

PALAEONTOLOGICAL HERITAGE COMMENT: SITE SENSITIVITY REPORT & LETTER OF EXEMPTION FROM FURTHER SPECIALIST STUDIES

Kokerboom 1, 2 and 3 Transmission lines and Switching Stations near Loeriesfontein, Namaqua District Municipality, Northern Cape

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EXECUTIVE SUMMARY

It is proposed to develop four adjoining wind energy facilities (WEFs), the Kokerboom 1 Wind Farm, Kokerboom 2 Wind Farm, Kokerboom 3 Wind Farm and Kokerboom 4 Wind Farm, on a site situated some 60 km to the north of Loeriesfontein in the Namakwa District Municipality and Hantam Local Municipality, Northern Cape. Three separate Environmental Applications (EAs) are being submitted with respect to the proposed connections of the Kokerboom 1-4 Wind Farms to the national grid.

The present palaeontological heritage comment (Site Sensitivity Report and Letter of Exemption from Further Specialist Studies) contributes to all three applications for EA and is based on a 5-day field assessment in the wind farm project area as well as desktop analysis, including several previous palaeontological assessment studies in the region by the author and others.

The Kokerboom 1, 2 and 3 Wind Energy Facilities' transmission lines and switching stations (henceforth referred to as "the Project") project area is underlain by several formations of potentially fossiliferous Late Palaeozoic sediments of the Eccca Group (Karoo Supergroup) that are extensively intruded by unfossiliferous igneous rocks of the Early Jurassic Karoo Dolerite Suite. The Eccca Group rocks (Prince Albert, Whitehill and Tierberg Formations) here are very poorly-exposed and deeply-weathered near-surface. They have also been locally baked (thermally metamorphosed) by nearby dolerite intrusions and occasionally secondarily mineralised. The only fossils recorded within these rocks comprise low-diversity trace fossil assemblages that occur widely within the Loeriesfontein region and are therefore not of unique scientific interest. No fossil vertebrate or plant remains were recorded within these rocks during the field assessments. The Karoo dolerites that crop out over large portions of the combined grid connection project area do not contain fossils. None of the wide range of Late Caenozoic superficial deposits examined during fieldwork appear to be highly fossiliferous. Important mammalian remains are known from pan and river sediments elsewhere in Bushmanland, but they are rare and their occurrence is unpredictable.

Palaeontological fieldwork as well as desktop studies indicate that, due to (1) high levels of bedrock weathering and (2) thermal metamorphism by dolerite intrusion in the region, as well as (3) low levels of sedimentary bedrock exposure, the palaeosensitivity of the entire Kokerboom 1-4 Wind Farm grid connection project area in practice LOW TO VERY LOW. The relevant DFFE screening tool sensitivity mapping, which shows sensitivity levels ranging from Low to Very High within the combined grid connection project footprint, is therefore *contested* here.

The construction phase of the Project infrastructure is likely to have a **VERY LOW TO LOW (negative) impact significance** in terms of local palaeontological heritage resources based on (1) the low palaeosensitivity and small area of the project footprints and (2) the small scale of anticipated excavations into fresh bedrock.

No high-sensitivity or No-Go areas have been identified within the Project area. The proposed Project developments have no fatal flaws in terms of palaeontological heritage. Further significant impacts are not anticipated in the operational and de-commissioning phases. No further assessment of palaeontological impacts is required to inform the EIA process.

The proposed electrical infrastructure developments are not fatally flawed in palaeontological heritage terms. Anticipated cumulative impacts are of LOW significance and therefore fall within acceptable limits.

There is no objection on palaeontological heritage grounds to authorization of the proposed Kokerboom 1, 2 and 3 Transmission lines and Switching Stations near Loeriesfontein.

- **Recommendations for monitoring and mitigation**

Given (1) the general low palaeosensitivity of the Project area, as well as (2) the anticipated low to very low impact significance of the proposed electrical infrastructure developments, **no further specialist palaeontological studies, monitoring or mitigation are recommended for any of projects, pending** the potential discovery of significant new fossil remains (e.g. vertebrate bones and teeth, horn cores, petrified wood) before or during the construction phase.

The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the Project should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint. During the construction phase all major clearance operations (e.g. for new or widened access roads, pylon footings, laydown areas) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ECO and/or on-site Environmental Officer (ESO). Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO or ESO should safeguard these, preferably *in situ*. They should then alert the South African Heritage Resources Agency, SAHRA, as soon as possible (Contact details: Dr Ragna Redelstorff, Heritage Officer Archaeology, Palaeontology & Meteorites Unit, SAHRA. 111 Harrington Street, Cape Town, 8001. Tel: +27 (0)21 202 8651. Fax: +27 (0)21 202 4509. E-mail: rredelstorff@sahra.org.za). This is to ensure that appropriate action (*i.e.* recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the proponent's expense.

The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

These monitoring and mitigation recommendations are summarized in the Appendix to this report and should be incorporated into the Environmental Management Programme (EMPr) for the Kokerboom 1, 2 and 3 transmission lines and switching stations project.

1. PROJECT OUTLINES & BRIEF

It is proposed to develop three adjoining wind energy facilities (WEFs), the Kokerboom 1 Wind Farm, Kokerboom 2 Wind Farm and Kokerboom 3 Wind Farm, on a site situated some 60 km to the north of Loeriesfontein in the Namakwa District Municipality and Hantam Local Municipality, Northern Cape. The proposed site for the Kokerboom 1,2 and 3 transmission lines, switching stations and associated infrastructure is located approximately 53 km north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site can be reached via the unsurfaced Granaatboskolk (AP2972, Nuwepos) Road that branches off the main road, R357. An overview map of the combined project footprints is given in Figure 1 and separate project descriptions and maps for each are provided below.

An application for Environmental Application (EAs) is being submitted with respect to the proposed connections of the Kokerboom 1-3 Wind Farms to the national grid. For each proposed grid line, a 300m wide corridor is being assessed.

The present desktop palaeontological heritage comment will contribute to the three grid connection environmental assessments that are being conducted by Zutari (previously Aurecon South Africa (Pty) Ltd) (Contact details: Ms Genie de Waal or Ms Corlie Steyn. Address: Zutari, Aurecon Centre, 1 Century City Drive, Waterford Precinct, Century City, South Africa 7441. E-mail: Genie.deWaal@zutari.com or corlie.steyn@zutari.com).

The present desktop report is based on (1) a review of the relevant scientific literature, including previous palaeontological impact assessments in the Loeriesfontein area (e.g. Almond 2008c, 2011a, 2011b, 2014b, 2014c, 2017a, 2017b, 2020, Pether 2012, Millstead 2014, Groenewald 2014 and Butler 2016), (2) Google Earth© satellite imagery as well as published geological maps and accompanying sheet explanations, (3) a combined five-day field study by the author and a field assistant in the broader Kokerboom WEF study area north of Loeriesfontein (23-25 June 2016, 21-22 February 2020) as well as (4) the author's extensive field experience with the formations concerned and their palaeontological heritage (e.g. Almond *in* Macey *et al.* 2011).

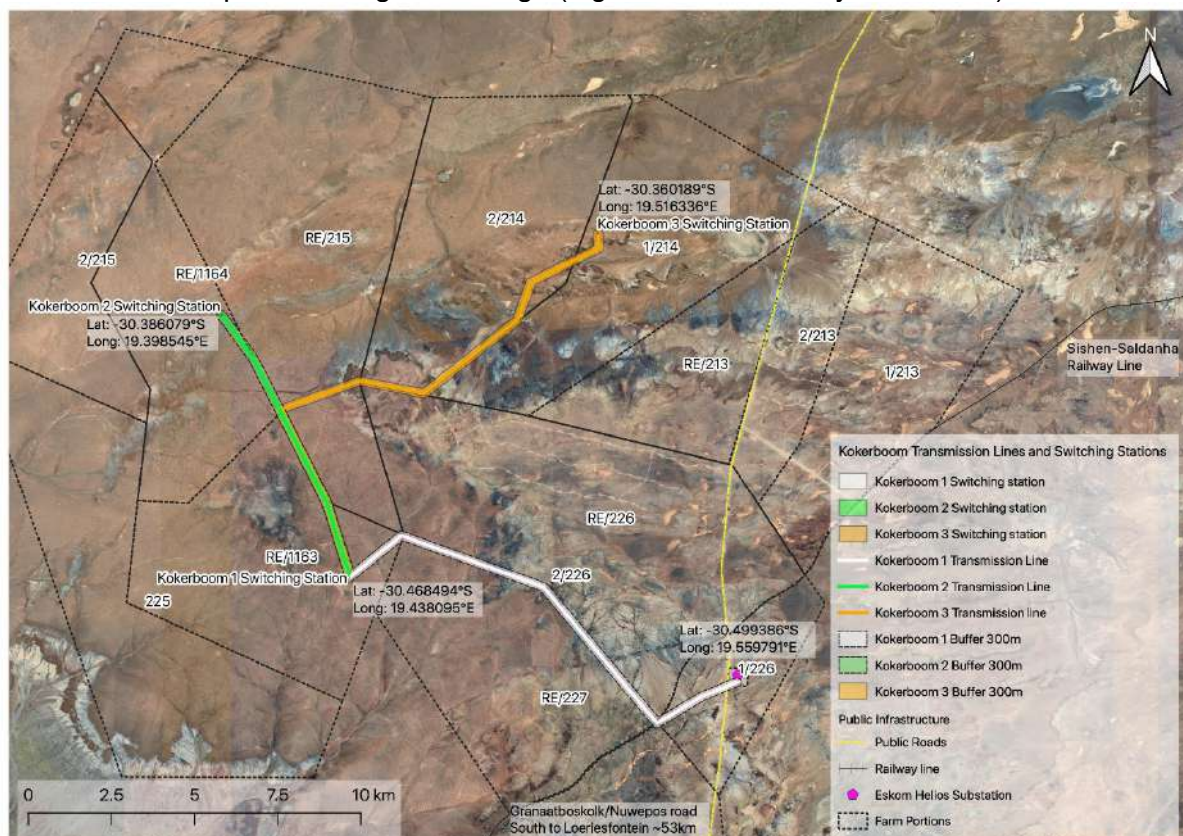


Figure 1: Satellite image showing the location of all three proposed transmission lines and switching stations for the Kokerboom 1, 2 and 3 Wind Energy Facilities near Loeriesfontein, Northern Cape. Detailed maps for each are provided below.

1.1. Kokerboom 1 transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the Farms Sous and Leeubergrivier. The technical specification of the Kokerboom 1 Transmission line, switching station and associated infrastructure are provided in Table 1 and illustrated in Figure 1 and Figure 2. The Kokerboom 1 Transmission line, switching station and associated infrastructure will be located on the farms listed in Table 2 below, and as illustrated in Figure 2.

Table 1: Technical details for Kokerboom 1 Transmission line and switching station

Component	Description
Overhead Powerline (OHL)	132kV single- or double-circuit Extending from the Kokerboom 1 switching station (collector substation) to the Eskom Helios MTS. OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-sitting).
OHL Pylons	Up to 45m in height (most structures will be up to 32m tall, only increasing to up to 45m when crossing the railway line, existing overhead powerlines and public roads, i.e. Granaatsboskolk Road (AP2972) – depending on the minimum clearance specified by the road, OHL and rail authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m ²)
OHL footprint	Length ≈16km Construction road / service track (jeep track) diameter ≈4m (or less) OHL footprint 6,4ha (16km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Number of pylons (based on average 150m average between pylons) ≈108 Pylon's disturbance footprint 1,08ha (108 x 100m ²)
Kokerboom 1 Switching Station adjacent to authorised Kokerboom 1, WEF facility substation.	Kokerboom 1 Switching Station (collector station) To be located directly adjacent to the Kokerboom 1 WEF Facility substation.
Switching station coordinates (approx. centre point)	Lat: -30.468494° Long: 19.438095°
Switching station footprint	Footprint of up to 1,5ha (100m wide and 150m long)
Laydown Areas	Temporary laydown area of ≈5000m ² will be required at the switching station.
Site Access	The existing approved access roads to the Kokerboom 1 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom WEFs will be utilized to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 2: Farm details for Kokerboom 1 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
Rona Rupert Trust (Francois van der Merwe)	RE/226	C01500000000022600000	Sous	9127,10
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/227	C01500000000022700000	Kleine Rooiberge	4231,23
AJ Van Heerden Familie Trust (Herman van Heerden)	RE/1663	C01500000000116300000	Leeubergrivier	4586,01
Eskom	1/226	C01500000000022600001	Helios MTS	35,99
Transnet	3/226	C01500000000022600003	Sishen-Saldanha Railway line	30,84

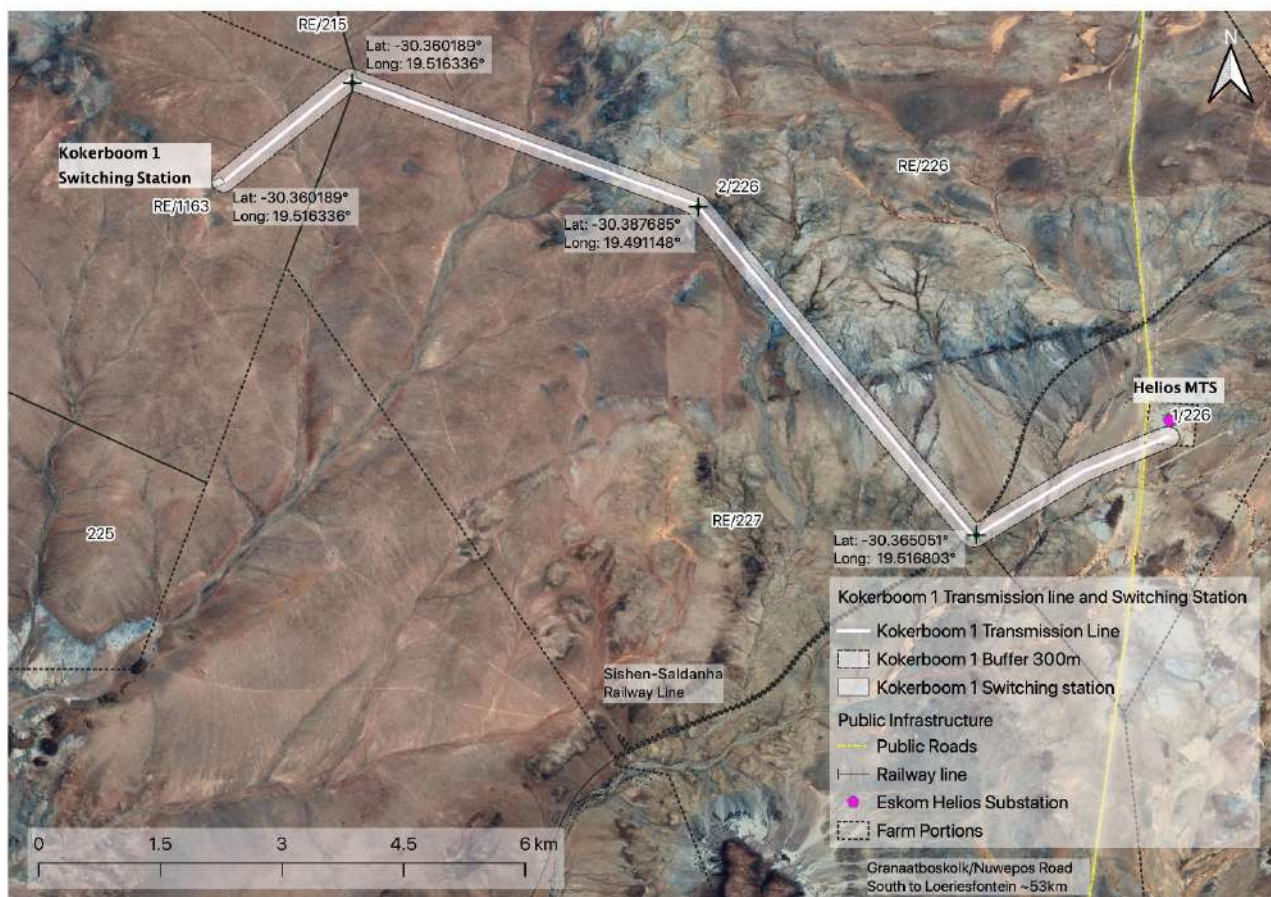


Figure 2: Satellite image showing the location of the proposed Kokerboom 1 transmission line (white) and switching station (small white rectangle).

1.2. Kokerboom 2 transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the Farms Sous, Leeubergrivier and Sprinbokpan. The technical specification of the Kokerboom 2 Transmission line, switching station and associated infrastructure are provided in **Table 3** and illustrated in Figure 1

and Figure 3. The Kokerboom 2 Transmission line, switching station and associated infrastructure will be located on the farms listed in **Table 4** below, and as illustrated in Figure 3.

Table 3: Technical details for Kokerboom 2 Transmission line and switching station

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 2 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-sitting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m
OHL footprint	Length ≈10km Construction road / service track (jeep track) diameter ≈4m (or less) OHL footprint 4ha (10km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Number of pylons (based on average 150m average between pylons) = ≈68 Pylons disturbance footprint 0,68ha (68 x 100m ²)
Switching Station adjacent to Kokerboom 2 WEF facility substations	Kokerboom 2 Switching Station To be located directly adjacent to the authorised Kokerboom 2 WEF Facility substation.
Switching station coordinates (approx. centre point)	Lat: -30.386079° Long: 19.398545°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of ≈5000m ² will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1 and 2 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1 and 2 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 4: Farm details for Kokerboom 2 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
AJ Van Heerden Familie Trust (Herman van Heerden)	RE/1663	C01500000000116300000	Leeubergrivier	4586,01
GA Van Der Westhuizen Familie Trust (Deon Van Der Westhuizen)	RE/1664	C01500000000116400000	Sprinbokpan	4465,03
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/215	C01500000000021500000	Springbok Tand	7335,21

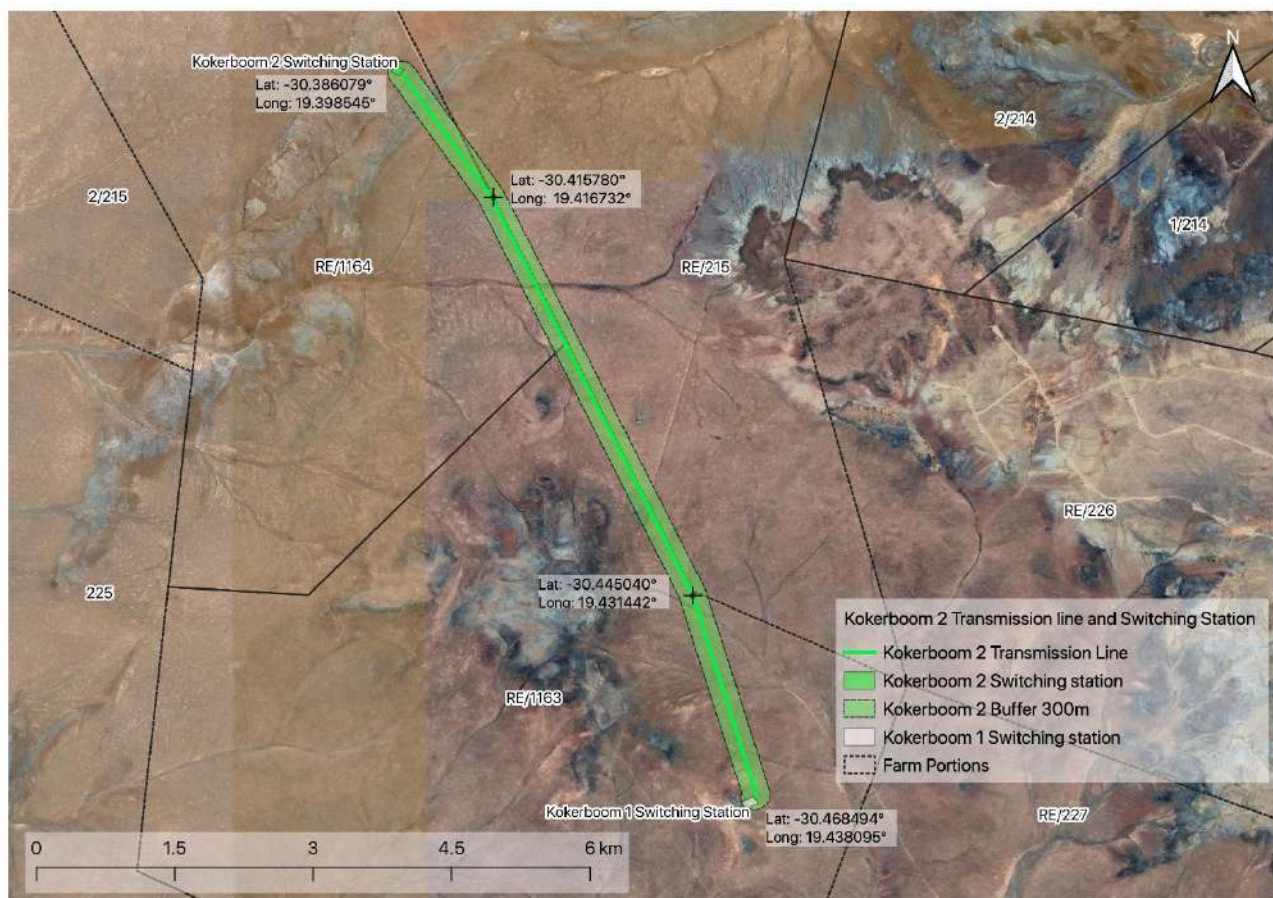


Figure 3: Satellite image showing the location of the proposed Kokerboom 2 transmission line and switching station. The Kokerboom 1 switching station is shown by the small white rectangle.

1.3. Kokerboom 3 transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the Farms Sous, Leeubergrivier and Sprinbokpan, Springbok Tand and Karree Doorn Pan. The technical specification of the Kokerboom 3 Transmission line, switching station and associated infrastructure are provided in **Table 5** and illustrated in Figure 1 and Figure 4. The Kokerboom 3 Transmission line, switching

station and associated infrastructure will be located on the farms listed in **Table 6** below, and as illustrated in Figure 4.

Table 5: Technical details for Kokerboom 3 Transmission line and switching station

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 3 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-sitting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities). Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m.
OHL footprint	Length \approx 19km Construction road / service track (jeep track) diameter \approx 4m (or less) OHL footprint 7,6ha (19km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Number of pylons (based on average 150m average between pylons) = \approx 127 Pylons disturbance footprint 1,27ha (127 x 100m ²)
Kokerboom 3 Switching Station adjacent to Kokerboom 3 WEF facility substations	Kokerboom 3 Switching Station To be located directly adjacent to the Kokerboom 3 WEF Facility substation.
Switching station coordinates (approx. centre point)	Lat: -30.360189° Long: 19.516336°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of \approx 5000m ² will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1, 2 and 3 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1, 2 and 3 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 6: Farm details for Kokerboom 3 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
AJ Van Heerden Familie Trust (Herman van Heerden)	RE/1663	C01500000000116300000	Leeuberggrivier	4586,01
GA Van Der Westhuizen Familie Trust (Deon Van Der Westhuizen)	RE/1664	C01500000000116400000	Sprinbokpan	4465,03
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/215	C01500000000021500000	Springbok Tand	7335,21
TR2 Immobilien GmbH	2/214	C01500000000021400002	Karree Doorn Pan	5,094.24
Gert Johannes Lombard	1/214	C01500000000021400001	Karree Doorn Pan	5,094.23

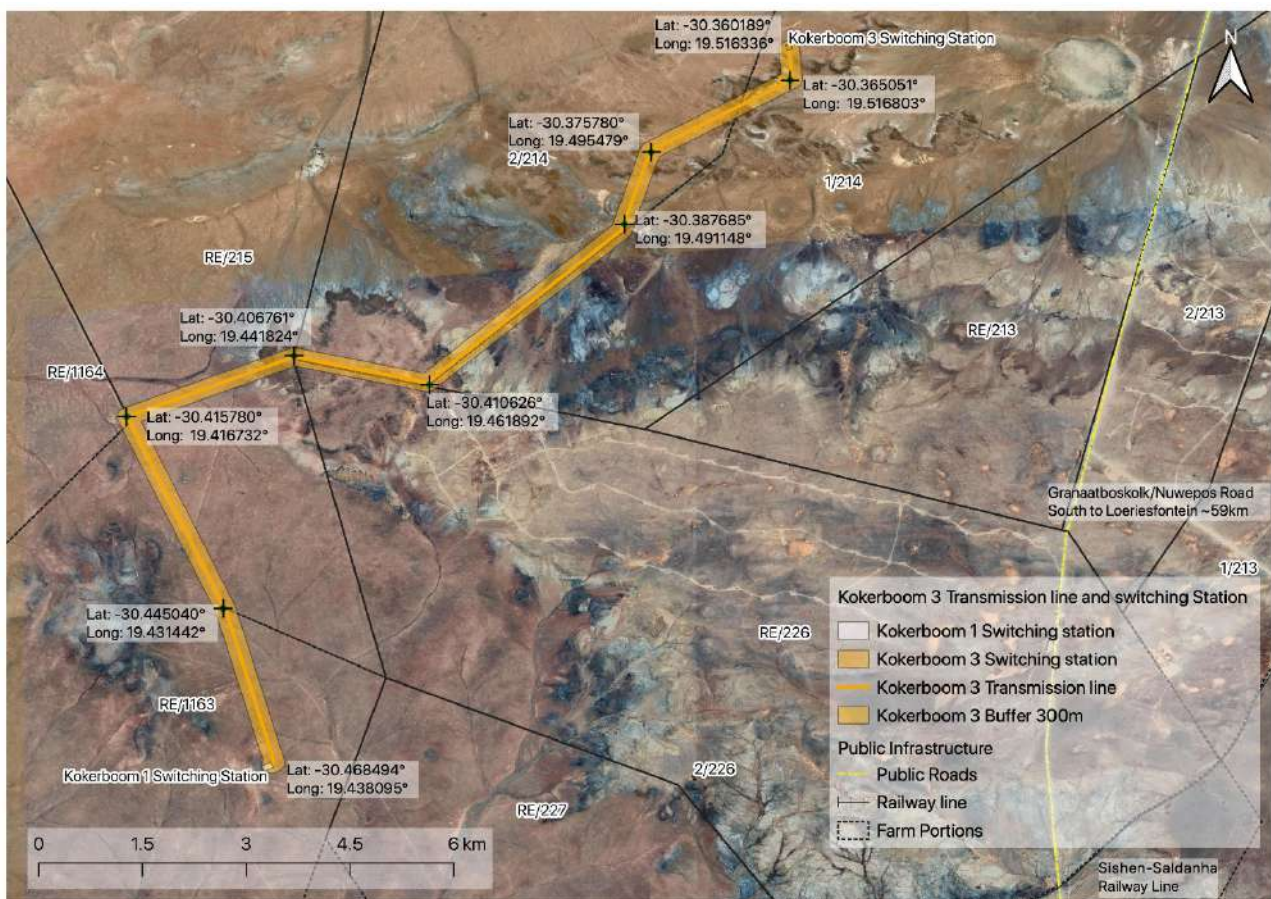


Figure 4: Satellite image showing the location of the proposed Kokerboom 3 transmission line and switching station. The Kokerboom 1 switching station is shown by the small white rectangle.

2. GEOLOGICAL CONTEXT

The geological setting for the Project areas near Loeriesfontein has already been described in some detail in previous PIA reports by Almond (2017a, 2020) (See also relevant geological maps and references therein) and will therefore only be briefly outlined here. The area lies within semi-arid, gently undulating terrain on the southern borders of the Bushmanland region. The prominent, dolerite-capped hills of Groot Rooiberg, Klein Rooiberg and Leeuberg to the south reach elevations of c. 880-1000 m amsl. The Sishen-Saldanha railway runs to the southeast and the Loeriesfontein – Granaatboskolk - Pofadder dust road traverses the eastern margins of the area.

The Project area is characterised by gently-undulating terrain with low hills, few rocky *kranzes* (ridges or scarps), shallow, usually dry water courses and extensive gravelly *vlaktes* (plains). The landscape is mantled in low karroid *bossieveld* with few, small trees along water courses and in rocky areas. In general levels of bedrock exposure are very low indeed due to the pervasive cover by superficial sediments (alluvium, colluvium, surface gravels, pedocretes *etc*); it is mainly limited to sporadic small dolerite *koppies*, stream beds, low scarps, erosion gullies as well as the margins of pans and dams. Several borrow pits, mainly situated along the Loeriesfontein – Pofadder dust road, provide important additional windows into the subsurface geology.

The Loeriesfontein region lies towards the north-western edge of the Main Karoo Basin of South Africa (Johnson *et al.* 2006). The geology of the combined grid connection project area is shown on 1: 250 000 geology sheet 3018 Loeriesfontein (Macey *et al.* 2011) and has been described and illustrated by Almond (2017a) (See black rectangle in Fig. 5). The sedimentary bedrock successions represented within the grid connection project area are predominantly basinal mudrocks assigned to the Early to Middle Permian **Ecca Group (Karoo Supergroup)**. They become broadly younger towards the east, although this pattern is largely obscured by much later, extensive dolerite intrusions. The three Ecca Group subunits represented in the study area include (1) dark mudrocks and fine-grained sandstones of the **Prince Albert Formation**; (2) white-weathering carbonaceous mudrocks of the **Whitehill Formation** followed by grey-green mudrocks and wackes (impure sandstones) of the **Tierberg Formation**. Early Jurassic sills of the **Karoo Dolerite Suite** (Jd) intrude the Ecca Group country rocks over large areas, especially towards the north and west. In addition, several **breccia pipes** associated with Karoo dolerite intrusion occur within the area, but are unmapped. Swarms of such intrusive pipes are well known from the Karoo region north of Loeriesfontein where they are especially abundant in the Prince Albert Formation outcrop area but also pierce through the overlying Whitehill rocks (*cf.* Macey *et al.* 2011, Almond 2014c). A range of **Late Caenozoic superficial sediments** - mostly unconsolidated and probably of Quaternary to Recent age – represented within the project area include alluvial and pan deposits, pedocretes (*e.g.* calcrete), surface gravels (including doleritic rubble) and various sandy to gravelly soils.

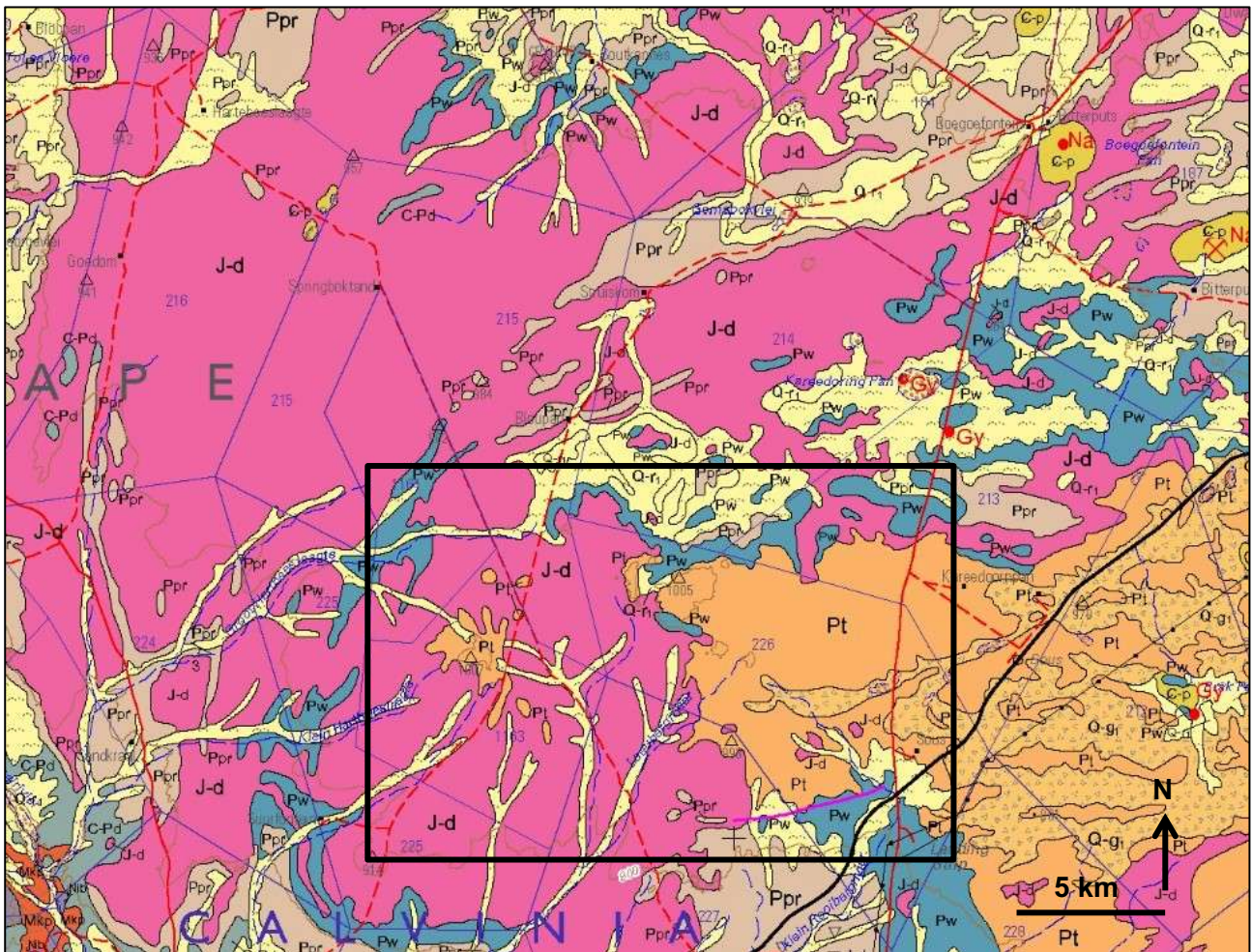


Figure 5: Extract from 1: 250 000 geology sheet 3018 Loeriesfontein (Council for Geoscience, Pretoria) showing the main rock units underlying the combined project area for the Kokerboom 1-3 Wind Farm grid connection developments (black rectangle), situated c. 60 km north of Loeriesfontein, Northern Cape. The main rock units represented within the Project area are:

1. KAROO SUPERGROUP (ECCA GROUP)

Prince Albert Formation (Ppr, buff)

Whitehill Formation (Pw, blue)

Tierberg Formation (Pt, orange)

2. KAROO DOLERITE SUITE

Dolerite sills and dykes (J-d, pink)

3. LATE CAENOZOIC SUPERFICIAL SEDIMENTS

Stream and river alluvium (pale yellow with flying bird symbol), sandy soils (Q-r1, pale yellow), dolerite rubble (Q-g1, pale orange with triangle symbols), unmapped scree deposits, various surface gravels, pan sediments (red dotted areas; Gy = gypsum deposits).

3. PALAEOLOGICAL HERITAGE CONTEXT

Palaeontological heritage that has been recorded within the sedimentary rock units represented within the Project area has been previously outlined, with extensive references, by Almond (2017a; see also Almond 2014c, 2020, Almond & Pether 2008), and is thus described briefly here.

On the basis of desktop studies (e.g. Almond & Pether 2008) as well as several previous palaeontological surveys within the broader study region by the author (See References, especially Almond 2014c, 2017a, 2020) and by other palaeontologists such as Pether (2012), Millstead (2014), Groenewald (2014) and Butler (2016), the following conclusions have been drawn:

- The Eccia Group rocks (**Prince Albert, Whitehill and Tierberg Formations**) are generally very poorly-exposed and deeply-weathered near-surface. They have also been locally baked (thermally metamorphosed) by dolerite intrusions and occasionally secondarily mineralised. The only fossils recorded here within these rocks comprise low-diversity trace fossil assemblages that occur widely within the Loeriesfontein region and therefore not of unique scientific importance. No scientifically important vertebrate or plant remains were recorded here during the field assessment.
- The **Karoo dolerites** that crop out over large portions of the Project area are also poorly-exposed, deeply-weathered for the most part and, in addition, do not contain fossils.
- Several unmapped, small-scale occurrences of Karoo and / or post-Karoo **breccia pipes** and **igneous intrusions** occur within the broader WEF project area. Some of the associated sandy sediments contain simple invertebrate trace fossils of uncertain age and stratigraphic position (*N.B.* possibly within deformed Prince Albert Formation country rocks). Similar traces have previously been recorded from similar settings elsewhere within the Loeriesfontein region; they are not considered to be of great scientific significance.
- None of the wide range of **Late Caenozoic superficial deposits** examined during fieldwork (e.g. alluvium, colluvium, surface gravels, calcretes, stream and pan sediments, sandy soils) appears to be highly fossiliferous. Important mammalian remains are known from pan and river sediments elsewhere in Bushmanland, but they are rare and their occurrence is highly unpredictable.

It is concluded that both the bedrocks as well as the superficial sediments underlying the Kokerboom 1, 2 and 3 transmission lines and switching stations project area, are generally of LOW to VERY LOW palaeontological sensitivity. However, the slight possibility remains that small, local areas of High to Very High palaeosensitivity (e.g. Quaternary mammal fossils within older alluvial deposits) occur within the region but these are inherently unpredictable.

4. SITE SENSITIVITY VERIFICATION

Palaeosensitivity maps for the Project areas, using the DFFE screening tool, have been provided by Zutari (Figs. 6 to 8). These maps, which are probably based on the 1: 1 000 000 geological maps, indicate a High Sensitivity for areas underlain by Ecca Group bedrocks and a Medium Sensitivity for the remainder (including unfossiliferous dolerite). More sophisticated mapping of local palaeosensitivity in the project area is provided by the SAHRIS palaeosensitivity map which is based on 1: 250 000 scale geological maps. This highlights the Ecca Group sedimentary bedrocks as High to Very High Sensitivity while Late Caenozoic superficial deposits are assigned a Low to Medium Sensitivity and Karoo dolerite a Zero Sensitivity.

Based on palaeontological fieldwork as well as desktop studies (as outlined in Section 3), the DFFE sensitivity mapping for the proposed grid connection project areas, as shown in Figure 6, is *contested* here. Due to high levels of bedrock weathering and thermal metamorphosis by dolerite intrusion in the region, as well as low levels of sedimentary bedrock exposure, the revised sensitivity of the Project area is assessed as Low to Very Low.

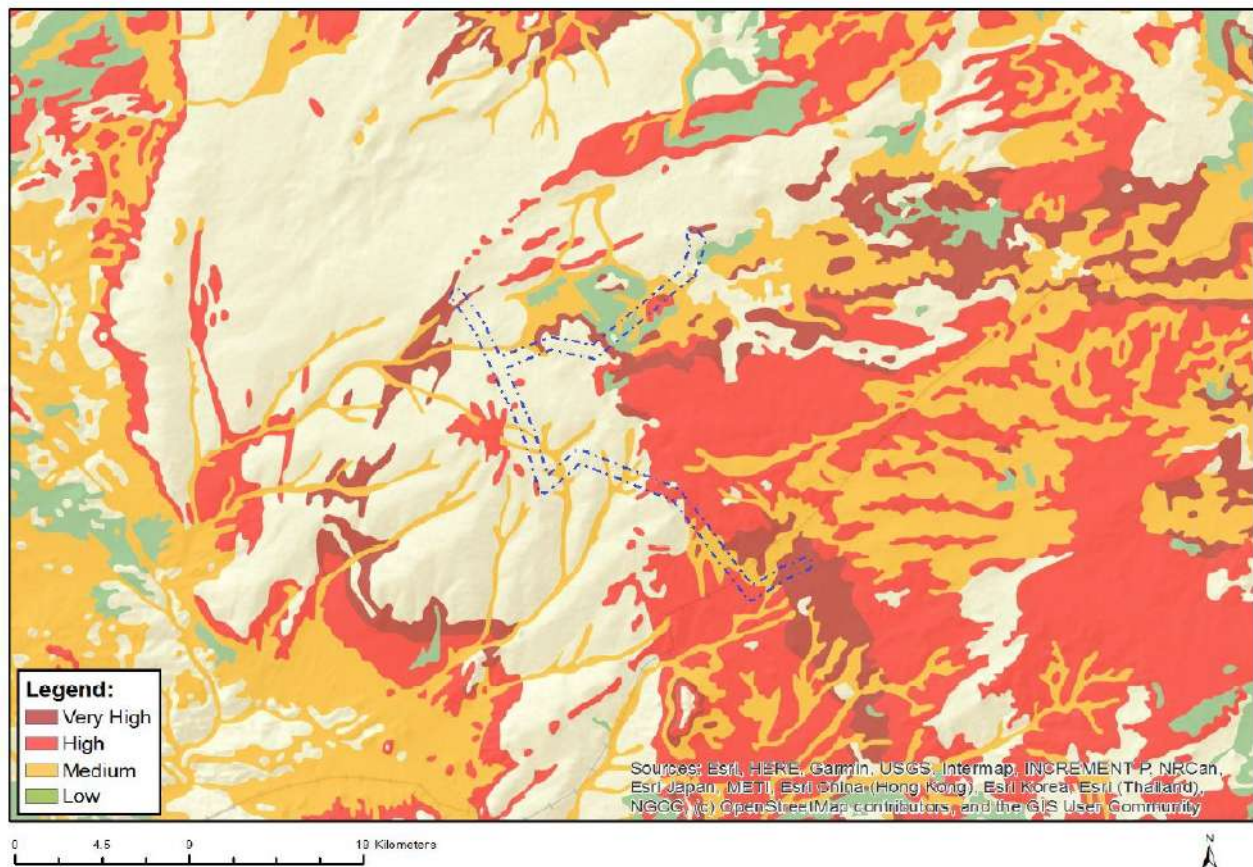


Figure 6: Palaeontological heritage site sensitivity map for the combined Kokerboom 1-3 Wind Farm grid connection project area (blue dotted polygon) based on the DFFE screening tool. The area includes sectors of zero as well as Low to Very High inferred palaeosensitivity. Based on fieldwork and desktop studies, this sensitivity mapping is *contested* here. Due to high levels of bedrock weathering in the region, the revised sensitivity of the entire project area is assessed as Low to Very Low (Map supplied by Zutari).

5. IMPACTS ON PALAEOONTOLOGICAL HERITAGE

Construction phase activities such as surface clearance and excavations for grid connection infrastructure such as access roads, pylon footings, temporary laydown areas and substation expansion can potentially have negative impacts on scientifically important, legally protected fossil heritage preserved at surface or below ground within the development footprint. Further significant impacts are not anticipated in the operational and de-commissioning phases.

The construction phase of the Kokerboom 1, 2 and 3 transmission lines and switching stations infrastructure is likely to have a **VERY LOW TO LOW (negative) impact significance** in terms of local palaeontological heritage resources based on:

- The low palaeosensitivity and small area of the project footprints;
- The small scale of anticipated excavations into fresh bedrock.

No high-sensitivity or **No-Go areas** have been identified within the Project area. The proposed grid connection developments have no fatal flaws in terms of palaeontological heritage.

5.1. Cumulative impacts

Tabulated data and satellite maps indicating proposed or authorised renewable energy facilities in the vicinity (c. 40 km radius) of the combined Kokerboom 1-4 Wind Farm grid connection project area north of Loeriesfontein, are presented in Table 1 and Figures 7 and 8 below (Data provided by Zutari).

Cumulative impacts posed by the proposed new grid connection infrastructure in the context of these developments and their associated grid connection infrastructure, has been assessed on the basis of the available PIA reports (*cf* Almond 2011a, 2011b, 2014c, 2017a, 2020, Pether 2012, Groenewald 2014, Millstead 2014, Butler 2016).

Given (1) the low palaeontological sensitivity of the broader Bushmanland region north of Loeriesfontein, (2) the low impact significance determined for the various renewable energy projects in the region (including the Kokerboom 1-4 Wind Farms themselves) and (3) the small footprints of this Project's proposed grid connection infrastructure, which do not entail involve large-scale bedrock excavations, it is concluded that **the cumulative impact on palaeontological heritage resources of all the proposed grid connection Project infrastructure, is LOW**. The anticipated cumulative impacts therefore fall within acceptable limits.

Table 1: Proposed or authorised renewable energy facilities in the vicinity of the combined Kokerboom 1-3 Wind Farm grid connection project area (Data provided by Zutari).

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Portion 2 of the Farm Graskoppies No. 176; and Portion 1 of the Farm Hartebeest Leegte No. 216.
Hartebeest Leegte Wind Farm	EA issued	Mainstream	Wind	235MW	<ul style="list-style-type: none"> Entire part of the Remainder of the Farm Hartebeest Leegte No. 216.
Xha! Boom Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Entire part of Portion 2 of the Farm Georg's Vley No. 217.
Ithemba Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> Western portion of Portion 2 of the Farm Graskoppies No. 176; and Western portion of Portion 1 of the Farm Hartebeest Leegte No. 216.
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227
Kokerboom 4 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	600MW	<ul style="list-style-type: none"> Remainder of the Farm Leeuwergrivier No. 1163; and Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 1 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	256MW	<ul style="list-style-type: none"> Remainder of the Farm Leeuwergrivier No. 1163; and Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> Remainder of the Farm Leeuwergrivier No. 1163; and Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 3 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	300MW	<ul style="list-style-type: none"> Remainder of the Farm Aan De Karree Doorn Pan No. 213; Portion 1 of the Farm Karree Doorn Pan No. 214; and Portion 2 of the Farm Karree Doorn Pan No. 214.

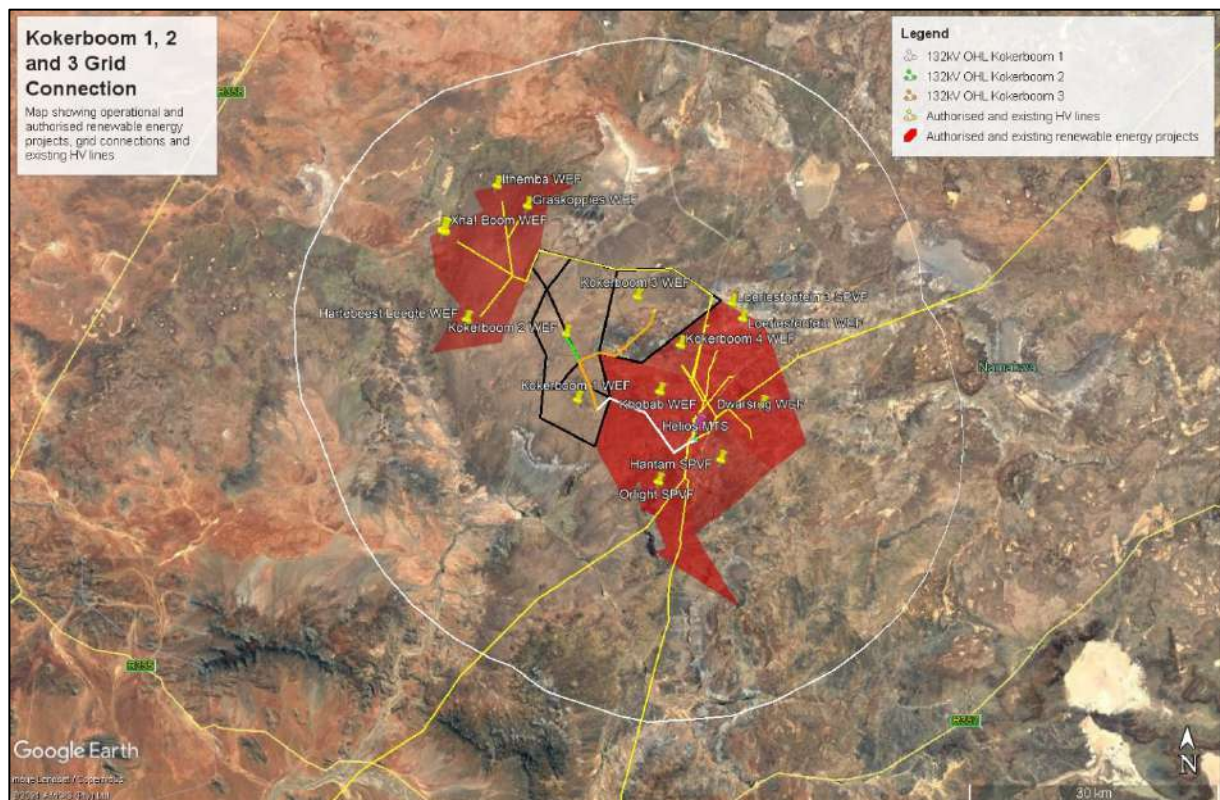


Figure 7: Satellite image showing proposed or authorised renewable energy facilities in the vicinity (c. 40 km radius) of the combined Kokerboom 1-3 Wind Farm grid connection project area north of Loeriesfontein (Data provided by Zutari).

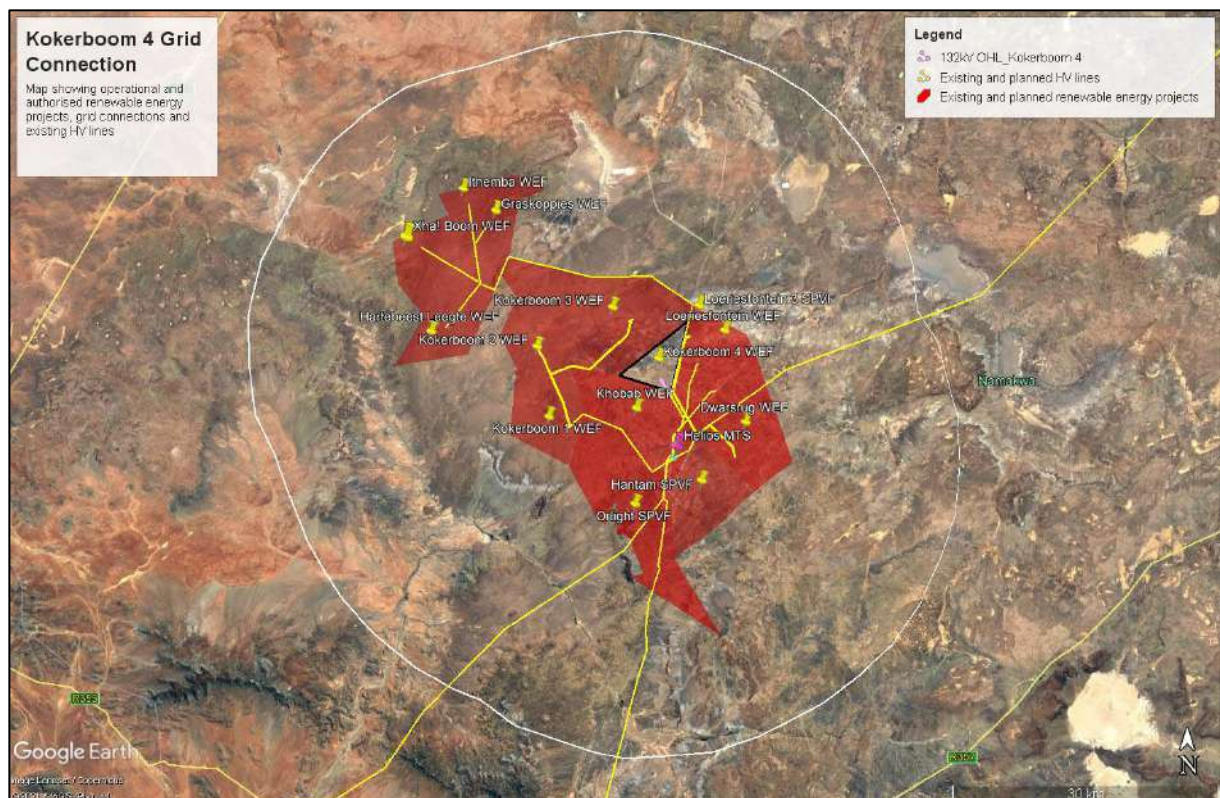


Figure 8: Satellite image showing proposed or authorised renewable energy facilities in the vicinity (c. 40 km radius) of the Kokerboom 4 Wind Farm grid connection project area north of Loeriesfontein (Data provided by Zutari).

6. CONCLUSIONS & RECOMMENDATIONS

Based on several desktop and field-based palaeontological heritage surveys in the combined Kokerboom 1-3 Wind Farm grid connection project area, as well as in the broader Bushmanland region north of Loeriesfontein, it is concluded that the sedimentary bedrocks as well as the superficial sediments underlying the grid connection project areas are generally of **LOW to VERY LOW palaeontological sensitivity**. However, the slight possibility remains that small, local areas of High to Very High palaeosensitivity (e.g. Quaternary mammal remains within older alluvial deposits) occur within the region.

The Construction Phase of the Project infrastructure (all components tabulated in report Section 1) is likely to have a **Very Low to Low impact significance** in terms of local palaeontological heritage resources (No significant further impacts are anticipated in the operational and decommissioning phases). No high-sensitivity **No-Go areas** have been identified within the combined grid connection project area. The proposed electrical infrastructure developments are not fatally flawed in palaeontological heritage terms. Anticipated cumulative impacts are of LOW significance and therefore fall within acceptable limits.

There is no objection on palaeontological heritage grounds to authorization of the proposed Kokerboom 1, 2 and 3 transmission lines and switching stations infrastructure near Loeriesfontein.

6.1. Recommendations for monitoring and mitigation

Given (1) the general low palaeosensitivity of the combined project area as well as (2) the anticipated low to very low impact significance of the proposed electrical infrastructure developments, **no further specialist palaeontological studies, monitoring or mitigation are recommended for any of projects**, pending the potential discovery of significant new fossil remains (e.g. vertebrate bones and teeth, horn cores, petrified wood) before or during the construction phase.

The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the Project should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint. During the construction phase all major clearance operations (e.g. for new or widened access roads, pylon footings, laydown areas) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ECO and/or on-site Environmental Officer (ESO). Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO or ESO should safeguard these, preferably *in situ*. They should then alert the South African Heritage Resources Agency, SAHRA, as soon as possible (Contact details: Dr Ragna Redelstorff, Heritage Officer Archaeology, Palaeontology & Meteorites Unit, SAHRA. 111 Harrington Street, Cape Town, 8001. Tel: +27 (0)21 202 8651. Fax: +27 (0)21 202 4509. E-mail: rredelstorff@sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the proponent's expense.

The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

These monitoring and mitigation recommendations are summarized in the Appendix to this report should be incorporated into the Environmental Management Programme (EMPr) for the Project.

It should be noted that, should fossils be discovered before or during construction and reported by the responsible ECO to the responsible heritage management authority (SAHRA) for professional recording and collection, as recommended here, the overall impact significance of the project would remain low to very low (negative). However, any residual negative impacts from inevitable loss of fossil heritage would be partially offset by an improved palaeontological database as a direct result of appropriate mitigation. This is a *positive* outcome because any new, well-recorded and suitably curated fossil material from this palaeontologically under-recorded region of Bushmanland would constitute a useful addition to our scientific understanding of the fossil heritage here.

5. ACKNOWLEDGEMENTS

Ms Genie de Waal and Ms Corlie Steyn of Zutari, Cape Town, are both thanked for commissioning this study and for persistently providing the necessary background information.

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7. 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, Limpopo, Northwest Province, Mpumalanga, KwaZulu-Natal, Gauteng and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as 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 APHP (Association of Professional Heritage 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 development project, 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.



Dr John E. Almond
Palaeontologist
***Natura Viva* cc**



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

File Reference Number:	(For official use only)
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

ENVIRONMENTAL AUTHORISATION FOR THE KOKERBOOM 1, 2, 3 AND 4 TRANSMISSION LINES, SWITCHING STATIONS AND KHOBAB SWITCHING STATION, NEAR LOERIESFONTEIN, NORTHERN CAPE:
Four new 132kV transmission lines and associated switching stations are being proposed, associated with the Kokerboom wind energy facilities, within Ward 5 of the Hantam Local Municipality

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	NATURA VIVA CC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition
Specialist name:	Dr John Edward Almond		
Specialist Qualifications:	PhD (palaeontology)		
Professional affiliation/registration:	Palaeontological Society of Southern Africa, Association of Professional Heritage Practitioners (W Cape)		
Physical address:	76 Breda Park, Breda Street, Oranjezicht, CAPE TOWN		
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Postal code:	8010	Cell:	n/a
Telephone:	021 462 3622	Fax:	n/a
E-mail:	naturaviva@universe.co.za		

2. DECLARATION BY THE SPECIALIST

I, Dr John Edward Almond, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

John E Almond

Signature of the Specialist

NATURA VIVA CC

Name of Company

1 July 2021

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Dr John Edward Almond, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

John E Almond

Signature of the Specialist

NATURA VIVA CC

Name of Company

1 July 2021

Date

John E Almond

Signature of the Commissioner of Oaths

0001-07-01

Date



CHANCE FOSSIL FINDS PROCEDURE: Kokerboom 1-4 Wind Farm grid connection project areas near Loeriesfontein	
Province & region:	NORTHERN CAPE, Namaqua District Municipality : Hantam Local Municipality
Responsible Heritage Resources Agency	SAHRA (Contact details: P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502)
Rock unit(s)	Ecce Group (Prince Albert, Whitehill and Tierberg Formations) Late Caenozoic alluvium, aeolian sands
Potential fossils	Trace fossils, plant remains, fish, aquatic reptile, shelly fossils and crustacean remains within Ecce Group bedrocks. Mammalian bones and teeth, freshwater molluscs, calcretised root casts, termitaria, ostrich egg shells, land snail shells Late Caenozoic superficial sediments.
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (<i>e.g.</i> rock layering)
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (<i>e.g.</i> entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (<i>e.g.</i> museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.