

**PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED BELVOIR AGGREGATE QUARRY II
ON PORTION 7 OF THE FARM MAIDENHEAD 169, ENOCH MGIJIMA MUNICIPALITY, DIVISION OF
QUEENSTOWN, EASTERN CAPE**

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EXECUTIVE SUMMARY

Civil & General Contractors CC intends to compile a Basic Assessment Report and Environmental Management Programme in support of applications for an Environmental Authorization and a Mining Permit. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the proposed development footprint and to assess the impact of the construction and operation of the development site on the palaeontological resources.

The proposed development area of the Belvoir Quarry, located on the remainder of Portion 7 of the Farm Maidenhead 169, is underlain by the Middle Triassic Katberg and Burgersdorp Formation (*Lystrosaurus* and *Cynognathus* Assemblage Zone), Tarkastad Subgroup, Beaufort Group, Karoo Supergroup) as well as Late Cenozoic superficial deposits.

Although the palaeontological sensitivity is rated high, the lack of fossiliferous exposure at the proposed site indicates that the impact on palaeontological material is negligible and regarded as insignificant. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

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1 INTRODUCTION

Civil & General Contractors CC intends on submitting an application for an environmental authorisation and a mining permit for the operation of an aggregate mine (hard rock quarry). The proposed development area of the Belvoir Quarry located on the remainder of Portion 7 of the Farm Maidenhead 169, Division of Queenstown, Eastern Cape Province; Ward 10 of the Enoch Mgijima Municipality is 3,273 ha in extent. An additional application to extend this area to a maximum of 5 ha may be submitted in accordance with Section 102 of the Mineral and Petroleum Resources Development Act, 2002 as amended. A current approved mine is located on 1.5 ha adjacent to the application area. Evidence of historic mining outside the application area is present. Operation will include stripping of topsoil and overburden and stockpiling, blasting, excavation, crushing and the transport of aggregate.

Isi-Xwiba Consulting CC has been appointed as the independent Environmental Assessment Practitioner by Civil & General Contractors CC for the undertaking of the Basic Environmental Impact Assessment process.

The planned mining area is approximately 125 m from the Klaas Smits River and 50 m from an ESKOM power line. Water will NOT be abstracted from the Klaas Smits River for the mining operation. The application is for a 2 year mining period with possible application for extension for two periods as may approve by the Department Mineral Resources.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) (Information provided by Isi-Xwiba Consulting)

Environmental Impact Assessment Regulations GN R. 326, GN R. 324 and GN R. 327 promulgated in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended, identify certain activities, which “*could have a substantial detrimental effect on the environment*”. These listed activities require environmental authorisation from the competent authority, the Department: Mineral Resources, prior to starting any development.

The following listed activities were triggered:

GN R. 327: Activities 21, 22, 26, 27, 28(ii), 30, 32, 34, 35 & 67

GN R. 324: Activities 12, 15 & 26

DESCRIPTION OF NEMA LISTED ACTIVITIES

GN R. 327

Activity 21: Any activity including the operation of that activity which requires a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including — (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or

(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing.

Activity 22: The decommissioning of any activity requiring – (i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or (ii) a prospecting right, mining right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure.

Activity 26: Residential, retail, recreational, tourism, commercial or institutional developments of 1 000 m² or more, on land previously used for mining or heavy industrial purposes

Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation

Activity 28(ii): Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:

(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;

Activity 30: Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

Activity 32: The continuation of any development where the environmental authorisation has lapsed and where the continuation of the development, after the date the environmental authorisation has lapsed, will meet the threshold of any activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014.

Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution

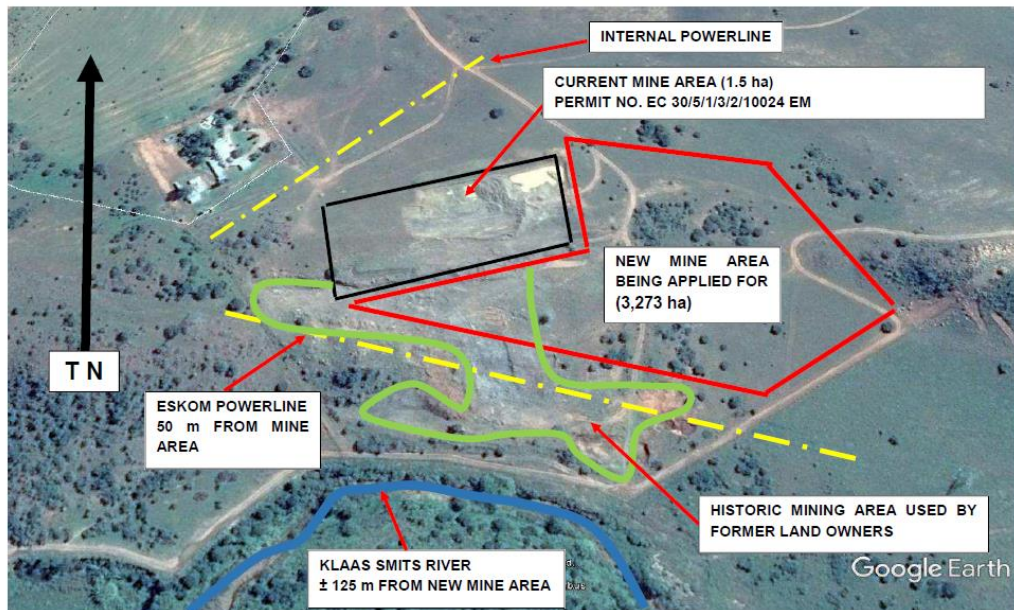
Activity 35: The expansion of residential, retail, recreational, tourism, commercial or institutional developments on land previously used for mining or heavy industrial purposes, where the increased development footprint will exceed 1 000 m²

Activity 67: Phased activities for all activities—

(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices or

(ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.

The excavations will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the existing topography and may disturb damage or destroy scientific valuable fossil heritage exposed at the surface or buried below ground. Palaeontological material is unique and non-renewable and is protected by the National Heritage Resources Act. A Palaeontological Impact Assessment of the proposed development is therefore necessary to certify that palaeontological material is either removed, or is not present.



GOOGLE IMAGE

Figure 1. The location of the proposed Belvoir Quarry on the remainder of Portion 7 of the Farm Maidenhead 169, Division of Queenstown, Ward 10 of the Enoch Mgijima Municipality Eastern, Cape Province. Map provided by Isi-Xwiba Consulting CC.

2 LEGISLATION

Cultural Heritage in South Africa is governed by the National Heritage Resources Act (Act 25 of 1999). This Palaeontological Environmental scoping assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the above mentioned Act. In accordance with Section 38, an HIA is required to assess any potential impacts to palaeontological heritage within the site.

SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 25 OF 1999

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- 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.
- No person may, without a permit issued by the responsible heritage resources authority—
 - Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
 - Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
 - 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
 - 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.
- 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—

- 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; and/or
- 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.

3 Objective

According to the South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports, the aims of the palaeontological impact assessment are:

- To identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- To assess the level of palaeontological significance of these formations;
- To comment on the impact of the development on these exposed and/or potential fossil resources; and
- To make recommendations as to how the developer should conserve or mitigate damage to these resources.

The objective is therefore to conduct a Palaeontological Impact Assessment, which forms of part of the Heritage Impact Assessment (HIA) and the EIA Report, to determine the impact of the development on potential palaeontological material at the site.

When a palaeontological desktop/scoping study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, members, etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is collected from published scientific literature; fossil sensitivity maps; consultations with professional colleagues, previous palaeontological impact studies in the same region and the databases of various institutions may be consulted. This data is then used to assess the palaeontological sensitivity of each rock unit of the study area on a desktop level. The likely impact of the proposed development on local fossil heritage is subsequently established on the basis of the palaeontological sensitivity of the rocks and the nature and scale of the development itself (extent of new bedrock to be excavated).

If rocks of moderate to high palaeontological sensitivity are present within the study area, a Phase 1 field-based assessment by a professional palaeontologist is necessary. Generally, damaging impacts

on palaeontological heritage occur during the construction phase. These excavations will modify the existing topography and may disturb, damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study.

When specialist palaeontological mitigation is suggested, it may take place prior to construction or, even more successfully, during the construction phase when new, potentially fossiliferous bedrock is still exposed and available for study. Mitigation usually involves the careful sampling, collection and recording of fossils, as well as relevant data concerning the surrounding sedimentary matrix. Excavation of the fossil heritage will require a permit from SAHRA and the material must be housed in a permitted institution. With appropriate mitigation, many developments involving bedrock excavation will have a *positive* impact on our understanding of local palaeontological heritage.

4 BACKGROUND TO THE GEOLOGICAL AND PALAEOONTOLOGICAL HISTORY

4.1 PALAEOONTOLOGY

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content (Fig. 2). The proposed development area in Queenstown (Fig. 3) is underlain by the Middle Triassic Katberg and Burgersdorp Formations (*Lystrosaurus* and *Cynognathus* AZ, Tarkastad Subgroup, Beaufort Group, Karoo Supergroup). Late Cenozoic superficial sediments are also present in the development area.

The *Lystrosaurus* AZ (Katberg Formation) is named after the dicynodont *Lystrosaurus* which contributes up to 95% of fossils found in this biozone (Botha & Smith 2007). The *Lystrosaurus* AZ is also known for the small captorhinid parareptiles *Procolophon* and a crocodile-like early archosaur, *Proterosuchus*. Armour-plated “labyrinthodont” amphibians (e.g. *Lydekkerina*) are also present in this biozone as well as small true reptile owenettids, therocephalians, and early cynodonts (e.g. *Galesaurus*, *Thrinaxodon*). This biozone is also characterized by vertebrate and invertebrate burrows. Invertebrate burrows are represented by aquatic and land living organisms while tetrapod burrows include various cynodonts, procolophonids and *Lystrosaurus* (Groenewald 1991, Groenewald and Kitching, 1995, Damiani *et al.* 2003, Abdala *et al.* 2006). Vascular plants in this biozone are generally rare but petrified wood (“*Dadoxylon*”) and leaves of glossopterid progymnosperms and arthropyte ferns (*Schizoneura*, *Phyllothea*) are present.

The *Cynognathus* AZ (Burgersdorp Formation) is dominated by amphibians, reptiles and therapsids. The Burgersdorp biotas include rich freshwater vertebrate fauna, fish groups as well as large capitosaurid and trematosuchid amphibians. The reptile fauna includes lizard-like sphenodontids, rhynchosaurs, and primitive archosaurs. Therapsids include *Kannemeyeria* and numerous small to medium-sized carnivorous and herbivorous therocephalians and advanced cynodonts. Tetrapod trackways and burrows are also present.

Late Cenozoic sediments consist mostly of superficial deposits (Partridge, 2005). The Quaternary represents a time span of approximately 2.5 million years ago to present (Walker *et al.*, 2009; Gradstein *et al.*, 2012). These alluvium sediments may also contain fossil remains which might include rolled bones, intact or fragmented vertebrate skeletons, vertebrate teeth, invertebrates such as molluscs and crustaceans, trace fossils of fossilised termite heaps (termitaria) and burrows of both vertebrates and invertebrates. Furthermore, fossilised plant remains such as wood and roots might

also be present in these sediments. All the above mentioned fossils however, tend to be low in variety as well as in abundance in these cover soil which obscure the underlying bedrock.

4.2 GEOLOGY

The Early Triassic Tarkastad Subgroup is characterised by a abundance of sandstone and red mudstone. In the Queenstown area the Katberg Formation is sandstone-rich, while the Burgersdorp Formation is mudstone-rich. Sandstones in the Katberg Formation are fine to medium grained. Oval to spherical calcretions is relatively common. The Burgersdorp Formation sandstones are fine grained greenish grey or light brownish grey with horizontal lamination. In both formations intraformational mud-pellet conglomerates are common. Red colours dominate in the mudstones of both formations.

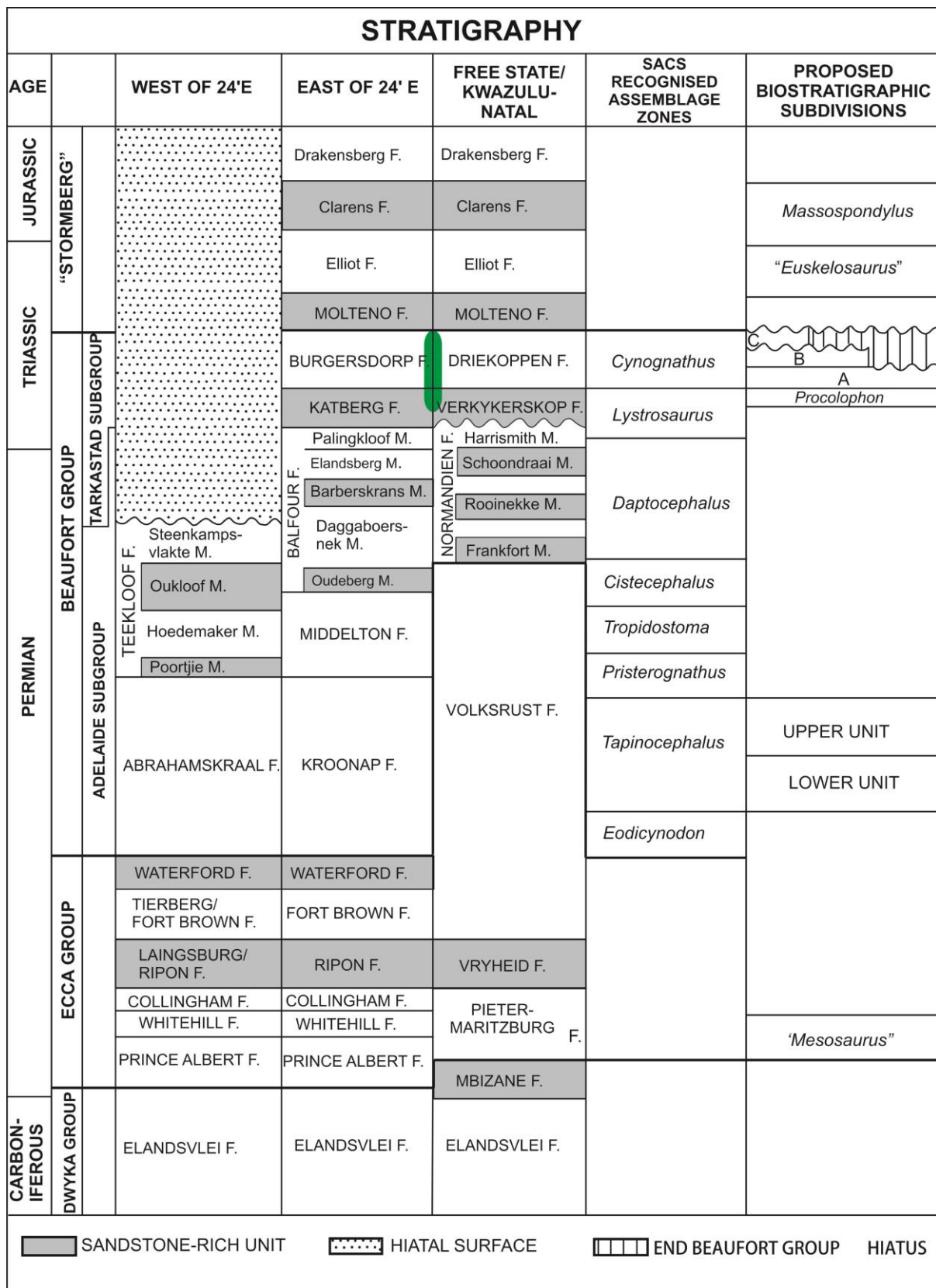


Figure 2: Karoo stratigraphy and biostratigraphy (after Smith *et al.*, 2012). Green line indicates the stratigraphic interval impacted by the proposed development.

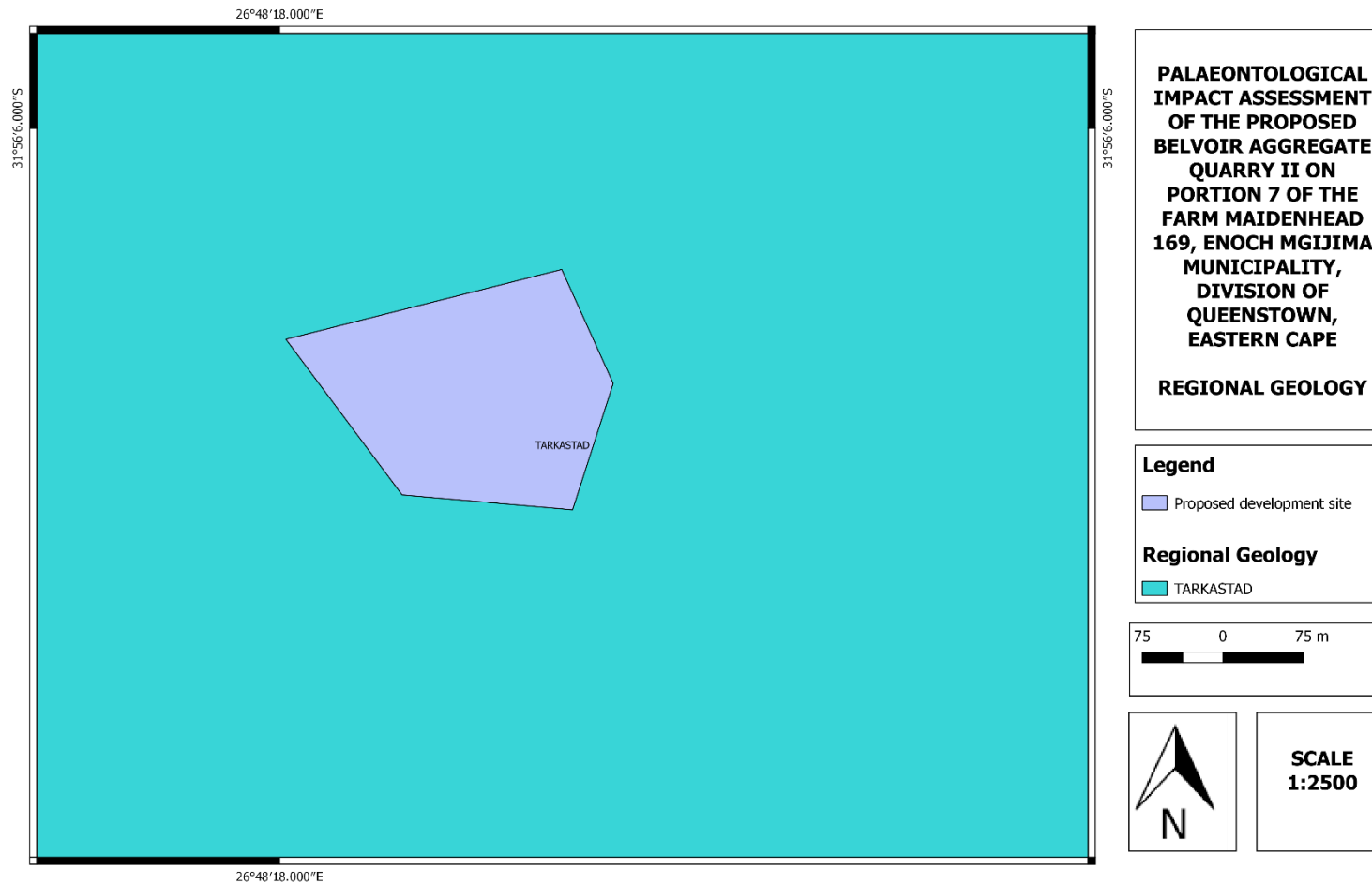


Figure 3. The surface geology of proposed Belvoir Quarry on the remainder of Portion 7 of the Farm Maidenhead 169, Division of Queenstown, Eastern Cape. The development area is underlain by Middle Triassic Katberg and Burgersdorp Formation (Tarkastad Subgroup, Beaufort Group, Karoo Supergroup).

5 GEOGRAPHICAL LOCATION OF THE SITE

Location: 31° 56' 13.93" S and 26° 48' 29.45" E

The proposed development area is located on Portion 7 of the Farm Maidenhead 169, Division of Queenstown, Eastern Cape Province; Ward 10 of the Enoch Mgijima Municipality.

6 METHODS

A Palaeontological Impact Assessment was conducted to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed areas of development. The author's experience, aerial photos (using Google, 2015), topographical and geological maps and other reports from the same were used to assess the proposed area of development.

6.1 ASSUMPTIONS AND LIMITATIONS

The accuracy and reliability of desktop Palaeontological Impact Assessments as components of heritage impact assessments are normally limited by the following restrictions:

- Fossil databases that have not been kept up-to-date or are not computerised. These databases do not always include relevant locality or geological information.
- The accuracy of geological maps where information may be based solely on aerial photographs and small areas of significant geology have been ignored. The sheet explanations for geological maps are inadequate and little to no attention is paid to palaeontological material.
- Impact studies and other reports (*e.g.* of commercial mining companies) - is not readily available for desktop studies.

Large areas of South Africa have not been studied palaeontologically. Fossil data collected from different areas but in similar Assemblage Zones might however provide insight on the possible occurrence of fossils in an unexplored area. Desktop studies therefore usually assume the presence of unexposed fossil heritage within study areas of similar geological formations.

7 SITE VISIT



Figure 4. General topography of the proposed development area.



Figure 5. Existing gravel quarry.

8 FINDINGS AND RECOMMENDATIONS

The proposed development site was investigated, and no palaeontological resources were observed. The absence of potentially fossiliferous exposures on the development site in Queenstown suggest that fossils are absent from this site. The impact on paleontological material is thus negligible and regarded as insignificant. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional paleontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

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10 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Elize Butler holds an MSc (Zoology) Cum Laude from the University of the Free State and has been working in Palaeontology for more than twenty 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 since 2006 and has been conducting Palaeontological Impact Assessments since 2014.

11 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:

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SIGNATURE:

