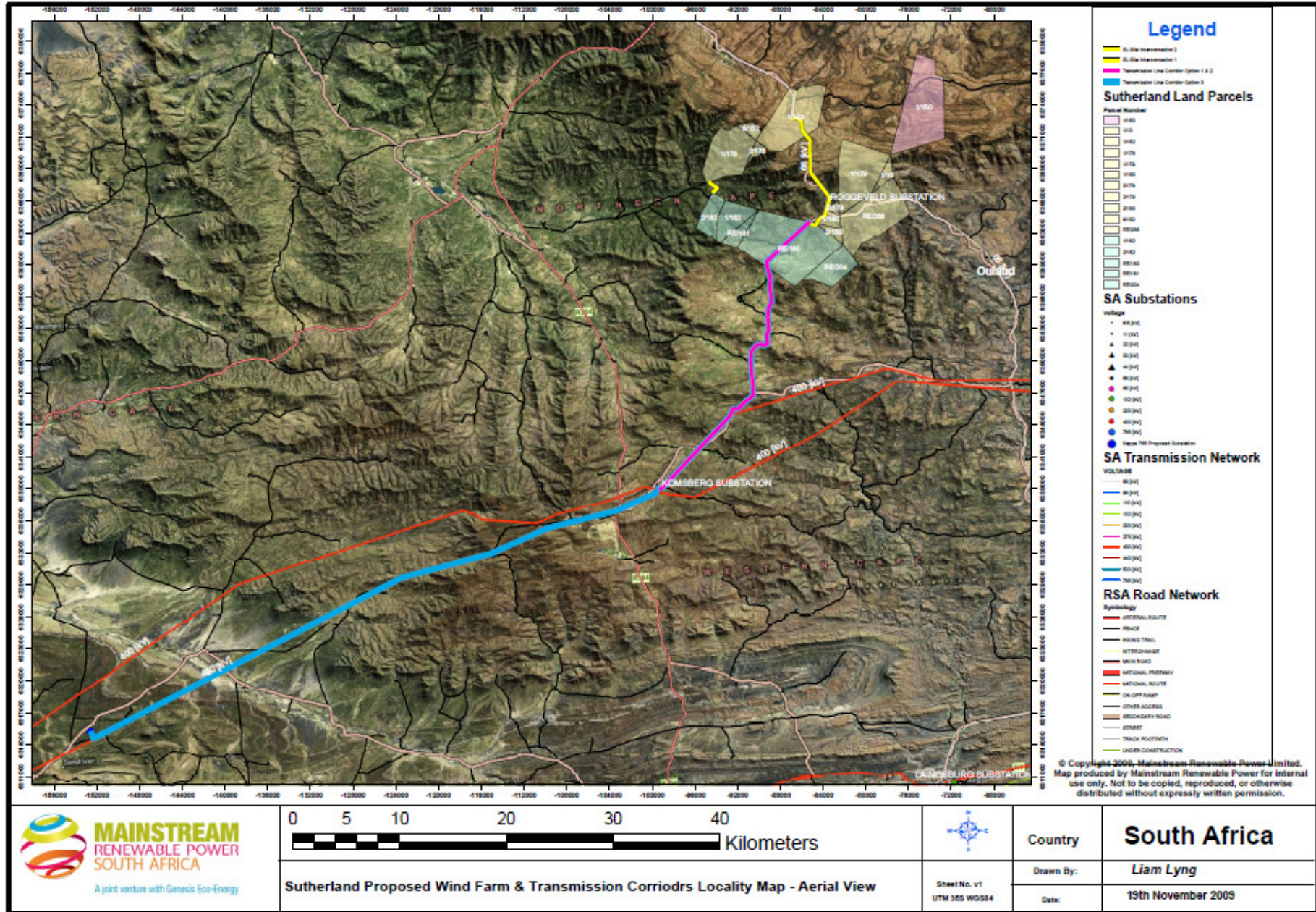


Fig. 1. Extract from 1: 250 000 topographic sheet 3320 Sutherland showing the Great Escarpment region 30-40km south-southeast of Sutherland with the approximate location (black rectangle) of the proposed Mainstream wind farm in the Komsberg Pass area, spanning the Northern and Western Cape Province boundary (Courtesy of the Chief Directorate of Surveys & mapping, Mowbray).

Fig. 2 (following page). Satellite image of the Great Escarpment region southeast of Sutherland showing location and extent of the proposed Mainstream wind farm in the Komsberg Pass area. Red lines to the south are existing 400kV transmission lines. Alternative routes of new transmission lines are shown in pink and blue.



3. GEOLOGICAL CONTEXT

The proposed Mainstream wind farm spans the Great Escarpment in the Komsberg Pass area some 30-40km to the south-southeast of Sutherland (Figs. 1, 2). The northern portions of the development area lie on the rocky plateau above the escarpment which lies at *c.* 1600-1700m asl in the Komsberg area. The more southerly portions overlie the steep slopes of the escarpment itself as well as the hilly Roggeveldberge region at its foot (*c.* 1200-1300m asl). The Roggeveldberge form a topographic high and drainage divide separating two low-lying subregions of the Great Karoo proper, the Tanqua Karoo to the west and the Moordenaarskaroo to the east. The Great Escarpment and Roggeveldberge are drained by numerous intermittently flowing “dry” rivers so the landscape is highly dissected.

The geology of the Sutherland region is outlined on the 1: 250 000 geology sheet 3220 Sutherland (Theron 1983; see also Cole & Vorster 1999) (Fig. 4). The entire study area is underlain by Middle Permian continental sediments of the **Lower Beaufort Group** (Adelaide Subgroup, Karoo Supergroup) that belong to the **Abrahamskraal Formation (Pa)**. A useful overview of the internationally famous Beaufort Group succession has been given by Johnson *et al.* (2006). The stratigraphic position of the Abrahamskraal Formation within the Beaufort succession as a whole is shown in Fig. 3 (Rubidge 1995). As is clear from the geological map, the Beaufort Group rocks within the study area are moderately deformed, with numerous small-scale, east-west trending fold axes and minor faults. Bedding dips above the escarpment are very low (< 10°) while below the plateau they locally reach values as high as 45°.

Geological and palaeoenvironmental analyses of the Lower Beaufort Group sediments in the Great Karoo have been conducted by a number of workers. Key references within an extensive scientific literature include various papers by Roger Smith (*e.g.* Smith 1979, 1980, 1986, 1987a, b, 1988, 1989, 1990, 1993a, 1993b) and Stear (1978, 1980), as well as several informative field guides (*e.g.* Cole & Smith 2008). In brief, these thick successions of clastic sediments were laid down by a series of large, meandering rivers within a subsiding basin over a period of some ten or more million years within the Late Permian Period (*c.* 265-251 Ma). Sinuous sandstone bodies of lenticular cross-section represent ancient channel infills, while thin (<1.5m), laterally-extensive sandstone beds were deposited by crevasse splays during occasional overbank floods. The bulk of the Beaufort sediments are greyish-green to reddish-brown or purplish mudrocks (“mudstones” = fine-grained claystones and slightly coarser siltstones) that were deposited over the floodplains during major floods. Thin-bedded, fine-grained playa lake deposits also accumulated locally where water ponded-up in floodplain depressions and are associated with distinctive fossil assemblages (*e.g.* fish, amphibians, coprolites or fossil droppings, arthropod, vertebrate and other trace fossils).

Frequent development of fine-grained pedogenic (soil) limestone or calcrete as nodules and more continuous banks indicates that semi-arid, highly seasonal climates prevailed in the Late Permian Karoo. This is also indicated by the frequent occurrence of sand-infilled mudcracks and silicified gypsum “desert roses” (Smith 1980, 1990, 1993a, 1993b). Highly continental climates can be expected from the palaeogeographic setting of the Karoo Basin at the time – embedded deep within the interior of the Supercontinent Pangaea and in the rainshadow of the developing Gondwanide Mountain Belt. Fluctuating water tables and redox processes in the alluvial plain soil and subsoil are indicated by interbedded mudrock horizons of contrasting colours. Reddish-brown to purplish mudrocks probably developed during drier, more oxidising conditions associated with lowered water tables, while greenish-grey mudrocks reflect reducing conditions in waterlogged soils during periods of raised water tables. However, diagenetic (post-burial) processes also greatly influence predominant mudrock colour (Smith 1990).

The **Abrahamskraal Formation (Pa** in Fig. 4) is a very thick (c. 2.4km) succession of fluvial deposits laid down in the Main Karoo Basin by meandering rivers on an extensive, low-relief floodplain during the Mid Permian Period, some 266-260 million years ago (Rossouw & De Villiers 1952, Johnson & Keyser 1979, Turner 1981, Theron 1983, Smith 1979, 1980, 1990, 1993a, 1993b, Smith & Keyser 1995a, Loock *et al.*, 1994, McCarthy & Rubidge 2005, Johnson *et al.*, 2006). These sediments include (a) lenticular to sheet-like channel sandstones, often associated with thin, impersistent intraformational breccio-conglomerates (larger clasts mainly of reworked mudflakes, calcrete nodules, *plus* sparse rolled bones, teeth, petrified wood), (b) well-bedded to laminated, grey-green to purple-brown floodplain mudrocks with common pedocrete horizons (calcrete nodules formed in ancient soils), (c) thin, sheet-like crevasse-splay sandstones, as well as more (d) localized playa lake deposits (*e.g.* wave-rippled sandstones, laminated mudrocks, limestones, evaporites). A number of greenish- to reddish- weathering, silica-rich “chert” horizons are also found. Many of these appear to be secondarily silicified mudrocks or limestones but at least some contain reworked volcanic ash (tuffs). A wide range of sedimentological and palaeontological observations point to deposition under seasonally arid climates. These include, for example, the abundance of calcretes and evaporites (silicified gypsum pseudomorphs or “desert roses”), reddened mudrocks, sun-cracked muds, “flashy” river systems, sun-baked fossil bones, well-developed seasonal growth rings in fossil wood, rarity of fauna, and little evidence for substantial bioturbation or vegetation cover (*e.g.* root casts) on floodplains away from the river banks.

Various types of **superficial deposits** (“drift”) of Late Caenozoic (Miocene / Pliocene to Recent) age occur widely throughout the Great Karoo and Great Escarpment region, including the study area. (Theron 1983). They include pedocretes (*e.g.* calcretes or soil limestones), colluvial slope deposits (sandstone scree, downwasted gravels *etc.*), sheet wash, river channel alluvium and terrace gravels, as well as spring and pan sediments (*cf* Cole *et al.*, 2004, Partridge *et al.* 2006). No large tracts of alluvium overlying the Lower Beaufort Group bedrock are separately indicated on the 1: 250 000 Sutherland geology sheet, however.

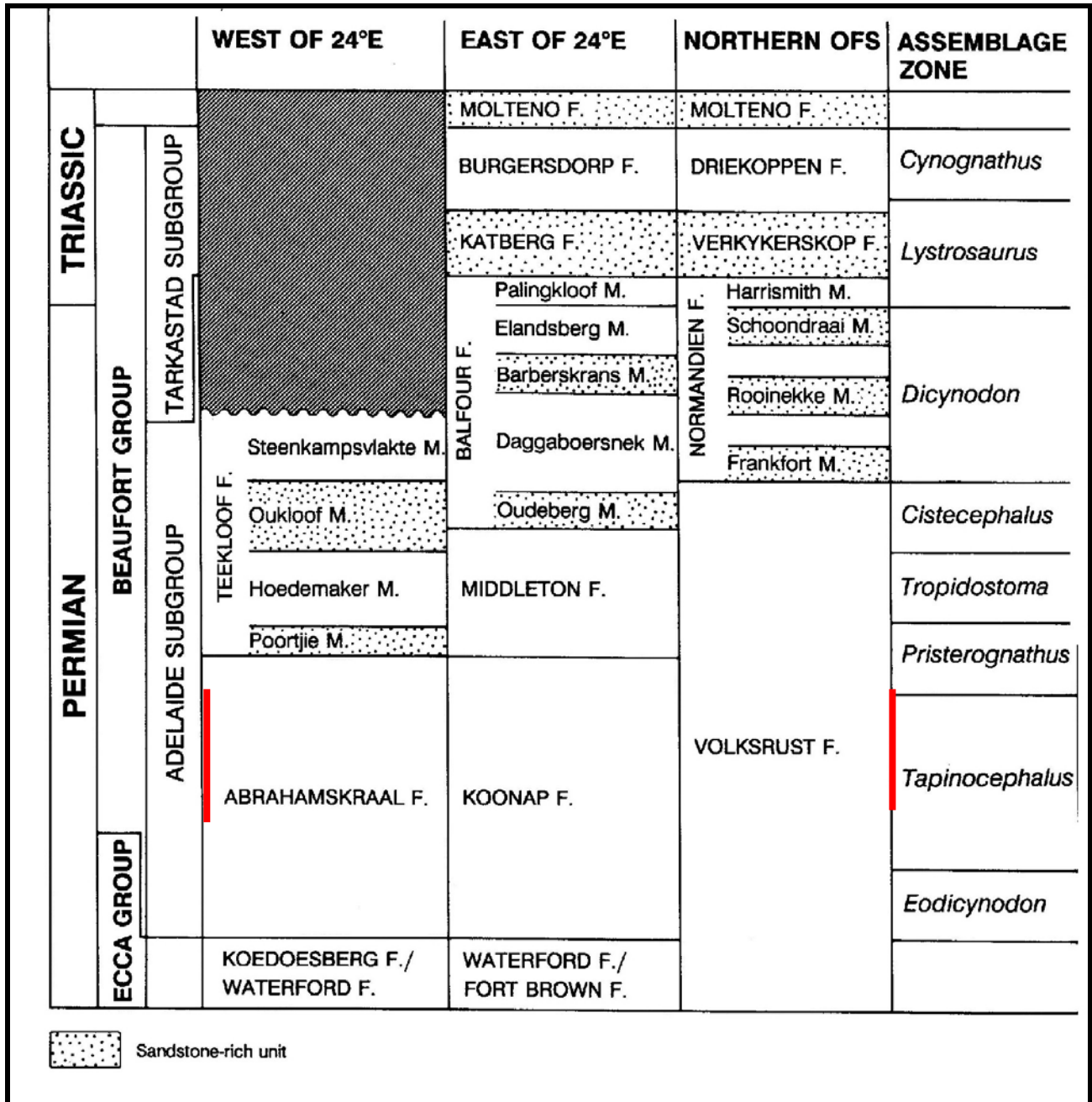


Fig. 3. Stratigraphy and biostratigraphic zonation of the Beaufort Group of the Main Karoo Basin (From Rubidge (Ed.) 1995). The vertical red lines indicate the Lower Beaufort rock units and fossil assemblage zone that are represented in the study area. It is possible that the uppermost beds here may extend into the *Pristerognathus* Assemblage Zone at the top of the Abrahamskraal Formation but this would need confirmation from field studies.

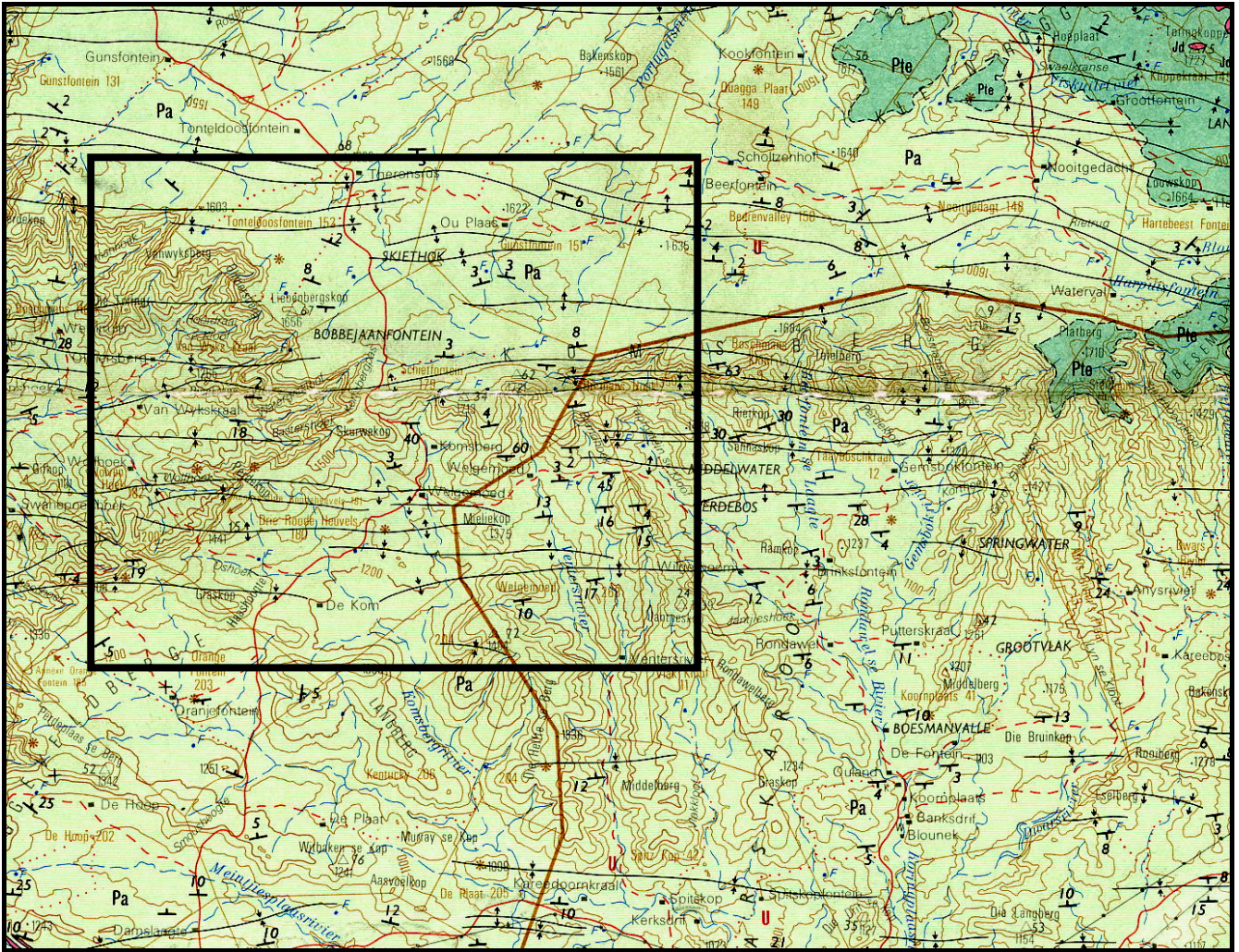


Fig. 4. Extract from 1: 250 000 geology sheet 3220 Sutherland showing geology of the study region lying across the Great Escarpment to the southeast of Sutherland, east of the Matjiesfontein-Sutherland tar road. Pa (pale green) = Mid Permian Abrahamskraal Formation (Adelaide Subgroup, Lower Beaufort Group). Pta (darker green) = Teekloof Formation (ibid.). No major areas of Late Caenozoic (Pleistocene to Recent) alluvium are separately mapped here. Note numerous W-E trending fold axes and faults indicated in the study area along and below the Great Escarpment.

4. PALAEOONTOLOGICAL HERITAGE

A brief outline of the known and expected fossil heritage within the two main geological units represented in the study area is given here.

4.1. Fossil biotas of the Beaufort Group

The overall palaeontological sensitivity of the Beaufort Group sediments is high to very high (Almond & Pether 2008). These continental sediments have yielded one of the richest fossil records of land-dwelling plants and animals of Permo-Triassic age anywhere in the world (MacRae 1999, Rubidge 2005, McCarthy & Rubidge 2005). Bones and teeth of Late Permian tetrapods have been collected in the Great Karoo region since at least the 1820s and this area remains a major focus of palaeontological research in the RSA.

A chronological series of mappable fossil biozones or assemblage zones (AZ), defined mainly on their characteristic tetrapod faunas, has been established for the Main Karoo Basin of South Africa (Rubidge 1995, 2005). Maps showing the distribution of the Beaufort assemblage zones within the Main Karoo Basin have been provided by Keyser and Smith (1979, Fig. 5 herein) and Rubidge (1995, 2005); a new updated version is currently in press. The Abrahamskraal sediments within the study area are referable to the Middle Permian *Tapinocephalus* **Assemblage Zone** (Fig. 5). It is possible that the stratigraphically highest rocks here, close to the base of the Teekloof Formation (Pte) that crops out along the escarpment only 20km to the east of the Komsberg Pass (Fig. 4), may belong to the Middle Permian *Pristerognathus* Assemblage Zone. Fieldwork is required to establish whether or not this is the case.

Selected fossil sites recorded within the *Tapinocephalus* Assemblage Zone in the Sutherland area are indicated on outline maps by Kitching (1977) as well as Keyser and Smith (1977-78). Several fossil sites also shown on the 1: 250 000 geological sheet 3220 Sutherland published by the Council for Geoscience, Pretoria, but none are shown within the study region itself (Fig. 4). In addition Kitching (1977) provides palaeofaunal lists for specific localities (e.g. *Bradysaurus* at Komsberg) within the Great Karoo region. On the whole, little palaeontological fieldwork has been carried out in the study area and any new fossil data from here would be of scientific interest.

4.1.1. Abrahamskraal Formation

The fossil biota of the greater part of the Abrahamskraal Formation is assigned to the *Tapinocephalus* **Assemblage Zone** of Mid Permian age on the basis of key vertebrate fossils, notably large dinocephalian therapsids *plus* smaller carnivorous therocephalians. The main categories of fossils expected within the *Tapinocephalus* fossil biozone (Keyser & Smith 1977-78, Anderson & Anderson 1985, Smith & Keyser 1995a, MacRae 1999, Rubidge 2005, Almond 2010) include:

- isolated petrified bones as well as rare articulated skeletons of tetrapods (*i.e.* air-breathing terrestrial vertebrates) such as true **reptiles** (notably large herbivorous pareiasaurs like *Bradysaurus*, small insectivorous millerettids), rare pelycosaurs, and diverse **therapsids** or “mammal-like reptiles” (e.g. numerous genera of large-bodied dinocephalians, herbivorous dicynodonts, flesh-eating biarmosuchians, gorgonopsians and therocephalians) (Figs. 6-7);
- aquatic vertebrates such as large **temnospondyl amphibians** (*Rhinesuchus*, usually disarticulated), and **palaeoniscoid bony fish** (*Atherstonia*, *Namaichthys*, often represented by scattered scales rather than intact fish) (Bender 2004);

- freshwater **bivalves** (*Palaeomutela*);
- **trace fossils** such as worm, arthropod and tetrapod burrows and trackways, coprolites (fossil droppings) and plant root casts;
- **vascular plant remains** (usually sparse and fragmentary), including leaves, twigs, roots and petrified woods ("*Dadoxylon*") of the *Glossopteris* Flora, especially glossopterid trees and arthropytes (horsetails) (Bamford 1999).

In general, tetrapod fossil assemblages in this zone are dominated by a wide range of dinocephalian genera and small therocephalians *plus* pareiasaurs, while relatively few dicynodonts can be expected (Day & Rubidge 2010, Jorah & Rubidge 2010 and refs. therein). Vertebrate fossils in this zone are generally much rarer than seen in younger assemblage zones of the Lower Beaufort Group, with almost no fossils to be found in the lowermost beds.

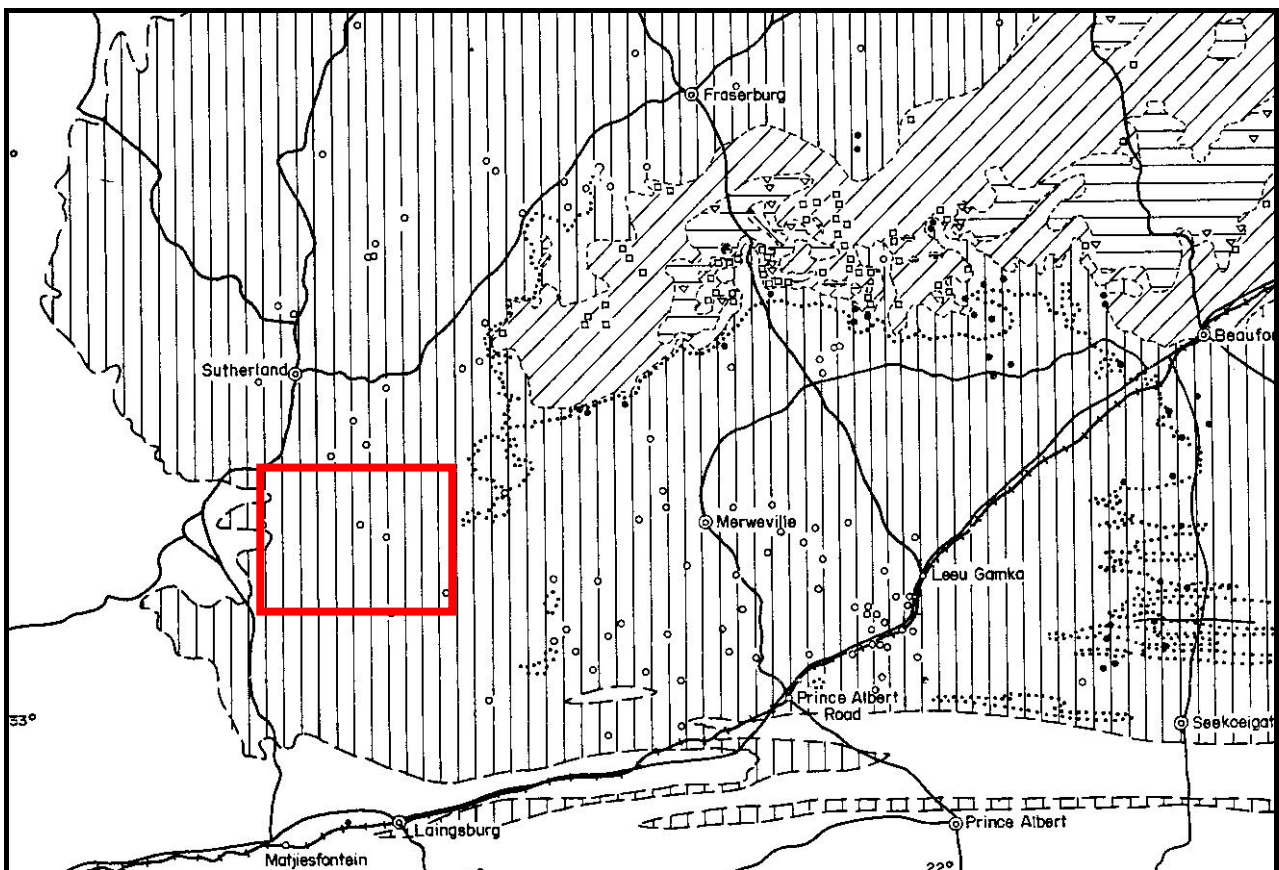


Fig. 5. Vertebrate fossil localities within the Lower Beaufort Group in the escarpment study region southeast of Sutherland. A scatter of *Tapinocephalus* Assemblage Zone specimens are found in this area (small open circles). (Map abstracted from Keyser & Smith 1977-78).

Despite their comparative rarity, there has been a long history of productive fossil collection from the *Tapinocephalus* Assemblage Zone in the Great Karoo area, as summarized by Rossouw and De Villiers (1952) and Boonstra (1969). Numerous fossil sites recorded in the region are marked on the 1: 250 000 Sutherland sheet 3220 and on the map in Keyser and Smith (1977-78; Fig. 5). Vertebrate and other fossils found in the Sutherland area are also listed by Kitching (1977) as well as Theron (1983).

Fossils in the *Tapinocephalus* Assemblage Zone occur in association with both mudrocks and sandstones, most notably in thin intraformational conglomerates (*beenbreksie*) at the base of channel sandstones (Rossouw & De Villiers 1952, Turner 1981, Smith & Keyser 1995).

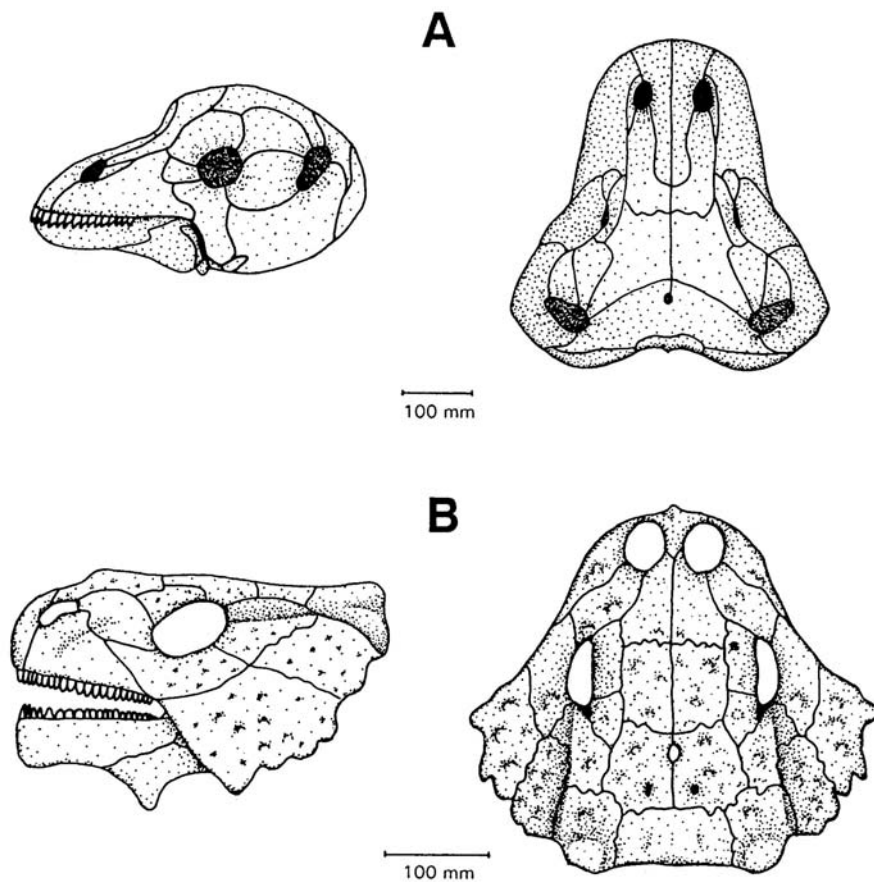


Fig. 6. Skulls of two key tetrapods of the *Tapinocephalus* Assemblage Zone: A - the dinocephalian therapsid *Tapinocephalus*; B - the pareiasaur *Bradysaurus* (From Smith & Keyser 1995).

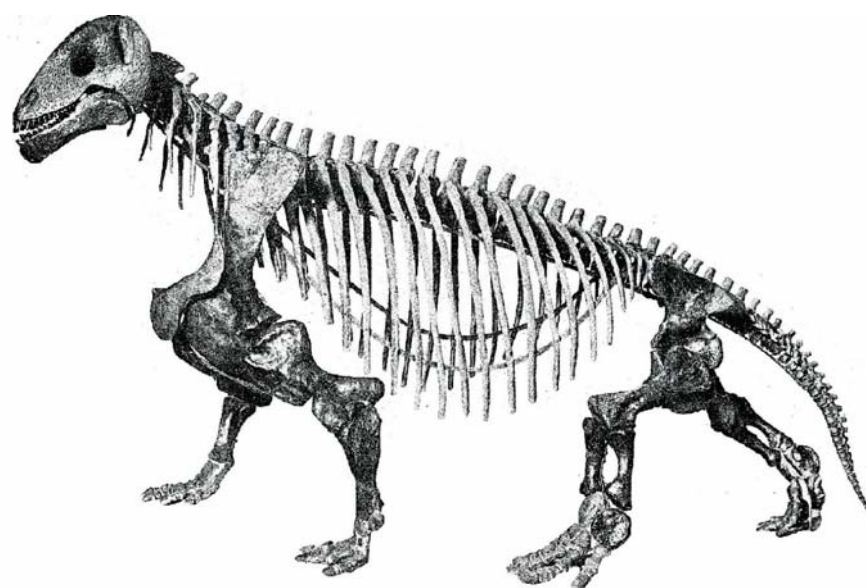


Fig. 7. Skeleton of the tapinocephalid (thick-skulled) dinocephalian *Moschops*, a rhino-sized herbivorous therapsid that reached lengths of 2.5 to 3m and may have lived in small herds.

There have been a number of attempts, hitherto only partially successful, to subdivide the very thick Abrahamskraal Formation succession in both lithostratigraphic and biostratigraphic terms. Among the most recent these was the study by Looek *et al.* (1994) in the Moordenaarskaroo area north of Laingsburg. Detailed geological mapping here led to the identification of six lithologically-defined members within the Abrahamskraal Formation. Intensive fossil collection within the middle part of the succession suggested that a significant faunal turnover event may have occurred at or towards the top of the sandstone-rich Koornplaats Member as defined by these authors, with the replacement of a more archaic, dinocephalian-dominated fauna (with primitive therapsids like the biarmosuchians) by a more advanced, dicynodont-dominated one at this level. This is the “faunal reversal” previously noted by Boonstra (1969) as well as Rossouw and De Villiers (1953). Other fossil groups such as therocephalians and pareiasaurs do not seem to have been equally affected. Problems have arisen in trying to correlate the lithologically-defined members recognized within the Abrahamskraal Formation by different authors across the whole outcrop area, with evidence for complex lateral interdigitation of the sandstone-dominated packages (D. Cole, pers. com., 2009). A research project is currently underway to subdivide the Abrahamskraal Formation on a biostratigraphic basis, emphasizing the range zones of various genera of small dicynodonts such as *Eodicynodon*, *Robertia* and *Diictodon* (Day & Rubidge 2010, Jirah & Rubidge 2010).

The fossil biota of the following *Pristerognathus* Assemblage Zone, best developed within the Portjie Member of the basal Teekloof Formation (Smith & Keyser 1995b), is of special palaeontological interest because, at least until recently, it was thought to represent an impoverished post-extinction recovery fauna following the catastrophic End-Guadalupian (= end Mid Permian) mass extinction event of 260.4 million years ago (Rubidge 2005, Retallack *et al.*, 2006, Erwin 2006, Lucas 2009). A new Mid-Permian radiometric date of 261.3 Ma obtained for the basal *Pristerognathus* Zone by Rubidge *et al.* (2010) is significant in that it shows that these low-diversity continental fossil assemblages actually *preceded* the global end-Mid Permian mass extinction event which is best established on the basis of marine invertebrate faunas (Erwin 2006, Retallack *et al.* 2006, Lucas 2009). This raises the possibility that two or more earlier extinction events in the continental realm are represented within the upper Abrahamskraal - Poortjie Member stratigraphic interval - *i.e.* (1) the faunal turnover at the top of the Koornplaats Member of the Abrahamskraal Formation and (2) the sudden impoverishment of Karoo tetrapods at the base of the *Pristerognathus* Zone, also within the upper Abrahamskraal Formation.

4.2. Fossil biotas within superficial deposits

The Karoo drift deposits have been comparatively neglected in palaeontological terms for the most part. However, they may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals (*e.g.* Skead 1980, Klein 1984, MacRae 1999, Partridge & Scott 2000). Other late Cenozoic fossil biotas from these superficial deposits include non-marine molluscs (bivalves, gastropods, rhizoliths), ostrich egg shells, trace fossils (*e.g.* calcretised termitaria, coprolites), and plant remains such as peats or palynomorphs (pollens) in organic-rich alluvial horizons.

5. CONCLUSIONS & RECOMMENDATIONS

Bedrock excavations made during construction of the proposed wind energy facility southeast of Sutherland will primarily affect continental sediments of the Middle Permian Beaufort Group. These sediments underlie the great majority of the study area and are renowned for their rich fossil heritage of terrestrial vertebrates (most notably mammal-like reptiles or therapsids), as well as fish, amphibians, molluscs, trace fossils (*e.g.* trackways) and plants (*e.g.* petrified wood). The upper Abrahamskraal Formation stratigraphic interval represented in the study area is of special palaeontological significance in that it contains a record of extinctions among continental biotas

preceding the disastrous End-Guadalupian Mass Extinction Event in the marine realm some 260.4 million years ago. The palaeontological sensitivity of these Beaufort Group rocks is therefore considered to be very high. Caenozoic surface sediments in the study area (*e.g.* alluvium, colluvium) are generally of low palaeontological sensitivity, but local concentrations of scientifically valuable fossils (*e.g.* mammalian bones, teeth) may also occur here.

Excavations and other construction work undertaken into Beaufort Group bedrock in order to install the wind turbines and associated infrastructure are likely to expose, disturb, destroy or seal-in valuable fossil heritage. Although the direct impact will be local, these fossils are of importance to national as well as international research projects on the fossil biota of the ancient Karoo and the Permian mass extinction events. Consequently, the impact from disturbance and/or destruction of valuable fossil heritage of the Beaufort Group bedrock is of high significance, at both local and regional levels.

It is therefore recommended that :

1. Before any major construction (*i.e.* substantial bedrock excavation) commences a thorough field scoping survey of representative natural and already existing artificial rock exposures (*e.g.* dams, roadcuts) within the study region as a whole should be undertaken by a qualified palaeontologist to identify specific areas or horizons of high palaeontological sensitivity on the ground.
2. On the basis of the initial field scoping, a realistic, collaborative mitigation programme and protocol should be drawn up by the palaeontologist in conjunction with the developer, SAHRA and Heritage Western Cape so that any important fossil heritage on site may be conserved cost-effectively. This mitigation would normally involve the recording and judicious collection of fossil material within the development area as well as the recording of relevant geological data, before or during the construction phase of the development. The palaeontologist involved in mitigation work will be required to obtain a palaeontological collection permit from SAHRA and to arrange a suitable repository for any fossils collected (*e.g.* Iziko: South African Museum, Cape Town).

Note that for those sites or areas of inferred high palaeontological sensitivity, repositioning of infrastructure should not be necessary except in exceptional cases, but selective monitoring of substantial excavations during development by a specialist palaeontologist might be required.

Should further substantial fossil remains be exposed during construction (notably articulated vertebrate skeletons or skulls), these should be recorded (*e.g.* photographed, with GPS location) and safeguarded by the responsible ECO, preferably *in situ*. Heritage Western Cape / SAHRA and a qualified palaeontologist should be alerted as soon as possible so that any appropriate mitigation measures can be considered.

6. ACKNOWLEDGEMENTS

Ms Mary Patrick of the Cape Archaeological Survey cc, Rondebosch, Cape Town is thanked for commissioning this study and for providing the necessary background information for the project.

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9. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva* cc. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHAP (Association of Professional Heritage Assessment Practitioners - Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Mainstream wind farm development projects, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



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