

**PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED DIAMONDS ALLUVIAL &
DIAMONDS GENERAL PROSPECTING RIGHT APPLICATION NEAR CHRISTIANA ON THE
REMAINING EXTENT OF PORTION 1 OF THE FARM KAFFRARIA 314, REGISTRATION
DIVISION HO, NORTH WEST PROVINCE**

Compiled for:

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30 November 2017

Prepared by:

BANZAI ENVIRONMENTAL (PTY) LTD

EXECUTIVE SUMMARY

Milnex 189 CC has been appointed by Chrismar Delwerye (Pty) Ltd to assist with an application for the prospecting rights of a diamond mine development near Christiana on the Remaining Extent of Portion 1 of the farm Kaffraria 314, North West Province. According to the National Heritage Resources Act (Act No 25 of 1999, Section 38), a palaeontological impact assessment is required to identify the occurrence of fossil material within the proposed development footprint and to calculate the impact of the construction and operation of the proposed project on the palaeontological resources.

The proposed development is primarily underlain by the Allanridge and Bothaville Formations of the Ventersdorp Supergroup as well as the Gordonia Formation of the Kalahari Group. Fossils in the Kalahari Group are generally rare and low in diversity and occur over a wide geographic area. A low palaeontological sensitivity has thus been allocated to the Kalahari Group. In the past palaeontologists did not focus on Cenozoic superficial deposits although they sometimes contain important fossil biotas. But, regardless of the rare and intermittent occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many fossil taxa are known from a single fossil. The Ventersdorp Supergroup is characterised by a major occurrence of igneous extrusion that is associated with fracturing of the Kaapvaal Craton approximately 2.7 Ga (billion years) ago. The ancient basement rocks, including the **Allanridge Formation, are not known to be fossiliferous** and thus there is no possibility that the rocks of the Allanridge Formation will contain any fossils.

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

In the event that fossil remains are discovered during any phase of construction, either on the surface or unearthed by fresh excavations, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (preferably *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carried out by a professional paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

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2 INTRODUCTION

Milnex 189 CC has appointed Banzai Environmental (Pty) Ltd to undertake a Palaeontological Impact Assessment assessing the palaeontological impact of the proposed Diamonds Alluvial & Diamonds general mine near Christiana on the Remaining Extent of Portion 1 of the farm Kaffraria 314, Registration Division HO, North West Province (Fig. 1&2). Numerous operational alluvial diamond mines exist adjacent to the proposed development area and thus the developer is applying for the prospecting right.

Alluvial mining in the North West of South Africa commenced in the early 19th century. New interest in the mining of alluvial diamonds was triggered by the El Niño associated drought of 1974 when many farmers decided to mine for diamonds instead of farming. At this time much larger volumes of gravel could be moved and greater depths could be reached due to more sophisticated earth moving and sorting equipment.

Gravels, rich in diamonds are distributed primarily in three major areas in the North West Province,

- area underlain by dolomite (east of Ventersdorp towards Lichtenburg and Bakerville and beyond (VLB)),
- Lichtenburg–Delareyville–Bloemhof–Klerksdorp–Lichtenburg area (LDBKL), generally underlain by Ventersdorp Supergroup basalt and Dwyka Group tillite and
- The area associated with the Vaal River banks and gravels.

In the VLB area, gravels, rich in diamonds are concentrated along straight and meandering areas of rivers as well as in sinkholes. The diamonds are present in ancient and current river waterways, banks and as alluvial and colluvial deposits, in the LDBKL area. Diamonds in the Vaal River, occur in the gravels of the current river and in the older gravels present in ancient river banks.

2.1 LEGISLATION

NATIONAL HERITAGE RESOURCES ACT (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). 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”**. Palaeontological

heritage is unique and non-renewable and is protected by the above mentioned Act. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority.

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

ACCORDING TO SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 1999, DEALING WITH ARCHAEOLOGY, PALAEONTOLOGY AND METEORITES:

35. (1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8) (a), all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority—

(a) Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological

site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

(a) Serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;

(b) Carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;

(c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

(6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or a meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

(7) (a) Within a period of two years from the commencement of this Act, any person in possession of any archaeological or palaeontological material or object or any meteorite which was acquired other than in terms of a permit issued in terms of this Act, equivalent provincial legislation or the National Monuments Act, 1969 (Act No. 28 of 1969), must lodge with the responsible heritage resources authority lists of such objects and other information prescribed by that authority. Any such object which is not listed within the prescribed period shall be deemed to have been recovered after the date on which this Act came into effect. (b) Paragraph (a) does not apply to any public museum or university. (c) The responsible authority may at its discretion, by notice in the *Gazette* or the *Provincial Gazette*, as the case may be, exempt any institution from the requirements of paragraph (a) subject to such conditions as may be specified in the notice, and may by similar notice withdraw or amend such exemption.

(8) An object or collection listed under subsection (7) — (a) Remains in the ownership of the possessor for the duration of his or her lifetime, and SAHRA must be notified who the successor is; and (b) must be regularly monitored in accordance with regulations by the responsible heritage authority.

HERITAGE RESOURCES MANAGEMENT

38. (1) Subject on the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length; (b) the construction of a bridge or similar structure exceeding 50 m in length; (c) any development or other activity which will change the character of a site—(i) exceeding 5 000 m² in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority (d) the re-zoning of a site exceeding 10 000 m² in extent; (e) or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

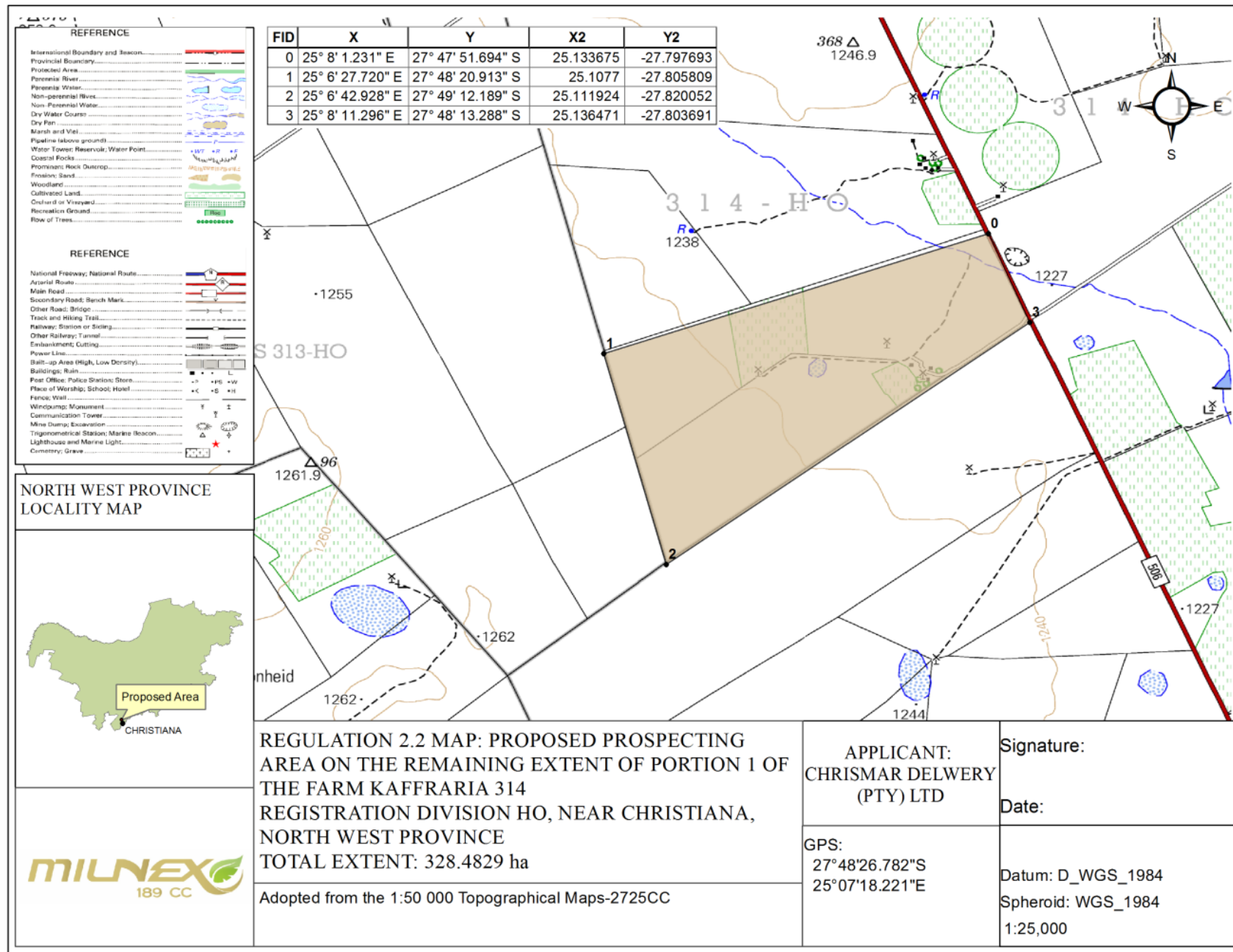


Figure 1. Locality map of the proposed prospecting area on the Remaining Extent of Portion 1 of the farm Kaffraria 314, near Christiana, North West Province. (Map provided by Milnex 189 CC).



Figure 2: Satellite image of the proposed mining development near Christiania, on the Remaining Extent of Portion 1 of the farm Kaffraria 314, near Christiania, North West Province. Scale bar represents 8.27 km.

3 OBJECTIVE

The objective of a Palaeontological Impact Assessment, is to determine the impact of the development on potential palaeontological material at the site.

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the palaeontological impact assessment are: 1) to identify the palaeontological importance of the exposed and subsurface rock formations in the development footprint 2) to evaluate the palaeontological importance of the formations 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, etc.) present within the study area are established from geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks and 2) the type and scale of the development footprint and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is necessary. Based on the desktop data as well as a field examination of the sedimentary rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. Generally, destructive impacts on palaeontological heritage only occur during the construction phase. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

4 GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE

The proposed development area is completely underlain by the Allanridge and Bothaville Formations of the Ventersdorp Supergroup as well as the Gordonia Formation of the Kalahari Group. For completeness the QGIS (Fig. 3) and Geological map (Fig. 4) of the proposed development is shown.

The Ventersdorp Supergroup comprises of the largest volcanic rock sequence on the Kaapvaal Craton. The best exposures of the Ventersdorp Supergroup is in the North West Province, Northern Cape Province as well as Gauteng and southern Botswana. This Supergroup consists of the Kliprivierberg Group (oldest) which is overlain by the Platberg Group, followed by the sedimentary Bothaville Formation and the volcanic Allanridge Formation (uppermost Vensterdorp unit, youngest Formation).

4.1 PALAEOLOGY

Gordonia Formation of the Kalahari Group

Caenozoic superficial deposits

Caenozoic fossil assemblages are generally rare and low in diversity and occur over a wide geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not focus on Caenozoic superficial deposits although they sometimes contain important fossil biotas.

Fossils assemblages may comprise of mammalian teeth bones and horn cores, tortoise skeletons, fragments of ostrich eggs as well as microfossils, non-marine mollusc shells and freshwater stromatolites. Plant material such as foliage, wood, pollens and peats are also recovered as well as trace fossils like vertebrate tracks and burrows and termitaria (termite mounts) and rhizoliths (root casts).

The ancient basement rocks, including the **Allanridge and Bothaville Formation, are not known to be fossiliferous.**

4.2 GEOLOGY

Caenozoic superficial deposits

The Tertiary to Caenozoic superficial deposits consist of aeolian sand, alluvium (clay, silt and sand deposited by flowing floodwater in a river valley/ delta producing fertile soil), colluvium (material collecting at the foot of a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water, for example, around mineral springs.) and lake deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels.

Allanridge Formation

The Allanridge formations consists primary of light green–grey porphyritic lava and pyroclastic rocks as well as dark-green amygdaloidal lava. The dark-green lava is the thickest unit in the Allanridge Formation. Both lava types consist of Amygdales but is more widespread in the dark-green lava.

Bothaville Formation

The Bothaville formation consists of conglomerate and quartzites. The conglomerates is found at the base of the formation and consists of rounded boulders and pebbles of chert, banded iron formation granite, quartz, quartzite, tuff lava and quartz porphyry of Ventersdorp and older formations.

5 GEOGRAPHICAL LOCATION OF THE SITE

The property is situated approximately 15km North West of Christiana, adjacent to the R506 road. The proposed development area is approximately 328.4829Ha in extent.

6 METHODS

A desktop study was conducted to assess the potential risk to palaeontological material (fossils and trace fossils) in the proposed area of development. When writing the desktop report the author's experience, topographical and geological maps, aerial photos (using Google Earth, 2017), and other reports from the same area were used to assess the proposed development footprint.

6.1 ASSUMPTIONS AND LIMITATIONS

The accurateness of Palaeontological Desktop Impact Assessments as part of heritage impact assessments are restricted by old fossil databases that does not always include relevant locality or geological formations. The geology in various areas of South Africa is based exclusively on aerial photographs. The accuracy of the sheet explanations for geological maps are inadequate as the focus was never intended to be on palaeontological material.

Vast areas of South Africa have not been studied palaeontologically. Fossil data gathered from similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally accept the presence of unexposed fossil heritage within the development areas. The accuracy of a Palaeontological Impact Assessment may be improved through a field-survey when bedrock exposures and potentially fossiliferous superficial sediments are present in the development area.

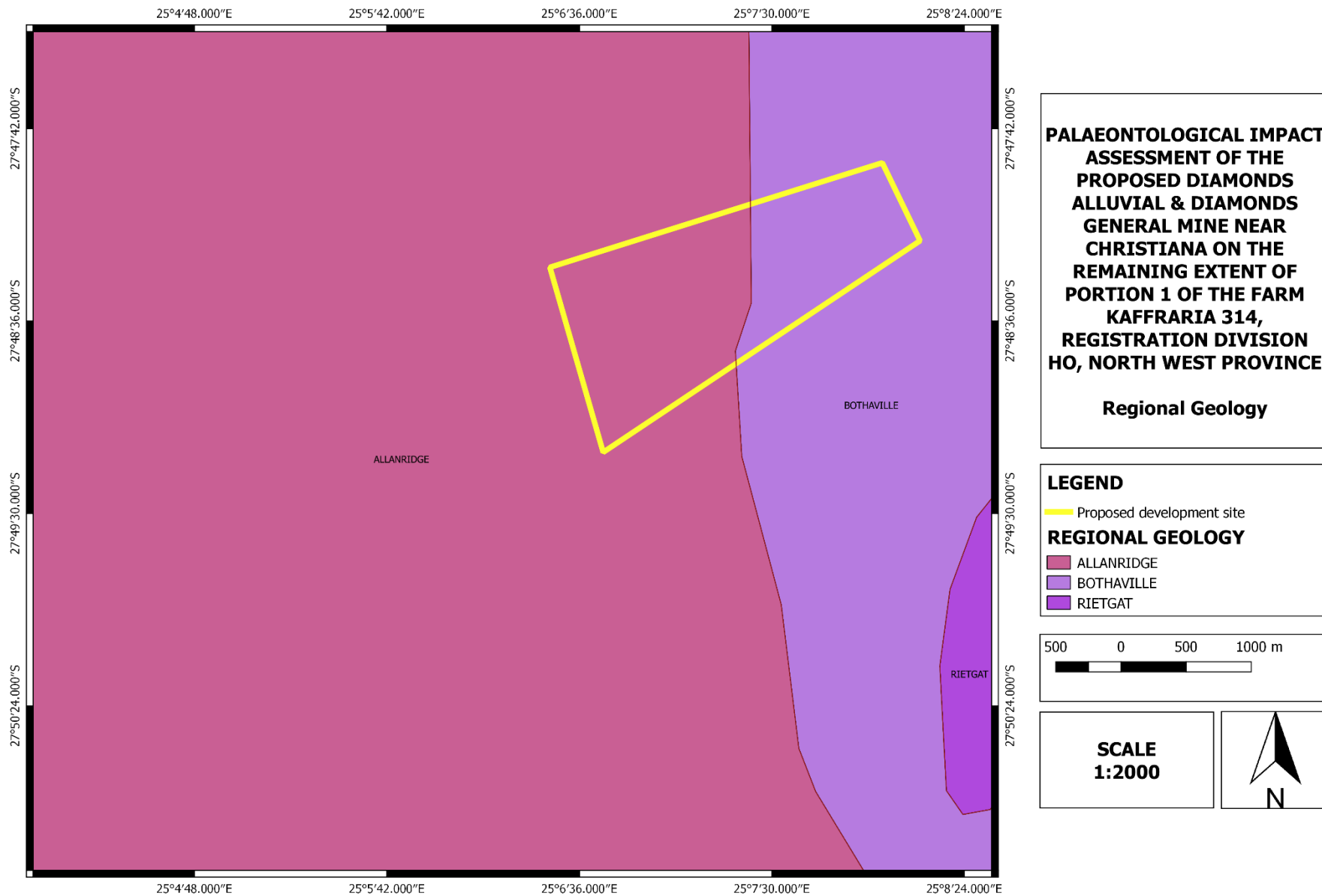


Figure 3. The surface geology of the proposed Diamonds alluvial and Diamonds General prospecting right application near Christiania, North West Province is primary underlain by rocks of the Allanridge and Bothaville Formations of Ventersdorp Supergroup as well as the Gordonia Formation of the Kalahari Group. Note that the Caenozoic deposits is not shown in this Map. Map drawn QGIS Desktop 2.18.14.

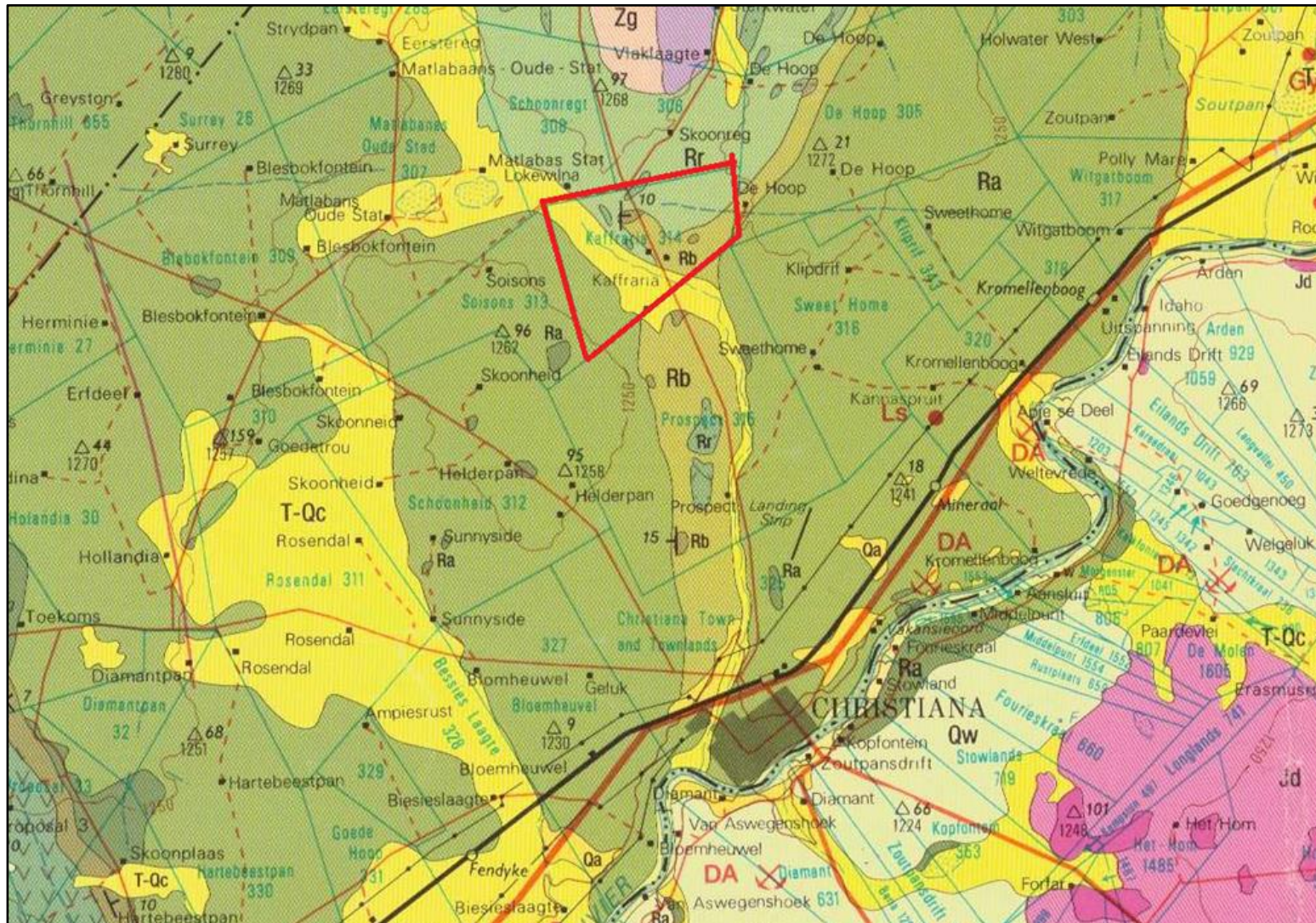


Figure 4: Extract from 1: 250 000 geological map 2724 Christiana (Council for Geoscience, Pretoria) showing the geology of the prospecting area outlined in red. Geological units include: Ra-Allanridge Formation (green); Rb -Bothaville formation (light green) and T-Qc- aeolian sands of the Gordonia Formation (Kalahari Group) (yellow).

7 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 1: 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).

Table 1 Continues

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.

Table 1 Continues

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

Table 1 Continues

SIGNIFICANCE		
<p>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.</p>		
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

8 FINDINGS AND RECOMMENDATIONS

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9 REFERENCES

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10 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 10 years. She has been conducting Palaeontological Impact Assessments since 2014

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 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 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 favourable 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 realise that a false declaration is an offence 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;

PALAEONTOLOGICAL CONSULTANT:

Banzai Environmental (Pty) Ltd

CONTACT PERSON:

Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE:

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