



**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR
THE PROPOSED VINCI PROSPECTING RIGHT APPLICATION ON THE REMAINDER OF
THE FARM VINCI 580, ZF MGCAWU DISTRICT MUNICIPALITY, IN THE NORTHERN
CAPE PROVINCE**

Compiled for:

LW Consultants

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Prepared by

Banzai Environmental

January 2022

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 favorable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting palaeontological impact assessments, 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 will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application.
- 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.
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application.
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not
- All the particulars furnished by me in this form are true and correct.
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations.

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SIGNATURE:

A handwritten signature in black ink, appearing to read 'Elize Butler', with a period at the end.

This PIA report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

Table 1 - NEMA Table

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 2 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vitae	Section 2 – refer to Appendix A	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Objective	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment		Desktop Assessment
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 7 Approach and Methodology	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure,	Section 1 and 10	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
inclusive of a site plan identifying site alternative;		
(g) An identification of any areas to be avoided, including buffers	Section 5	No buffers or areas of sensitivity identified
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 and 10	
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 10	
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 10	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 10	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 10	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(ii) If the opinion is that the proposed activity, activities, or portions thereof should be authorised, any avoidance, management and mitigation measures that should	Section 1 and 10	-

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
be included in the EMPr, and where applicable, the closure plan		
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	
(p) A summary and copies if any comments that were received during any consultation process	N/A	
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by LW Consultants to conduct the Palaeontological Desktop Assessment (PDA) assessing the proposed Vinci Prospecting Right Application on the Remainder of the Farm Vinci 580, ZF Mgcawu District Municipality, in the Northern Cape Province. This PDA is compiled to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), to confirm if fossil material could potentially be present in the planned development area and to evaluate the impact of the proposed development on the Palaeontological Heritage.

The proposed Vinci Prospecting Right Application (manganese and iron ore) near Postmasburg in the Northern Cape is underlain by the Ghaap Group (Transvaal Supergroup), while the south eastern portion of the proposed development is underlain by Tertiary to Quaternary Surface Limestone, alluvium deposits as well as wind-blown sand and dunes of the Kalahari Group. The Ghaap Group is known for its rare stromatolitic successions while fossils in the sands of the Kalahari Group resembles modern plants and animals but are generally rare, low in diversity and occur over a wide-ranging geographic area. The pedogenic limestones contain a low-diversity of invertebrate burrows and plant roots that is fairly widespread. Impacts on fossil heritage will be of low conservation significance and mitigation measures is not necessary. It is therefore considered that the proposed development is believed to be appropriate and will not lead to detrimental impacts on the palaeontological reserves of the area.

However, if significant fossil remains or trace fossils are discovered during any phase of construction, on the surface or exposed by excavations the Environmental Control Officer (ECO) in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

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1 INTRODUCTION

Matsapa Trading 529 plans to apply for a manganese and iron ore Prospecting Right Application for the Proposed Vinci Project on the Remainder of the Farm Vinci 580, ZF Mgcawu District Municipality, in the Northern Cape Province. (Figure1-3). The proposed development is 1948 ha in extent.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 300 PIAs for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga Provinces. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting, and curating fossils. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include **“all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens”**.

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21

Palaeontological Desktop Assessment for a proposed Vinci Prospecting Right Application near Postmasburg in the Northern Cape Province.

- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

MPRDA Regulations of 2014

Environmental reports to be compiled for application of mining right – Regulation 48

- Contents of scoping report – Regulation 49
- Contents of environmental impact assessment report – Regulation 50
- Environmental management programme – Regulation 51
- Environmental management plan – Regulation 52

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) “...*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*”.

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.
 - the construction of a bridge or similar structure exceeding 50 m in length.
 - any development or other activity which will change the character of a site—
 - (Exceeding 5 000 m² in extent; or
 - involving three or more existing erven or subdivisions thereof; or
 - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
 - the re-zoning of a site exceeding 10 000 m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

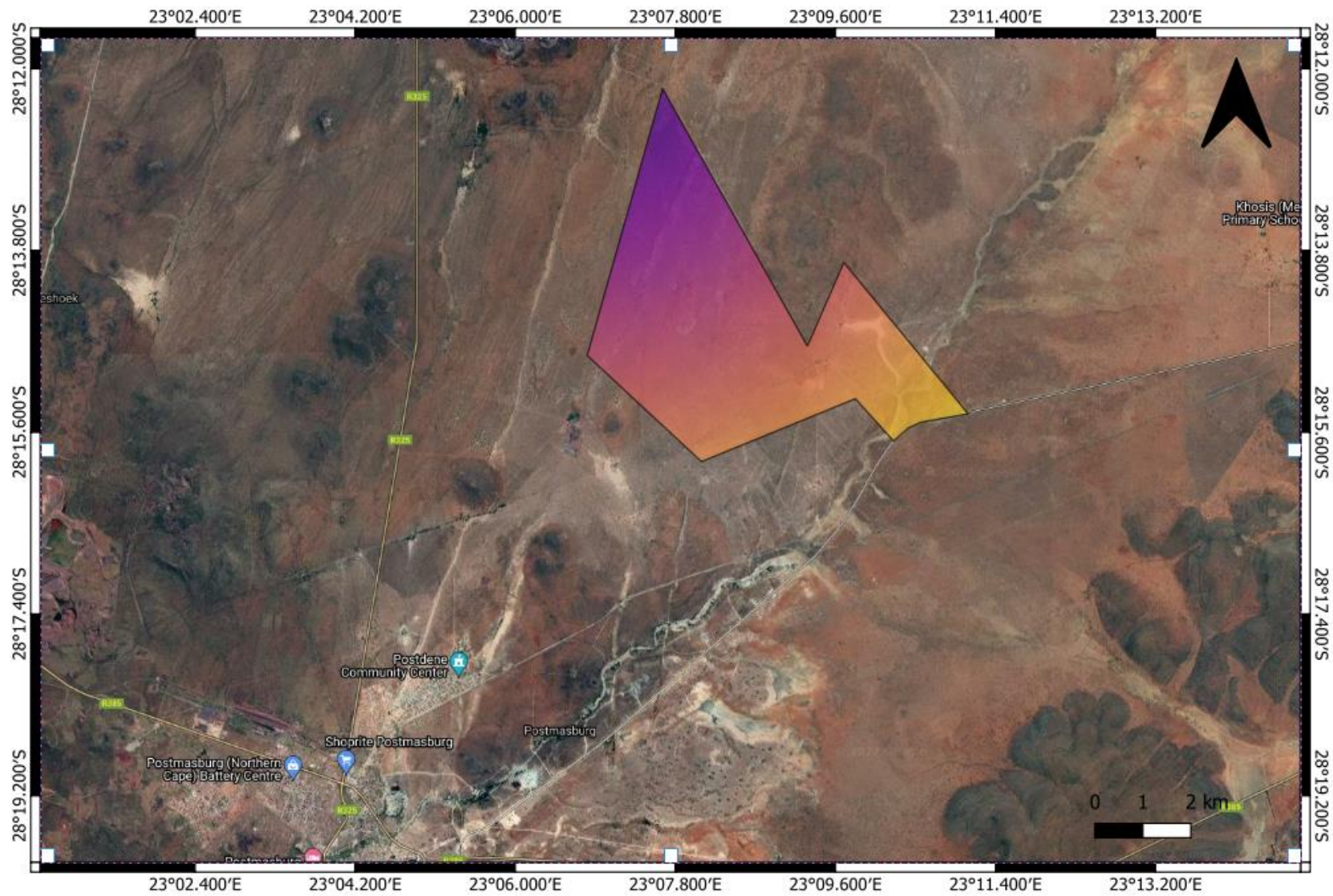


Figure 1: Google Earth Image (2022) indicating the locality of the proposed Prospecting Right Application near Postmasburg in the Northern Cape.

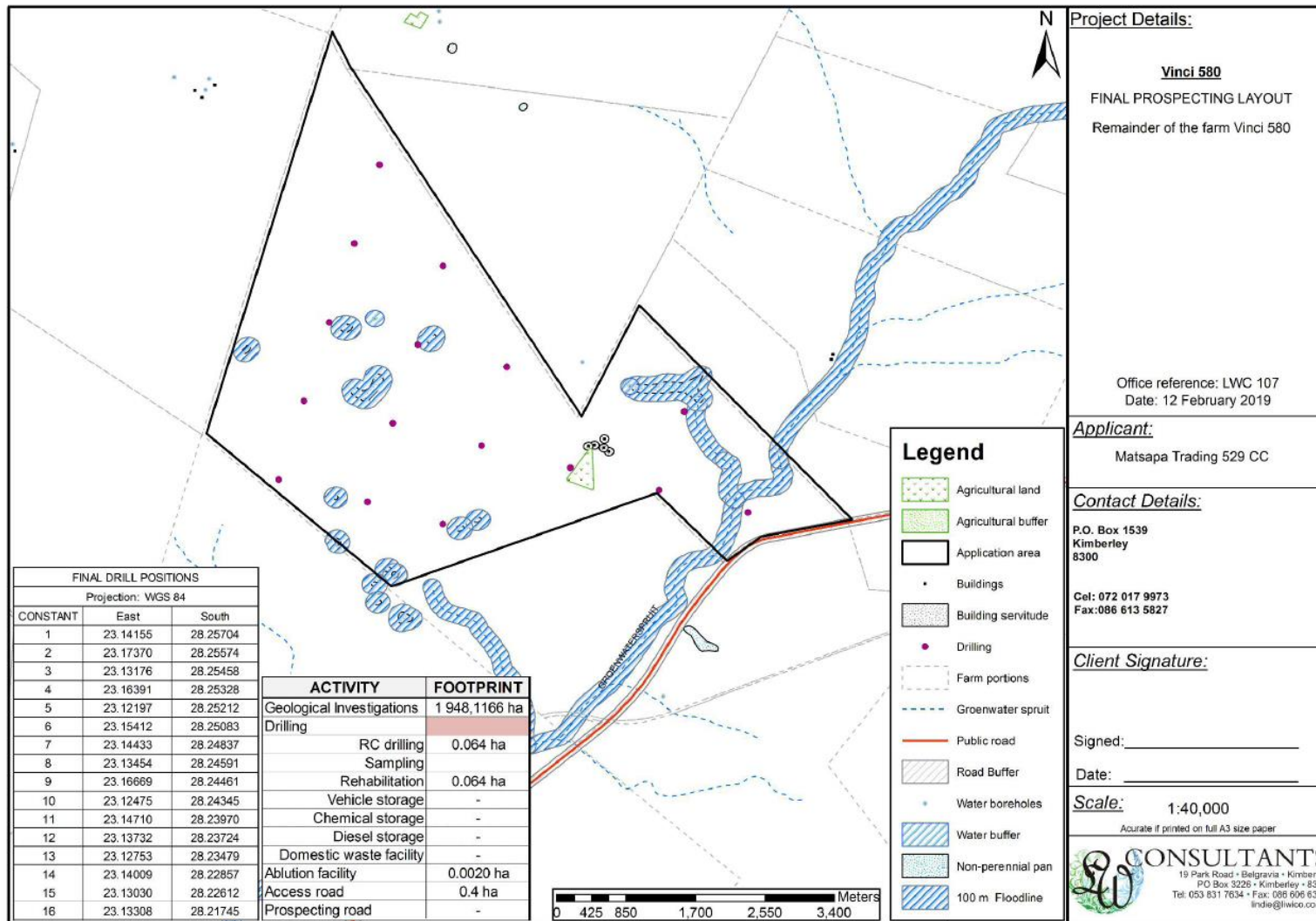


Figure 2: Locality of the proposed Prospecting Right Application.

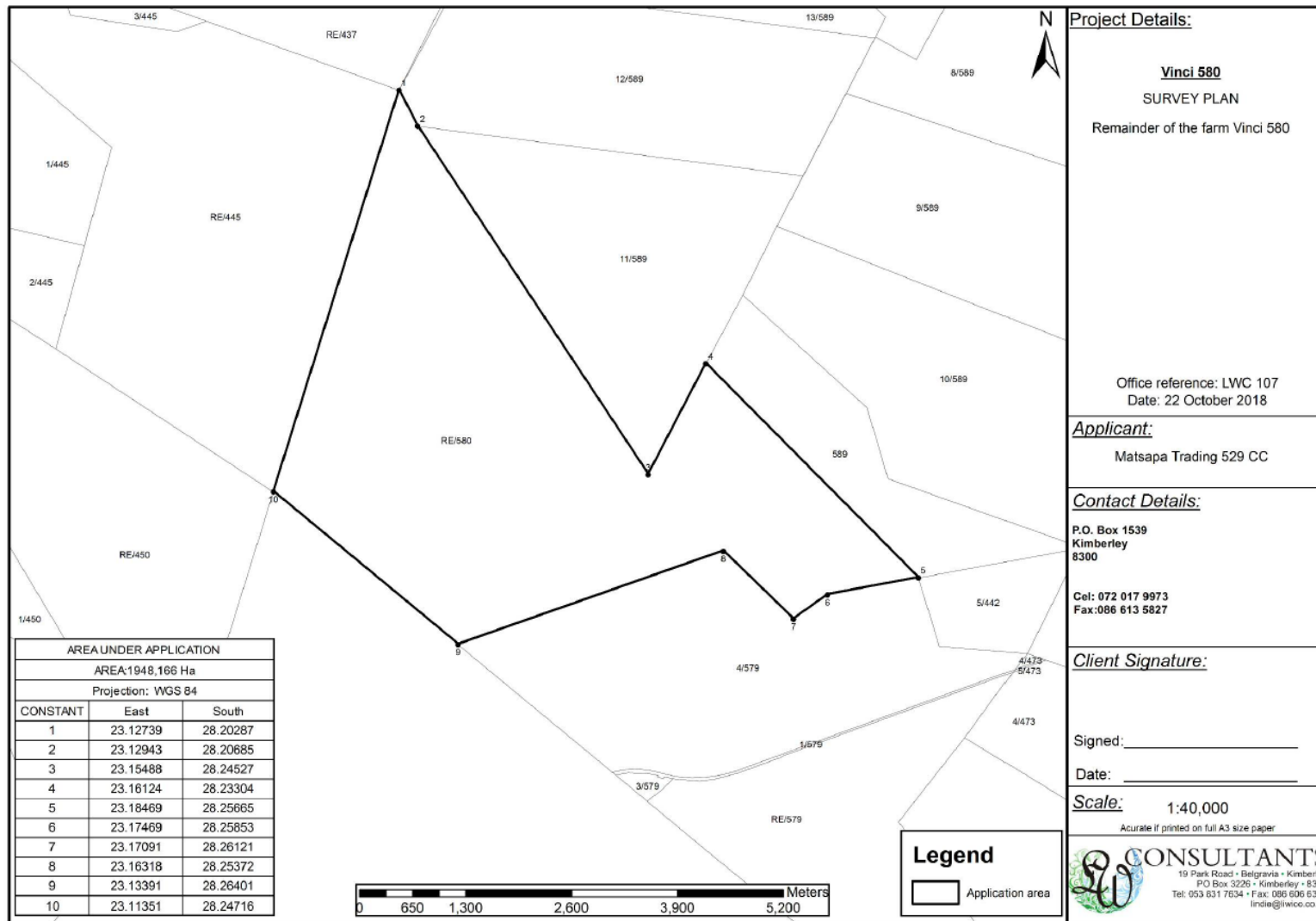


Figure 3: Site Plan.

4 OBJECTIVE

The aim of a Palaeontological Impact Assessment (PIA) is to decrease the effect of the development on potential fossils at the development site.

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the purpose of the PIA is: 1) to identify the palaeontological importance of the rock formations in the footprint; 2) to evaluate the palaeontological magnitude of the formations; 3) to clarify the impact on fossil heritage; and 4) to suggest how the developer might protect and lessen possible damage to fossil heritage.

The palaeontological status of each rock section is calculated as well as the possible impact of the development on fossil heritage by a) the palaeontological importance of the rocks, b) the type of development and c) the quantity of bedrock removed.

When the development footprint has a moderate to high palaeontological sensitivity a field-based assessment is necessary. The desktop and the field survey of the exposed rock determine the impact significance of the planned development and recommendations for further studies or mitigation are made. Destructive impacts on palaeontological heritage usually only occur during the construction phase while the excavations will change the current topography and destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation usually precede construction or may occur during construction when potentially fossiliferous bedrock is exposed. Mitigation comprises the collection and recording of fossils. Preceding excavation of any fossils a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is applied correctly, a positive impact as possible because our knowledge of local palaeontological heritage may be increased

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended.
- Adherence to all applicable best practice recommendations, appropriate legislation, and authority requirements.
- Submit a comprehensive overview of all appropriate legislation, guidelines.
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.

- Description and location of the proposed development and provide geological and topographical maps.
- Provide Palaeontological and geological history of the affected area.
- Identification sensitive areas to be avoided (providing shapefiles/kml's) in the proposed development.
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect, and cumulative:
 - a. **Direct impacts** are impacts that are caused directly by the activity and occur at the same time and at the place of the activity.
 - b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
 - c. **Cumulative impacts** result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably near future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed Vinci Prospecting Right Application near Postmasburg in the Northern Cape is depicted on the 1: 250 000 2428 Postmasburg (1977) Geological Map (Council for Geosciences, Pretoria) (**Figure 4**). According to this map the proposed development is mostly underlain by Vaalian aged Campbell Rand Subgroup (Vgl-blue) (Ghaap Group, Transvaal Supergroup), while the south eastern portion of the proposed development is underlain by Tertiary to Quaternary Surface Limestone (Ql), alluvium (yellow with single bird figure) as well as wind-blown sand and sand dunes of the Kalahari Group (Qs, yellow with darker dots).

Postmasburg is in the **Griqualand West Basin**, Northern Cape Province which consists of clastic sediments as well as volcanic rocks, diamictites and banded iron formations (BIF) (Table 1). The Hotazel Formation and upper Postmasburg Group (approximately 2222 Ma) contains Manganese deposits. The Vryburg Formation is the basal unit and overlies unconformably the granite and rocks of the Ventersdorp Supergroup. The Campbell Group overlies the Vryburg Formation and comprises of the Schmidtsdrif Formation and the upper Ghaap Plateau Formation. The Griquatown Group is divided into two formations namely the Asbestos Hills and Koegas Formations. Followed by the Gamagara Formation on the Maremane Anticline and in turn is overlain by the Makganyene Formation. The Cox Group consists of the lower Ongeluk Formation and the upper Voëlwater

Formation. The Ongeluk Formation was deposited under water and is between 400 and 900 m thick. This Formation is mainly volcanic (Visser 1989). Manganese is present in the upper Voëlwater Formation (Snyman 1996). Both Kent (1980) and Snyman (1996) is of the opinion that the Griqualand West Basin reaches a maximum thickness of 4500 m.

Table 2: Generalised Stratigraphic Column and Associated Geology of the proposed development site

Stratigraphy			Lithology	
Kalahari Formation (Qs and Q)			Clay, limestone and sand	
Transvaal Supergroup	Postmasburg Group	Voëlwater Subgroup	Hotazel Formation	Iron Formation
				Upper Mn ore body
				Middle Mn ore body
				Iron Formation
				Lower Mn ore body
				Mn-rich iron formation
			Iron Formation	
			Ongeluk Formation	Basaltic lava

Recently, revisions to the stratigraphic subdivision and alignments of the Precambrium rocks present in the Postmasburg and Kathu area has been completed. Eriksson *et al.* (2006) conducted stratigraphic studies on the Transvaal Supergroup while Moen (2006) conducted the study for the Olifantshoek Supergroup. Simplified regional geological maps based on Cairncross and Beukes (2013) and Smith and Beukes (2016) were published. The geological map (**Figure 5**) indicates that the proposed development is located east of the Maremane Dome (a major N-S trending anticline within the Early Proterozoic bedrocks of the Ghaap Group, Transvaal Supergroup. The Maremane Dome comprises of carbonate rocks of the Ghaap Group, Transvaal Supergroup overlain by the Kalahari Group .

In the past the shallow marine carbonates of the Campbell Rand Subgroup (Ghaap Group) were included in the Ghaapplato Formation. It is about 2.6 to 2.5 Ga (billion years old) and was deposited on the shallow submerged shelf of the Kaapvaal Craton. This carbonate platform is very thick (approximately 1.6 -2.5 km) and comprise of cherts with minor tuffs and siliciclastic rocks as well as dolostones and dolomitic limestones.

Sea level changes were caused by changing depositional cycles in shallow water facies. Stromatolitic limestones and dolostones, oolites, minor tuffs as well as laminated calcilutites, cherts, with subordinate siliclastics (shales, siltstones) are present in this area (Beukes 1980, Beukes 1986, Sumner 2002, Eriksson *et al.* 2006, Sumner & Beukes 2006).

West of the Maremane Dome a major unconformity exists at the base of the Palaeoproterozoic Elim Group (basal Keis Supergroup) (**Figure 6**), This unconformity (about 2.2-2.0 Ga) cuts the folded Ghaap Group succession and is associated with the development of manganese and iron ores. These ores are extensively mined in the Sishen – Postmasburg region of Griqualand West. These ores are associated with the palaeokarst-related Manganore Formation overlying the Campbell Rand Subgroup carbonates of the Maremane Dome as well as the Gamagara Formation at the base of the Elim Group. In the past the Elim Group was included in the Olifantshoek Group (Schalkwyk 2005, Van Niekerk 2006, Da Silva 2011, Cairncross & Beukes 2013, Smith & Beukes 2016). In the greater Kathu region, the Postmasburg Group comprise of basaltic to andesitic lavas/magma of the Ongeluk Formation (dated to 2.2 Ga) that crops out south of the Gamagara River.

In the development area Precambrian rocks are mantled by the late Cretaceous to Late Cenozoic aeolian sands, clays, calcretes, and gravels of the Kalahari Group [approximately Ca 65 – 2.5 million years old (Ma)]. Studies north west of the proposed development site has shown that the Kalahari Group sediments that overlies the Precambrian rocks are about 80 m thick (Haddon, 2005). The earliest Kalahari beds are assigned to the Wessels Formation (basal gravels) and Budin Formation (calcareous clays) and is probably Late Cretaceous in age (Partridge *et al.* 2006).

The top 15 m of the Kalahari sediments consist of clays, calcretised siltstones, and pebbly horizons with the occurrence of solution hollows along joint surfaces (10 m from the surface) (**Figure 7**). Calcretised silcretes with *in situ* brecciation are present close to the surface . Thick pedogenic calcretes (Plio-Pleistocene Mokalanen Formation) are mapped along the Ga-Mogara drainage line and underlies the Kalahari sands in this region. These deposits indicate the seasonally arid climates over the last five million years (Truter *et al.* 1938; Boardman and Visser 1958). Surface limestones may be up to 20 m thick and are locally conglomeratic with clasts of reworked calcrete and foreign pebbles.

Pleistocene Kalahari sands (Gordonia Formation) has been described to mantle thick calcretes and downwasted surface gravels (Almond 2013). He described a range of calcrete types namely gravelly, brecciated, silicified, honeycomb and karstified facies, the latter with an associated sand- or gravel-infilled solution hollows

Older terrace gravels are described from the banks of the Ga-Mogara drainage line. Unconsolidated, reddish-brown aeolian sands of the Quaternary Gordonia Formation are present. These sands are Late Pliocene / Early Pleistocene to Recent in age due to the Middle to Later Stone Age stone tools (Dingle *et al.*, 1983, p. 291) found in them. Recent studies have dated the Pliocene - Pleistocene boundary from 1.8Ma back to 2.588 Ma and placed the Gordonia Formation almost completely within the Pleistocene Epoch.

Small patches of Late Tertiary to Quaternary calcretes or pedogenic limestones (Ql) are present in the development. The calcretes may be correlated with the Pleistocene or Late Pliocene Mokalane Formation of the Kalahari Group, or even younger (Partridge et al. 2006, Moen 2007). These horizons include layered to structureless and nodular calcretes covering basement rocks that are generally less than 3 m thick and partly covered by wind-blown sands.

Quaternary fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages resemble modern animals and may comprise of mammalian teeth, bones and horn cores, reptile skeletons and fragments of ostrich eggs. Microfossils, non-marine mollusc shells are also known from Quaternary deposits. Plant material such as foliage, wood, pollens, and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts).

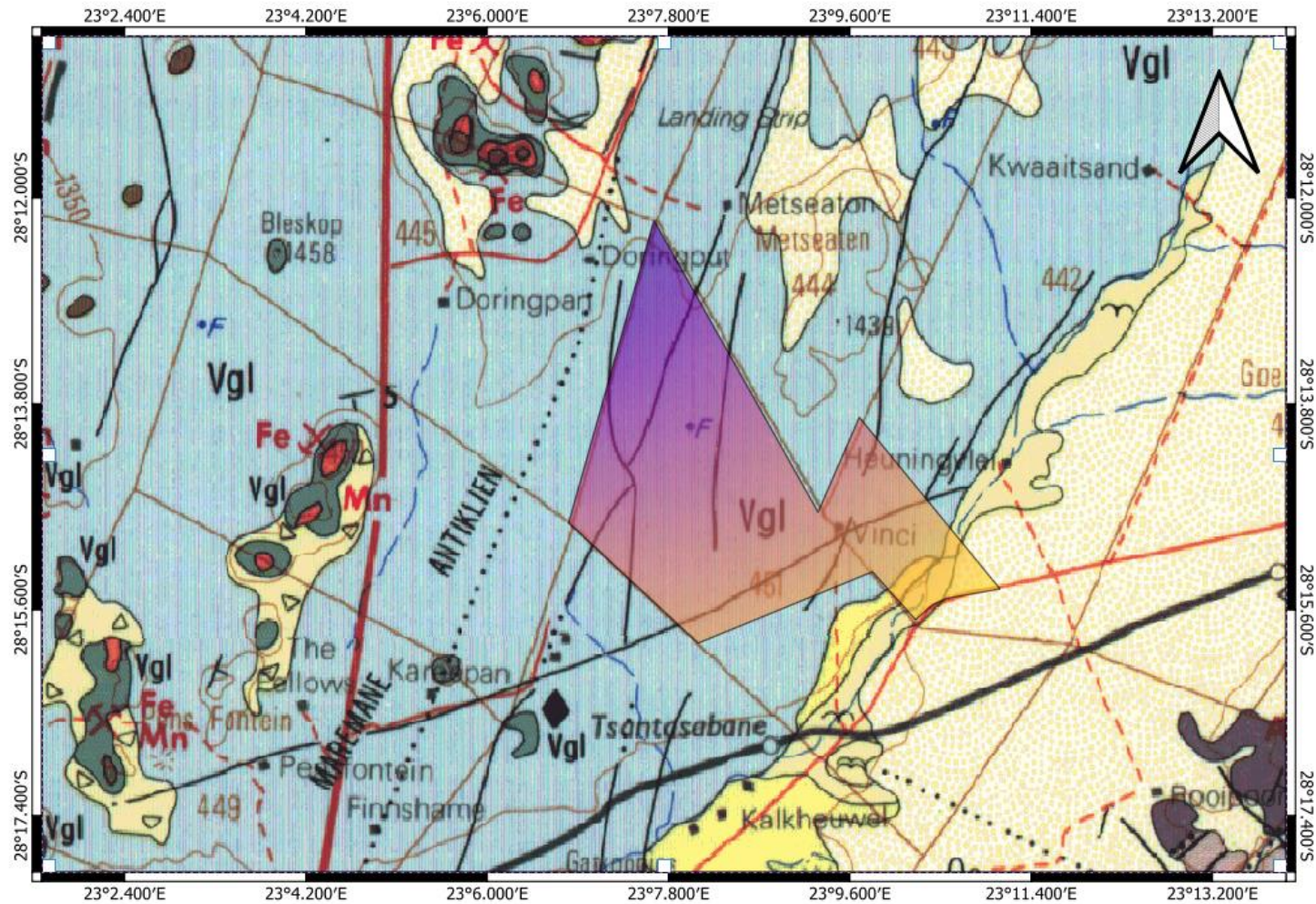


Figure 4: Extract of the 1:250 000 2822 Postmasburg (1977) Geological map (Council of Geoscience, Pretoria) indicating the proposed development.

GEOLOGIESE LEGENDE

TERSIER TOT KWATERNER TERTIARY TO QUATERNARY	Qw	Wit tot vleeskleurige sand ("brulsand") White to flesh-coloured sand ("roaring sand")
	Qs	Rooi tot vleeskleurige waaisand; sandduin () Red to flesh-coloured wind-blown sand; sand dune ()
	[Symbol]	Alluvium Alluvium
	[Symbol]	Verweringspuin Rubble
	[Symbol]	Rivierterrasgruis River-terrace gravel
	[Symbol]	Hoëterrasgruis High terrace gravel
	Ql	Oppervlakkalksteen Surface limestone

Vgl	Chert en chertbreksie ("silikabreksie" of "mangaanmerker") Chert and chert breccia ("silica breccia" or "manganese marker")			
Vgl	Dolomitiese kalksteen (kreukelkalksteen) met ondergeskikte grofkristallyne dolomiet, chert en lense van kalksteen () Dolomitic limestone (puckered limestone) with subordinate coarsely crystalline dolomite, chert and lenses of limestone ()		Lime Acres	Ghaapplato
Vgl	Gestreepte chert en chertbreksie, grotendeels puinbedek Banded chert and chert breccia, largely covered with rubble			
Vgf	Grofkristallyne hergekristalliseerde dolomiet met tussengelaagde chert; prominente chert aan basis () Coarsely crystalline recrystallised dolomite with interbedded chert; prominent chert at base ()		Fairfield	Campbell
Vgu	Fynkorrelrige dolomiet en kalksteen met tussengelaagde chert; gestreepte ystersteenmerker aan die bokant (-----) Fine-grained dolomite and limestone with interbedded chert; banded ironstone marker at top (-----)		Ulco	
Vsm	Dolomiet met stromatolitiese kalksteen, kwartsiet, siltsteen en chert Dolomite with stromatolitic limestone, quartzite, siltstone and chert		Monteville	Schmidtsdrif
Vsc	Skalie met tussengelaagde dolomite Shale with interbedded dolomite		Clearwater	
Vsb	Oölitiese, stromatolitiese en algekalksteen met tussengelaagde siltsteen Oolitic, stromatolitic and algal limestone with interbedded siltstone		Boomplass	Vryburg
Vvs	Skalie, kwartsiet, grintsteen en konglomeraat; plaveisteen met tussengelaagde klastiese kalksteen en karbonaatrijke sandsteen (-----) aan die bokant Shale, quartzite, grit and conglomerate; flagstone with interbedded clastic limestone and carbonate-rich sandstone(-----) at the top			
rp Supergroup				

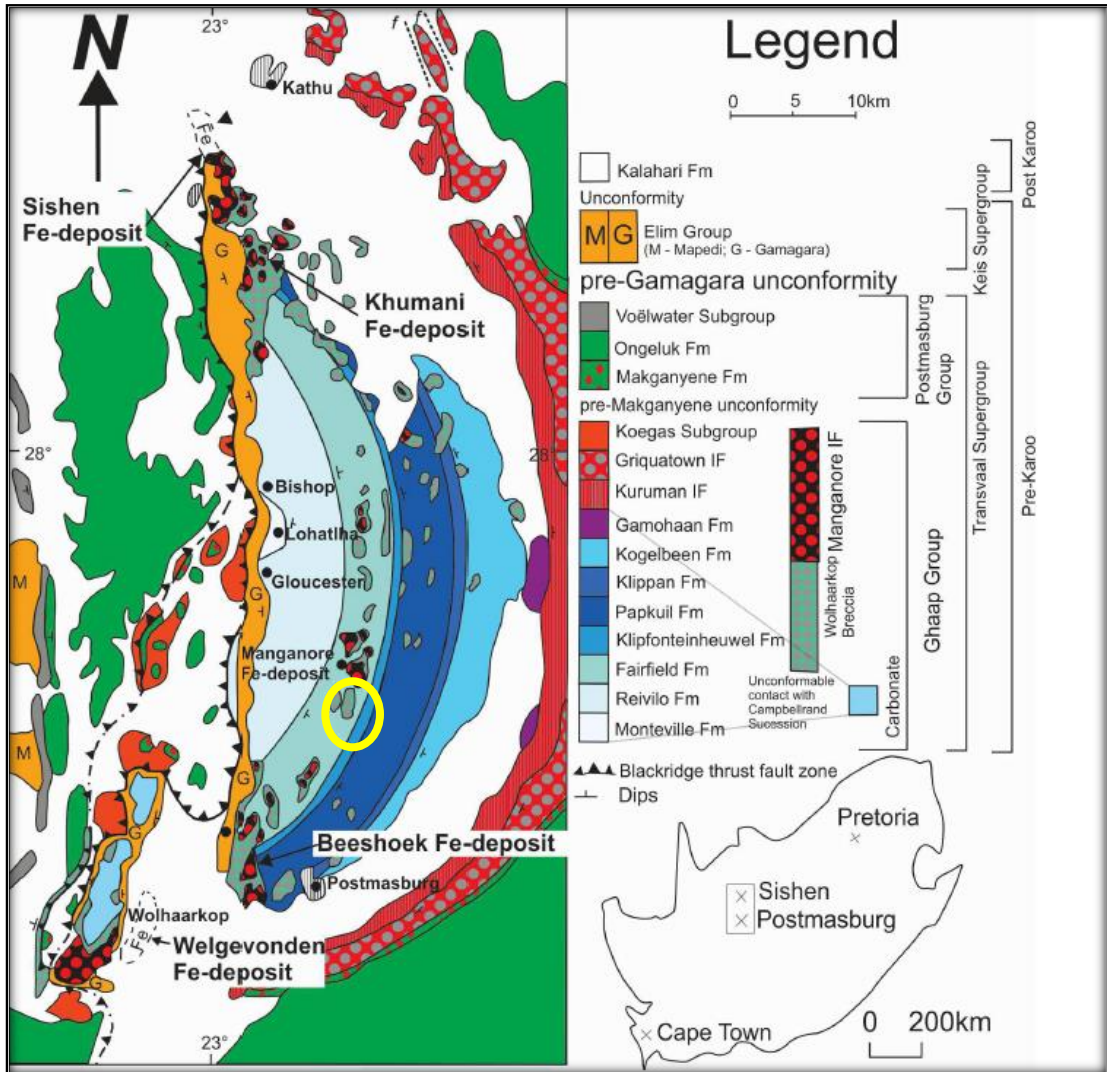


Figure 5: Updated Regional Geology of the Maremane Dome in the Northern Cape (from Smith & Beukes 2016). The approximate location of the proposed development is indicated by the yellow circle.

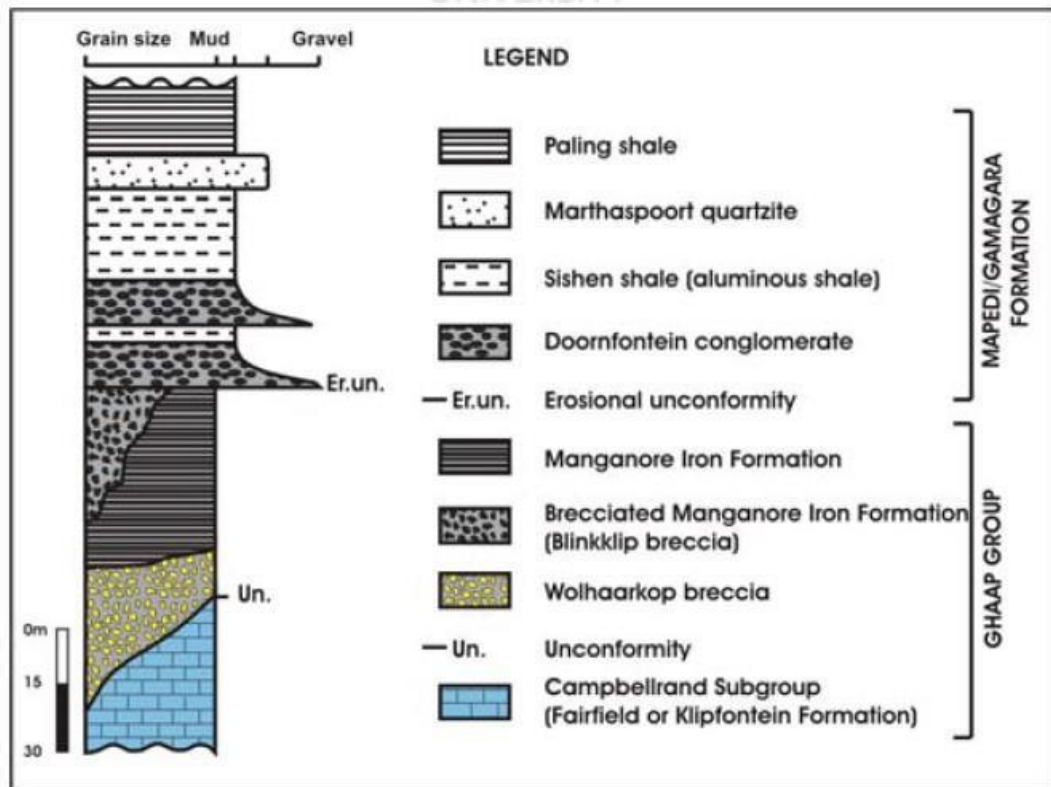


Figure 6: Stratigraphy of the iron formations in the Sishen-Postmasburg area (Schalkwyk 2005). The base of the Elim Group (Kheis Supergroup) is formed by the Gamagara Formation and the ferruginous Doornfontein conglomerates at its base. The Manganore Formation is underlain by the Wolhaarkop Breccia that forms part of a complex, supergene-enriched, lateritic weathering profile below the 2.2-2.0 Ga pre-Gamagara Unconformity associated with the collapse of the Asbestos Hills Subgroup BIF into karstic solution hollows on the Maremane Dome.

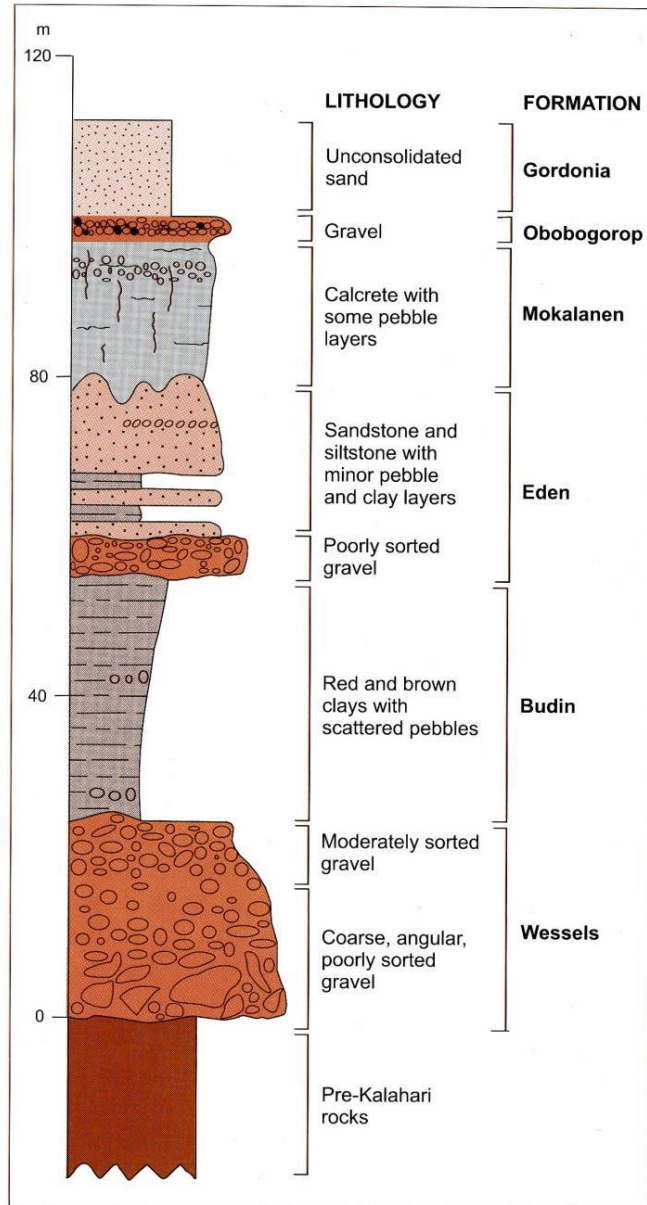


Figure 7: General stratigraphy of the Late Cretaceous to Recent Kalahari Group (Taken from Partridge et al. 2006).

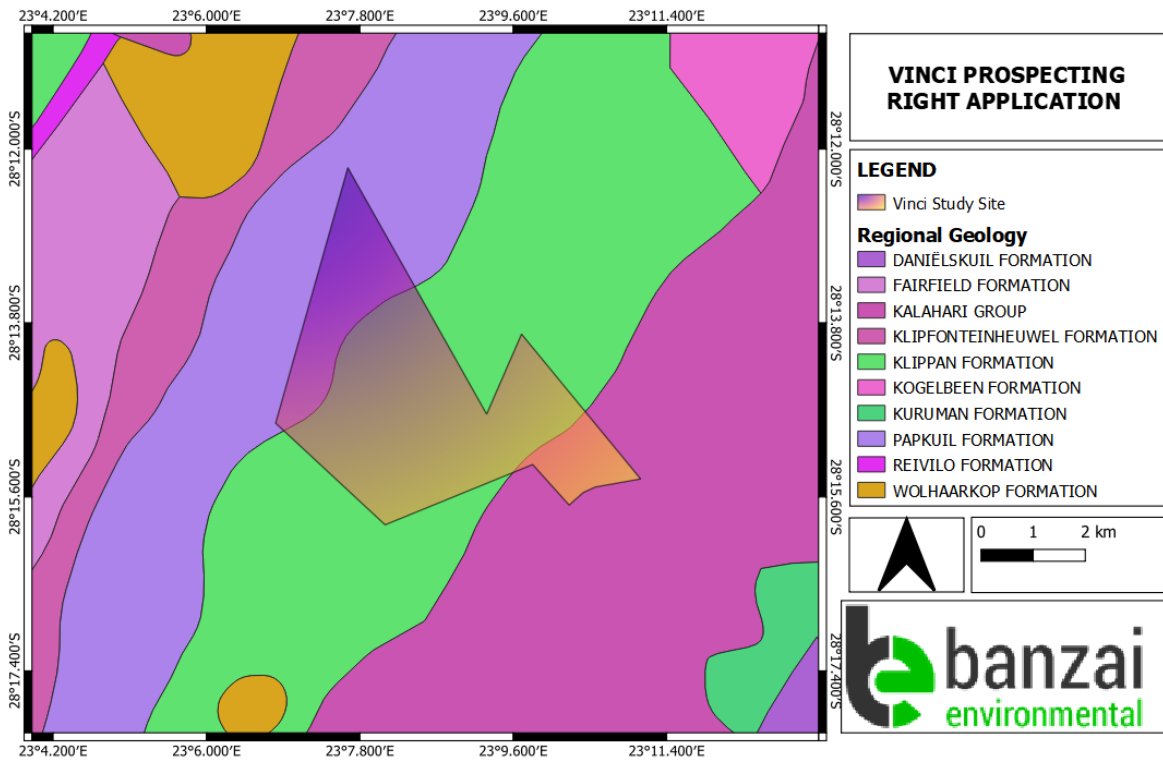


Figure 8: Surface Geology indicated by Shape files (Council of Geoscience, Pretoria) of the proposed Vinci Prospecting project.

The map in Figure 8 was drawn by Shape files supplied by the Council of Geoscience, Pretoria. This map indicates that the proposed mining application is underlain by the Klippan and Papkuil Formations of the Ghaap Group (Transvaal Supergroup).

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed study area is about 14 km north-east of Postmasburg on the Remainder of the Farm Vinci 580, ZF Mgcauw District Municipality, in the Northern Cape Province

The approximate middle coordinates of the development is -28.245760° 23.137954°

7 METHODS

The aim of a desktop study is to evaluate the risk to palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes PIA reports in the same area, aerial photos, and Google Earth images, topographical as well as geological maps.

7.1 Assumptions and Limitations

When conducting a PIA, several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area, and the sheet explanations were not meant to focus on palaeontological heritage. Many, inaccessible regions of South Africa have not been reviewed by palaeontologists and data is based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area that was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is assumed that exposed fossil heritage is present within the footprint.

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984).
- 1: 250 000 000 22428 Postmasburg (1977) Geological Map (Council for Geosciences, Pretoria).
- A Google Earth map with polygons of the proposed development was obtained from LW Consultants.

9 IMPACT ASSESSMENT METHODOLOGY

9.1 Impact Rating System

Impact assessment must take account of the nature, scale, and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the following project phases:

- Construction
- Operation
- Decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 3: *The rating system*

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).

DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation

		and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive

9.1.1 Summary of Impacts

Only the site will be affected (1). It is that the impact will occur (1). The expected duration of the impact is assessed as potentially permanent to long term (4). The impact on fossil heritage will be irreversible (4) and a complete loss of fossil heritage will take place (4). The cumulative effect of the impact will be low (2). The magnitude of the impact happening will be low (1)

The Impact significance will therefore be a negative low Impact.

10 FINDINGS AND RECOMMENDATIONS

The proposed Vinci Prospecting Right Application (manganese and iron ore) near Postmasburg in the Northern Cape is underlain by the Ghaap Group (Transvaal Supergroup), while the south eastern portion of the proposed development is underlain by Tertiary to Quaternary Surface Limestone, alluvium deposits as well as wind-blown sand and dunes of the Kalahari Group. The Ghaap Group is known for its rare stromatolitic successions while fossils in the sands of the Kalahari Group

resembles modern plants and animals but are generally rare, low in diversity and occur over a wide-ranging geographic area. The pedogenic limestones contain a low-diversity of invertebrate burrows and plant roots that is fairly widespread. Impacts on fossil heritage will be of low conservation significance and mitigation measures is not necessary. It is therefore considered that the proposed development is deemed appropriate and will not lead to detrimental impacts on the palaeontological reserves of the area.

However, if significant fossil remains or trace fossils are discovered during any phase of construction, on the surface or exposed by excavations the Environmental Control Officer (ECO) in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carry out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

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