BM GEOLOGICAL SERVICES

DESKTOP PALAEONTOLOGICAL HERITAGE IMPACT ASSESSEMENT REPORT ON THE SITE OF A PROPOSED AGGREGATE QUARRY TO BE A PORTION OF PORTION 2 OF THE FARM DWAALFONTEIN 565, MPUMALANGA PROVINCE

13 July 2014

Prepared for:

Heritage Contracts and Archaeological Consulting CC

On behalf of:

B & E International (Pty) Ltd

Postal address:
P.O. Box 13755
Hatfield
0028
South Africa

Cell: +27 (0) 79 626 9976
Faxs:+27 (0) 86 678 5358
E-mail: bmgeoserv@gmail.com

DESKTOP PALAEONTOLOGICAL HERITAGE IMPACT ASSESSEMENT REPORT ON THE SITE OF A PROPOSED AGGREGATE QUARRY TO BE A PORTION OF PORTION 2 OF THE FARM DWAALFONTEIN 565, MPUMALANGA PROVINCE

Prepared for:

Heritage Contract and Archaeological Consulting CC

On Behalf of:

B & E International (Pty) Ltd

Prepared By:

Prof B.D. Millsteed

EXECUTIVE SUMMARY

B & E International (Pty) Ltd desires to operate open cast mining operations to extract aggregate to be utilised in the construction industry. The site is located approximately 34 km west of Emalahleni, 20 km southeast of Bronkhorstspruit and 2 km to the west of the Kusile Power Station within the Magisterial District of Witbank, Nkangala District Council, Mpumalanga Province (Figure 1). The proposed project will be located within a portion of portion 2 of the farm Dwaalfontein 565 and has a planned aerial extent of 1.5 ha.

B & E International (Pty) Ltd has appointed Heritage Contract and Archaeological Consulting CC, as independent consultants, to undertake a Heritage Impact Assessment of the project area. Heritage Contract and Archaeological Consulting CC has appointed BM Geological Services to provide a desktop Palaeontological Heritage Impact Assessment Report in respect of the proposed project that will form part of the final Heritage Impact assessment Report.

In terms of the effects of the construction operations disruption to geological strata will be restricted to the Vaalian-age diabase intrusive rocks which are genetically related to the emplacement of the Bushveld Complex; this geological unit is unfossiliferous. Accordingly, no negative effect upon the palaeontological heritage of the project area is anticipated.

The social benefits of the project have been classified as beneficial, herein, as the project aims to provide useful stone aggregate for the local building industry. This positive assessment does not need to be balanced against any possible negative impacts upon the palaeontological heritage of either project area. As such **this desktop study has not identified any palaeontological reason to prejudice the progression of the mining project**.

TABLE OF CONTENTS

1 INTRODUCTION 5
2 TERMS OF REFERENCE AND SCOPE OF THE STUDY 5
3 LEGISLATIVE REQUIREMENTS 7
3.1 The National Heritage Resources Act 7
3.2 Need for Impact Assessment Reports 7
3.3 Legislation Specifically Pertinent to Palaeontology* 8
3.4 The National Environmental Management Act [as amended] 9
4 RELEVENT EXPERIENCE 10
5 INDEPENDENCE 10
6 GEOLOGY AND FOSSIL POTENTIAL 10
6.1 Vaalian diabase 10
6.1.1 Geology 10
6.1.2 Palaeontological potential 10
7 ENVIRONMENT OF THE PROPOSED PROJECT SITE 12
8 OVERVIEW OF SCOPE OF THE PROJECT 15
8.1 Effect of project on the geology 15
9 IMPACT ASSESSMENT 15
9.1 Nature of Impact 15
9.2 Extent of impact 15
9.3 Duration of impact 16
9.4 Probability of impact 16
9.5 Significance of the impact 16
9.6 Severity / Benefit scale 16
9.7 Status 17
10 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSABLE LOSS 17
10.1 Mitigation 17
10.2 Reversal of damage 17
10.3 Degree of irreversible loss 17
11 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE 18
12 ENVIRONMENTAL IMPACT STATEMENT 18

13 REFERENCES 18

TABLE OF FIGURES

Figure 1: Location map showing the position of the proposed mining operations. 6

Figure 2: Generalised geological map of the areas underlying the proposed mining operations and their immediate environs. 11

Figure 3: Google earth image showing the location of the proposed mining operations and, thus, the area reported upon herein (yellow polygon). 12

Figure 4: Map of the project area and its immediate environs. The topographic contour interval is 20 m and, as such, it is clear that the region is generally flat and featureless. It is also evident that no surface drainage systems transect either project area. 13

Figure 5: Map of the distribution of the vegetation veld types located within the project area and its immediate environs (after Mucina and Rutherford, 2006). 14

1 INTRODUCTION

B & E International (Pty) Ltd desires to operate open cast mining operations to extract aggregate to be utilised in the construction industry. The site is located approximately 34 km west of Emalahleni, 20 km southeast of Bronkhorstspruit and 2 km to the west of the Kusile Power Station within the Magisterial District of Witbank, Nkangala District Council, Mpumalanga Province (Figure 1). The proposed project will be located within a portion of Portion 2 of the farm Dwaalfontein 565 and has a planned aerial extent of 1.5 ha.

B & E International (Pty) Ltd has appointed Heritage Contract and Archaeological Consulting CC, as independent consultants, to undertake a Heritage Impact Assessment of the project area. Heritage Contract and Archaeological Consulting CC has appointed BM Geological Services to provide a desktop Palaeontological Heritage Impact Assessment Report in respect of the proposed project that will form part of the final Heritage Impact assessment Report.

2 TERMS OF REFERENCE AND SCOPE OF THE STUDY

The terms of reference for this study were as follows:-

- Conduct a desktop assessment of the potential impact of the proposed project on the palaeontological heritage of the project area.
- Describe the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions.
- Quantify the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions.
- Provide an overview of the applicable legislative framework.
- Make recommendations concerning future work programs as, and if, necessary.

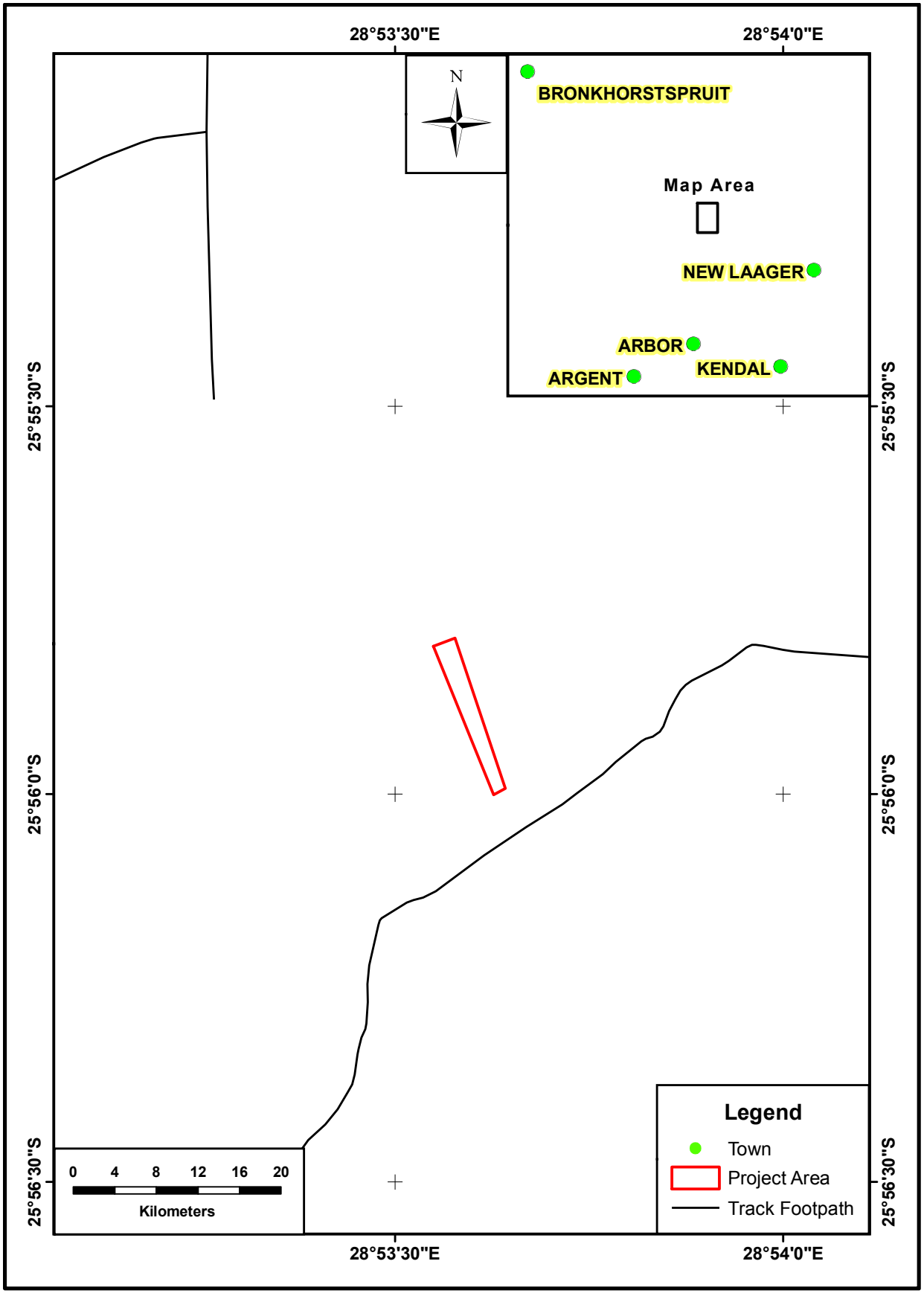

Figure 1: Location map showing the position of the proposed mining operations.

3 LEGISLATIVE REQUIREMENTS

South Africa's cultural resources are primarily dealt with in two Acts. These are the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998).

3.1 The National Heritage Resources Act

The following are protected as cultural heritage resources by the National Heritage Resources Act:

- Archaeological artefacts, structures and sites older than 100 years,
- Ethnographic art objects (e.g. prehistoric rock art) and ethnography,
- Objects of decorative and visual arts,
- Military objects, structures and sites older than 75 years,
- Historical objects, structures and sites older than 60 years,
- Proclaimed heritage sites,
- Grave yards and graves older than 60 years,
- Meteorites and fossils,
- Objects, structures and sites or scientific or technological value.

The Act also states that those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities. The national estate includes the following:

- Places, buildings, structures and equipment of cultural significance,
- Places to which oral traditions are attached or which are associated with living heritage,
- Historical settlements and townscapes,
- Landscapes and features of cultural significance,
- Geological sites of scientific or cultural importance,
- Sites of Archaeological and palaeontological importance,
- Graves and burial grounds,
- Sites of significance relating to the history of slavery,
- Movable objects (e.g. archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.).

3.2 Need for Impact Assessment Reports

Section 38 of the Act stipulates that any person who intends to undertake an activity that falls within the following:

- The construction of a linear development (road, wall, power line, canal etc.) exceeding 300 m in length,

- The construction of a bridge or similar structure exceeding 50 m in length,
- Any development or other activity that will change the character of a site and exceed 5 000 m^2 or involve three or more existing erven or subdivisions thereof,
- Re-zoning of a site exceeding 10 000 m^2,
- Any other category provided for in the regulations of SAHRA or a provincial heritage authority.

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. If there is reason to believe that heritage resources will be affected by such development, the developer may be notified to submit an impact assessment report. A Palaeontological Impact Assessment (PIA) only looks at the potential impact of the development palaeontological resources of the proposed area to be affected.

3.3 Legislation Specifically Pertinent to Palaeontology*

*****Note: Section 2 of the Act defines "palaeontological" material as "any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains".

Section 35(4) of this Act specifically deals with archaeology, palaeontology and meteorites. The Act states that no person may, without a permit issued by the responsible heritage resources authority (national or provincial):

- 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 that assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites,
- Alter or demolish any structure or part of a structure which is older than 60 years as protected.

The above mentioned palaeontological objects may only be disturbed or moved by a palaeontologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to demolish such a site or structure, a destruction permit from SAHRA will also be needed.

Further to the above point, Section 35(3) of this Act indicates that "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". Thus, regardless of the granting of any official clearance to proceed with any development based on an earlier assessment of its impact on the Palaeontological Heritage of an area, the development should be halted and the relevant authorities informed should fossil objects be uncovered during the progress of the development.

3.4 The National Environmental Management Act [as amended]

This Act does not provide the detailed protections and administrative procedures for the protection and management of the nation's Palaeontological Heritage as are detailed in the National Heritage Resources Act, but is more general in is application. In particular Section 2(2) of the Act states that environmental management must place people and their needs at the forefront of its concerns and, amongst other issues, serve their cultural interests equitably. Further to this point section 2(4)(a)(iii) states that disturbances of sites that constitute the nation's cultural heritage should be avoided, and where it cannot be avoided should be minimised and remedied.

Section 23(1) indicates that a general objective of integrated environmental management is to identify, predict and evaluate the actual and potential impact of activities upon the cultural heritage. This section also highlights the need to identify options for mitigating of negative effects of activities with a view to minimising negative impacts.

In order to give effect to the general objectives of integrated environmental management outlined in the Act the potential impact on cultural heritage of activities that require authorisation or permission by law must be investigated and assessed prior to their implementation and reported to the relevant organ of state. Thus, a survey and evaluation of cultural resources must be done in areas where development projects that will potentially negatively affect the cultural heritage will be performed. During this process the impact on the cultural heritage will be determined and proposals for the mitigation of the negative effects made.

4 RELEVENT EXPERIENCE

Prof Millsteed holds a PhD in palaeontology and has previously been employed as a professional palaeontologist with the Council for Geoscience in South Africa. He is currently the principle of BM Geological Services and has sufficient knowledge of palaeontology and the relevant legislation required to produce this Palaeontological Impact Assessment Report. Dr Millsteed is registered with the South African Council for Natural Scientific Professions (SACNASP), and is a member of the Palaeontological Society of South African and the Geological Society of South Africa.

5 INDEPENDENCE

Prof Millsteed was contracted as an independent consultant to conduct this Palaeontological Heritage Impact Assessment study and shall receive fair remuneration for these professional services. Neither Prof Millsteed nor BM Geological Services has any financial interest in B & E International (Pty) Ltd or the proposed quarry.

6 GEOLOGY AND FOSSIL POTENTIAL

Figure 2 shows that the project area is completely underlain by rocks of the Vaalian (Achaean) age diabase intrusive rocks. A summary of the characteristics of the diabase and its fossiliferous potential follows.

6.1 Vaalian diabase

6.1.1 Geology

The entire area underlying the site of the proposed quarry is underlain by Vaalian-age (Achaean) hypabyssal, igneous rocks of diabase composition (Figure 2). Dykes and sills of this magmatic event within South Africa are genetically related to the emplacement of the Bushveld Complex.

6.1.2 Palaeontological potential

Diabase is a medium-grained, hypabyssal plutonic igneous rock type. It has accordingly, formed by crystallisation directly from a liquid magma at significant depth within the Earth's crust. The potential for any fossil materials occurring within this rock unit is **nil**.

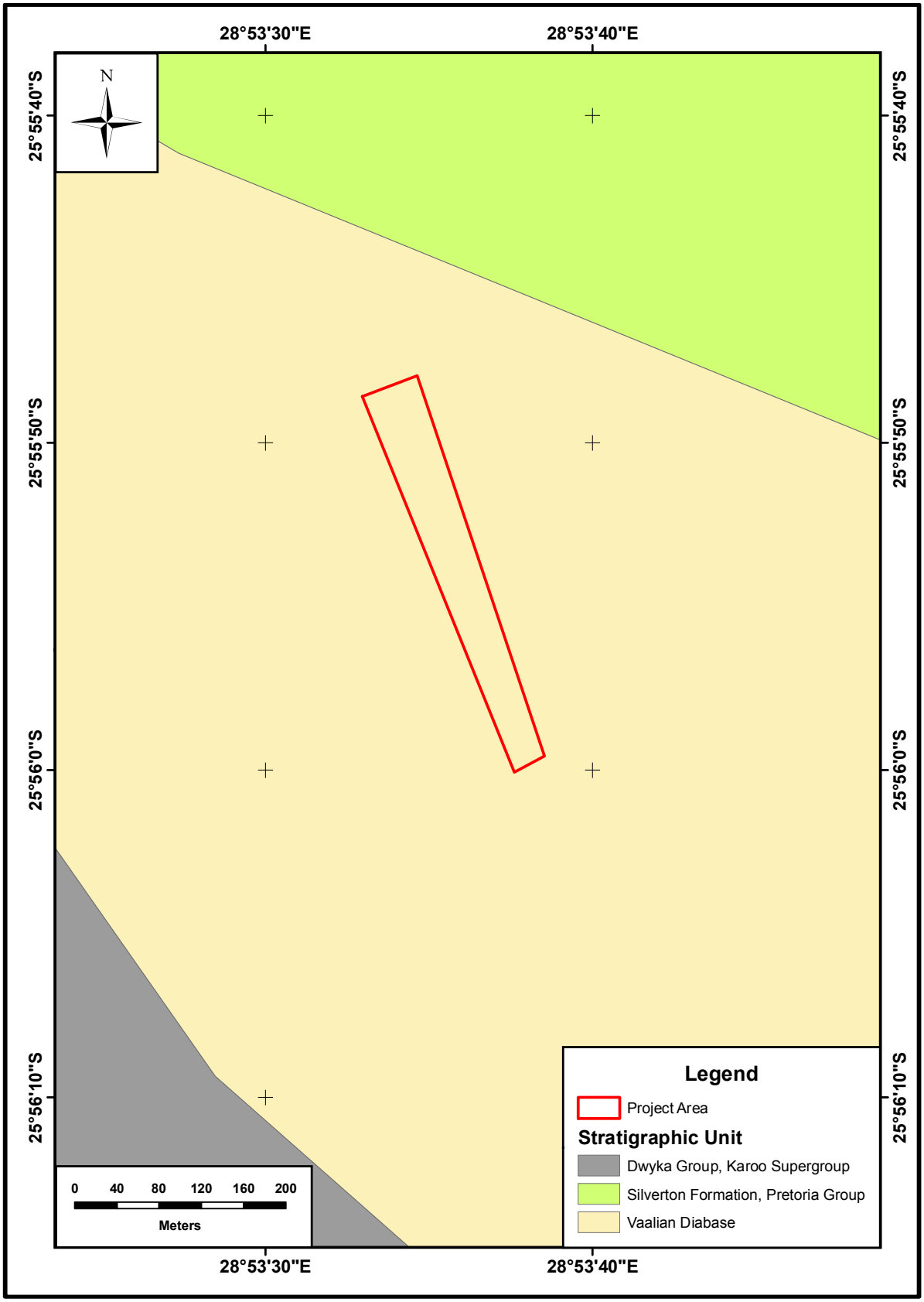

Figure 2: Generalised geological map of the areas underlying the proposed mining operations and their immediate environs.

7 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The area underlain by the project areas is small, being approximately 1.5 ha in size. Examination of Google earth imagery (Figure 3) indicates that the project area is situated in the middle of a pre-existing mining area that appears to consist of another quarry pit and its stockpiles; the surrounding countryside is undeveloped. The site is located immediately to the west of Lone Rock Road.

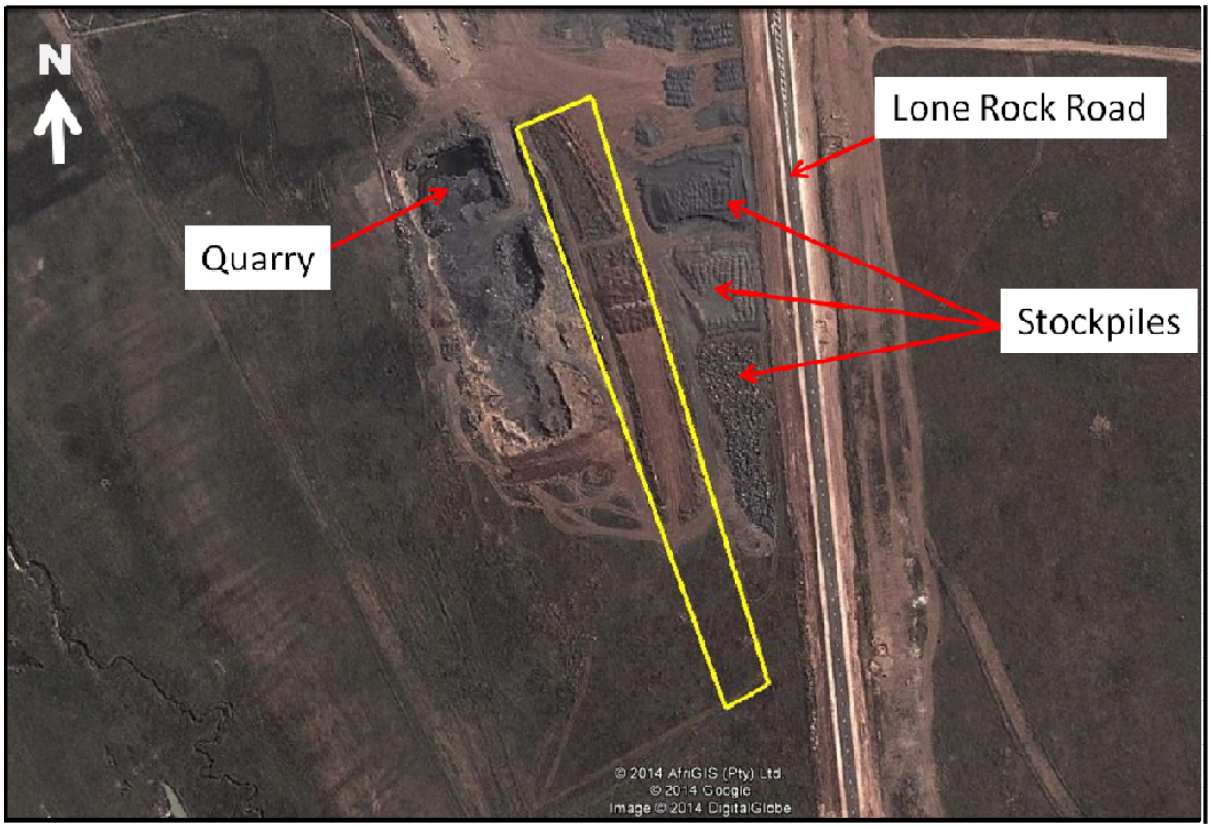

Figure 3: Google earth image showing the location of the proposed mining operations and, thus, the area reported upon herein (yellow polygon).

The project area and its environs are flat and featureless. No significant drainage lines or river systems transect either of the project areas, but the site lies between two ephemeral drainage lines locate to the north and south (Figure 4).

Mucina and Rutherford (2006) indicate that the vegetation cover of the general area encompassing the project area consists of the Rand Highveld Grassland veld type (Figure 5). The conservation status of the Rand Highveld Grassland veld type is described by Mucina and Rutherford as endangered. However, it apparent from Figure 3 that little or none of the original vegetation remains on the project area.

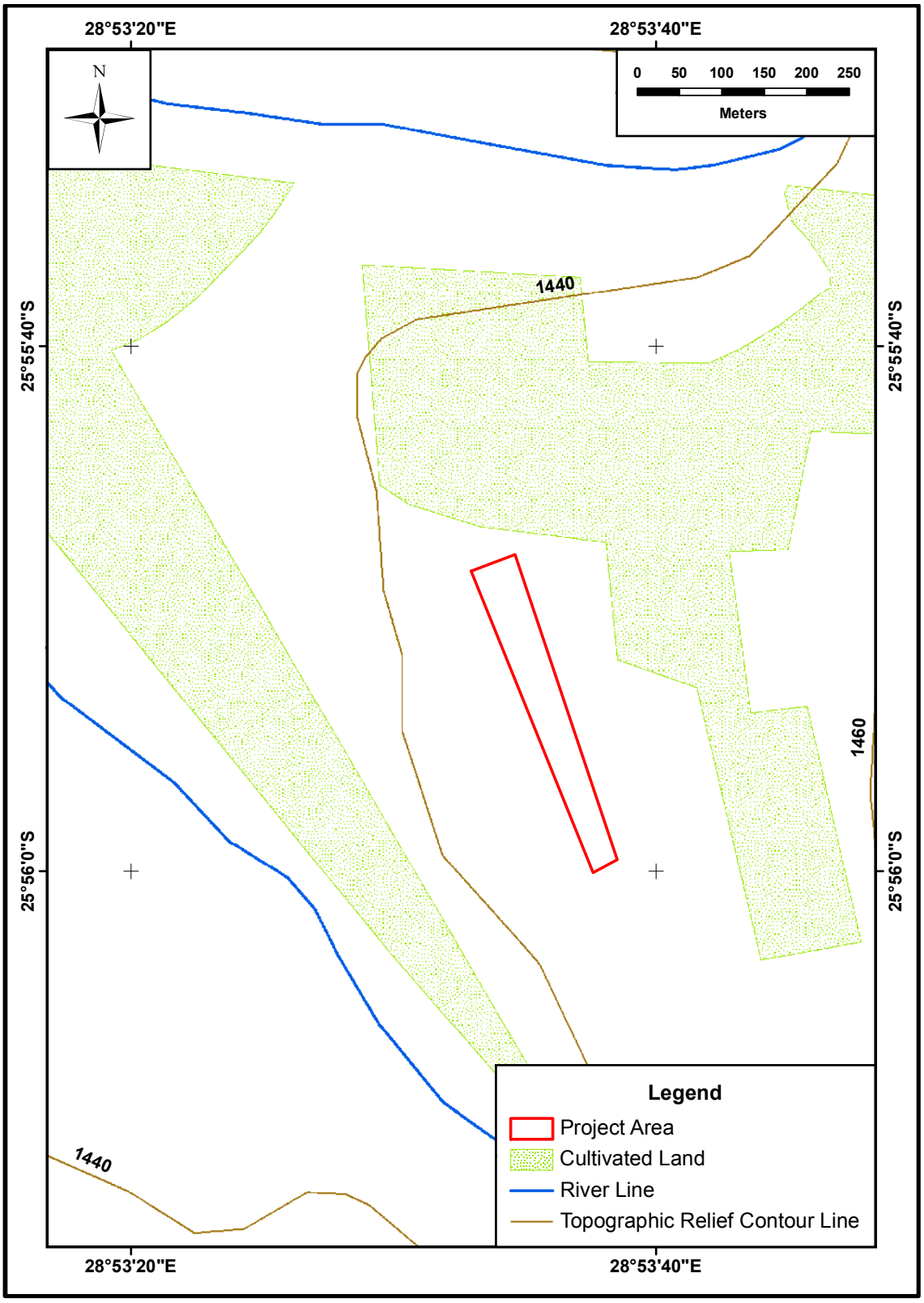

Figure 4: Map of the project area and its immediate environs. The topographic contour interval is 20 m and, as such, it is clear that the region is generally flat and featureless. It is also evident that no surface drainage systems transect either project area.

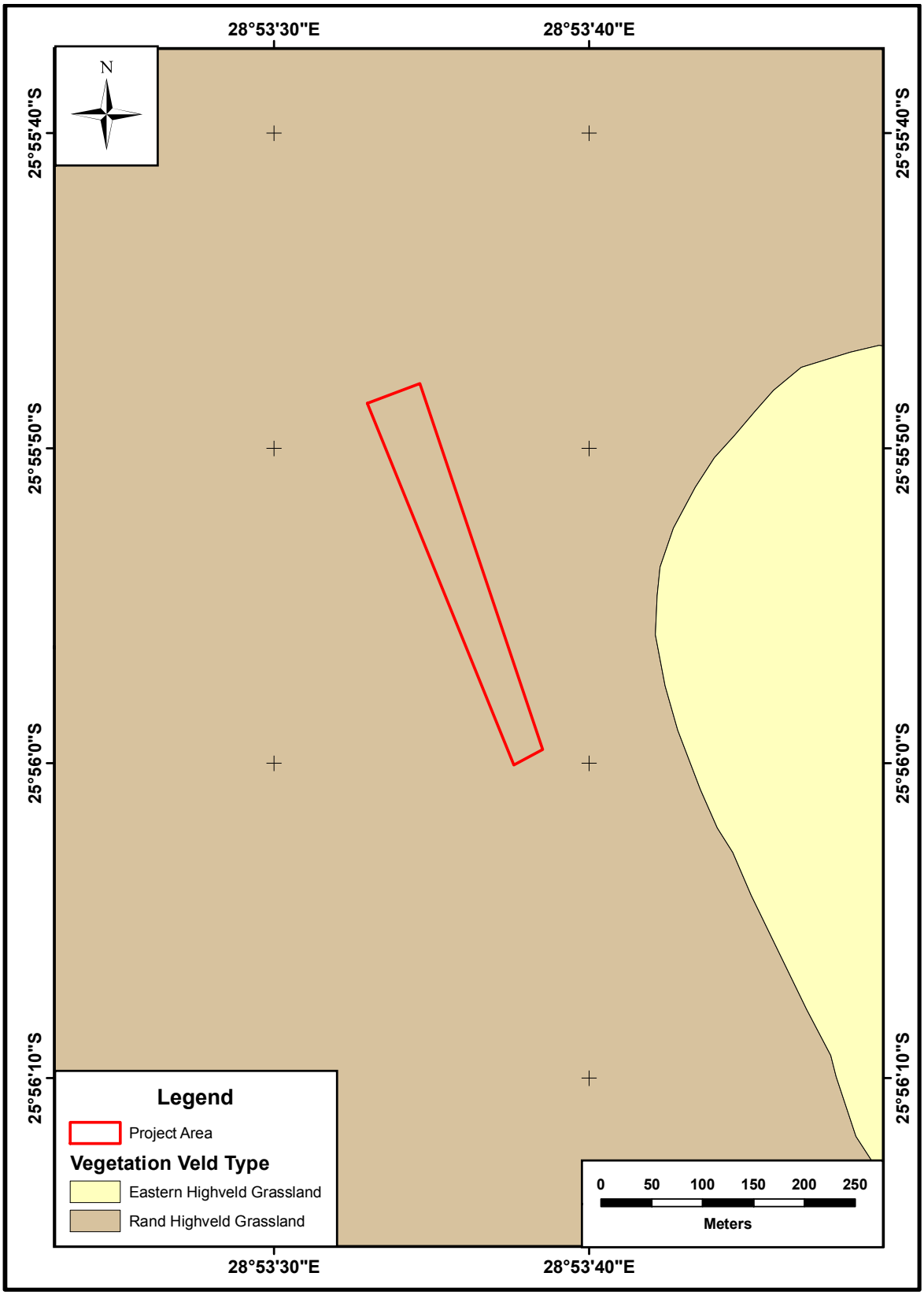

Figure 5: Map of the distribution of the vegetation veld types located within the project area and its immediate environs (after Mucina and Rutherford, 2006).

8 OVERVIEW OF SCOPE OF THE PROJECT

The proposed quarry will occupy an area of approximately 1.5 ha and will mine diabase rocks of intrusive origin for aggregate to be used in the construction industry. It is projected that the maximum mining depth will be 30 m. The mining activities will be contained completely within the diabase as the rock types (the shales of the Silverton Formation) that underlie it are unsuitable for aggregate.

8.1 Effect of project on the geology

It is evident from Section 9 above that the mining activities will be restricted entirely within the diabase.

9 IMPACT ASSESSMENT

The potential impact of the proposed mining area is categorised below according to the following criteria:-

9.1 Nature of Impact

The potential negative impacts of the proposed project on the palaeontological heritage of the area are:

- Damage or destruction of fossil materials during the construction of project infrastructural elements to a maximum depth of those excavations. Many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general. Where fossil material is present and will be directly affected by the building or construction of the projects infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).
- Movement of fossil materials during the construction phase, such that they are no longer *in situ* when discovered. The fact that the fossils are not *in situ* would either significantly reduce or completely destroy their scientific significance.
- The loss of access for scientific study to any fossil materials present beneath infrastructural elements for the life span of the existence of those constructions and facilities.

9.2 Extent of impact

The possible extent of the permanent impact of the proposed project on the palaeontological heritage of South Africa is restricted to the damage, destruction or

accidental relocation of fossil material caused by the excavations and construction of the necessary infrastructure elements forming part of the project. The possible source of a less permanent negative impact on the palaeontological heritage is the loss of access for scientific research to any fossil materials that become covered by the various infrastructural elements that comprise the project. The **extent of the area of potential impact is, accordingly, categorised as local** (i.e., restricted to the project site).

9.3 Duration of impact

The anticipated duration of the identified potential impact is assessed as potentially **permanent to long term**. This is assessment is based on the fact that, in the absence of mitigation procedures (should fossil material be present within the area to be affected) the damage or destruction of any palaeontological materials will be permanent. Similarly, any fossil materials that exist below the structures and infrastructural elements that will constitute the two industrial parks will be unavailable for scientific study for the life of the existence of those features.

9.4 Probability of impact

The Vaalian-age diabase completely underlies the site of the proposed quarry; indeed, the diabase is the target rock type for the mining operations. Diabase is a hypabyssal igneous rock type which is unfossiliferous. The probability either project resulting in a negative impact upon the palaeontological heritage of the rock unit is assessed as being **nil**

9.5 Significance of the impact

The rocks of the diabase are unfossiliferous, thus, the significance of any affect of the mining operations on the palaeontological heritage of this unit is **nil**.

9.6 Severity / Benefit scale

The proposed project is categorised, herein, as being potentially **beneficial**. This classification is based on the intention that the project will provide stone aggregate for the local building industry.

The probability of a negative impact on the palaeontological heritage of the project areas has been categorised as nil. As such there are no negative effects on the palaeontological heritage of either project area that must be weighed against the potential benefits of either project.

9.7 Status

Given the combination of factors discussed above, it is anticipated that the project will result in no negative effect on the palaeontological heritage of the area. As the proposed project would provide stone aggregate for the local building industry the project is determined as having a **positive status** herein.

10 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSABLE LOSS

The degree to which the possible negative effects of the proposed project can be mitigated, reversed or will result in irreversible loss of the palaeontological heritage can be determined as discussed below.

10.1 Mitigation

Due to the unfossiliferous nature of the rocks underlying project area, and as the mining operations will be restricted to the diabase, it is not anticipated that any fossil materials will be negatively impacted upon. Accordingly, no damage mitigation procedures are required to be outlined for either of the two projects.

10.2 Reversal of damage

Any damage to, or the destruction of, palaeontological materials or reduction of scientific value due to a loss of the original location is **irreversible**.

10.3 Degree of irreversible loss

Once a fossil is damaged, destroyed or moved from its original position without its geographical position and stratigraphic location being recorded the **damage is irreversible**.

Fossils are usually scarce and sporadic in their occurrence and the chances of negatively impacting on a fossil in any particular area are low. However, any fossil material is potentially of the greatest scientific and cultural importance. Thus, the potential always exists during construction and excavation within potentially fossiliferous rocks for the permanent and irreversible loss of extremely significant or irreplaceable fossil material. This said, many fossils are incomplete in their state of preservation or are examples of relatively common taxa. As such, just because a fossil is present it is not necessarily of great scientific value. Accordingly, not all fossils are necessary significant culturally of scientifically significant and the potential degree of irreversible loss will vary from case to case. The judgement on the significance of the fossil must be made by an experienced palaeontologist.

11 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The information provided within this report was derived from a desktop study of available maps and scientific literature; no direct observation was made of the area as result of a site visit.

12 ENVIRONMENTAL IMPACT STATEMENT

A desktop study has been conducted on the site of a proposed stone aggregate quarry to be located on the farm Dwaalfontein 565 in Mpumalanga Province. The proposed project area is small (approximately 1.5 ha). However, any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of either development area. The extent of any impacts is accordingly characterised as local.

In terms of the effects of the construction operations disruption to geological strata will be restricted to the Vaalian-age diabase intrusive rocks related to the emplacement of the Bushveld Complex; this geological unit is unfossiliferous. Accordingly, no negative effect upon the palaeontological heritage of the project area is anticipated.

The social benefits of the project have been classified as beneficial, herein, as the project aims to provide useful stone aggregate for the local building industry. This positive assessment does not need to be balanced against any possible negative impacts upon the palaeontological heritage of either project area. As such **this desktop study has not identified any palaeontological reason to prejudice the progression of the mining project**.

13 REFERENCES

Mucina, L. and Rutherford, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelizia* 19. South African National Biodiversity Institute, Pretoria.

Republic of South Africa (1998). National Environmental Management Act (No 107 of 1998). Pretoria: The Government Printer.

Republic of South Africa (1999). National Heritage Resources Act (No 25 of 1999). Pretoria: The Government Printer.

Prof B.D. Millsteed

13th July 2014