



**DESKTOP PALAEOLOGICAL
HERITAGE IMPACT ASSESSEMENT
REPORT ON THE SITE OF A
PROPOSED SAND AND CLAY MINE
TO BE LOCATED ON PORTIONS 0
OF THE FARM PAPKUILFONTEIN
469 JR, MPUMALANGA PROVINCE**

28 October 2013

Prepared for:
Environmental Assurance (Pty) Ltd

On behalf of:
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**DESKTOP PALAEOLOGICAL HERITAGE IMPACT ASSESSEMENT REPORT ON
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Prepared for:

Environmental Assurance (Pty) Ltd

On Behalf of:

Meepo Ya Mmu Mineral Resources (Pty) Ltd

Prepared By:

Dr B.D. Millstead

Desktop Palaeontological Impact Assessment Report on the site of a proposed sand and clay mine to be located on Portion 0 of the farm Papkuilfontein 469 JR, Mpumalanga Province

EXECUTIVE SUMMARY

Meepo Ya Mmu Mineral Resources (Pty) Ltd has applied for a Mining Right in respect of clay and sand on Portion 0 of the Farm Papkuilfontein 469 JR. The applicant is currently the holder of a Mining Permit covering a portion of the same property and in respect of the same minerals.

The site is located approximately 20 km north of Bronkhorstspuit and 14 km west of Cullinan, north of the N4 highway, Mkobola Magisterial District, Mpumalanga Province. While the site lies within the Mpumalanga Province, the shared provincial boundary with Gauteng Province coincides with the western margin of the farm (Figure 1). The site is approximately 97 ha in aerial extent.

Meepo Ya Mmu Mineral Resources (Pty) Ltd has appointed Environmental Assurance (Pty) Ltd, as independent consultants, to undertake a Scoping and Environmental Impact Assessment process to identify and assess all potential environmental impacts associated with the proposed project and propose appropriate mitigation measures in an Environmental Management Programme (EMP). Environmental Assurance (Pty) Ltd appointed BM Geological Services to provide a desktop Palaeontological Heritage Impact Assessment Report in respect of the proposed project that will support the final Heritage Impact Assessment Report.

The area of the proposed mining operations is completely underlain by Palaeoproterozoic red bed, clastic sediments of the Wilge River Formation. In addition to the bedrock it is inferred that a widespread regolith cover is distributed across the project area. The origin of the regolith (e.g., soil, colluvium or alluvium etc) is uncertain.

The mineral deposit found on the site will be mined using open cast methods in order to produce construction material. It is proposed that the ultimate depth of the mining area will be between approximately 5m and 10m. The current Mining Right application is for an area of approximately 1,5 ha, with an expected life of mine of 2 years.

The average depth of the regolith is uniformly approximately 2,4m – 3m over the whole of the deposit area only thinning out towards the south. Accordingly, the mining operations will negatively impact upon both the regolith cover and the underlying bedrock strata of the Wilge River Formation.

The sediments of the Wilge River Formation are unfossiliferous and as such the potential for a negative impact on the fossil heritage of the formation is **nil**. The possibility of a negative impact on the palaeontological heritage within the regolith is considered to be **low** in general, due to the generally uncommon and sporadic occurrence of fossils in the geological record. Where the regolith has been disturbed by ploughing or has been mined the probability is **nil**. Any fossils that may occur within the deeper uncultivated

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regions of the regolith cover may be scientifically significant. The probability of any significant negative impact upon the fossil assemblages contained within these two geological units is **local in extent** as they will be restricted to the area beneath the planned infrastructure elements.

The project has been assessed as being socially beneficial, herein, as it would provide low cost building materials to locally expanding communities. Similarly, the project will generate both direct and indirect employment opportunities within the region. The possibility of any negative impact on the palaeontological heritage of the project area could be minimised if thorough investigations are made of all excavation as they are being performed. Should any fossil materials be identified, the excavations should be halted and SAHRA informed of the discovery. A potential positive outcome of these mitigation protocols could be that fossil materials become available for scientific study that would otherwise have been hidden within the regolith. Should such new palaeontological material be located as a result of this site investigation this could prove to have a positive effect on the understanding of the fossil record of South Africa and positively affect the palaeontological heritage of the country.

In summary, this desktop study has not identified any palaeontological reason to prejudice the progression of this project, subject to adequate mitigation programs being put in place.

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1 INTRODUCTION

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Meepo Ya Mmu Mineral Resources (Pty) Ltd has appointed Environmental Assurance (Pty) Ltd, as independent consultants, to undertake a Scoping and Environmental Impact Assessment process to identify and assess all potential environmental impacts associated with the proposed mining project. Environmental Assurance (Pty) Ltd has appointed BM Geological Services to provide a desktop Palaeontological Heritage Impact Assessment Report in respect of the proposed project that will support 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.

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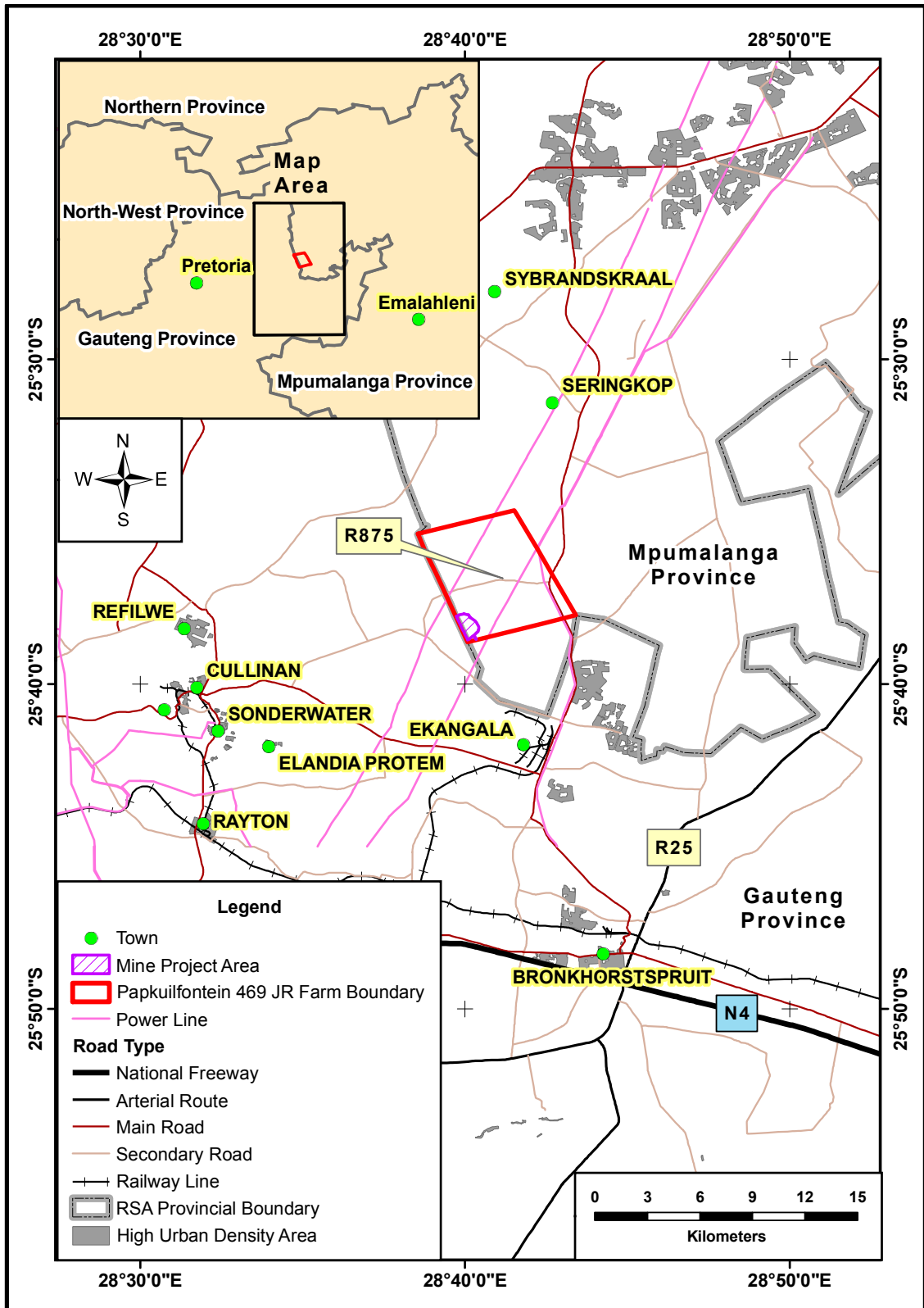


Figure 1: Location map showing the position of the proposed mining project.

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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)[as amended].

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 of 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.).

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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 300m 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 m² or involve three or more existing erven or subdivisions thereof,
- Re-zoning of a site exceeding 10 000 m²,
- 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 on 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

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- 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 its 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 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

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will potentially negatively affect the cultural heritage. During this process the impact on the cultural heritage will be determined and proposals for the mitigation of the negative effects made.

4 RELEVANT EXPERIENCE

Dr Millstead 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 Millstead 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

Dr Millstead was contracted as an independent consultant to conduct this Palaeontological Heritage Impact assessment study and shall receive fair remuneration for these professional services. Neither Dr Millstead nor BM Geological Services has any financial interest in Meepo Ya Mmu Mineral Resources (Pty) Ltd or the proposed mining operation.

6 GEOLOGY AND FOSSIL POTENTIAL

Figure 2 shows that the farm Papkuilfontein 469 JR is predominantly underlain by a diverse series of stratigraphic units including strata of the Wilge River, Dwyka and Vryheid Formations. The area of the proposed mining operations is completely underlain by the Wilge River Formation. In addition to the bedrock there is a widespread regolith cover is distributed across the project area. A summary of the characteristics of the Wilge River Formation and the regolith cover and their fossiliferous potentials follows.

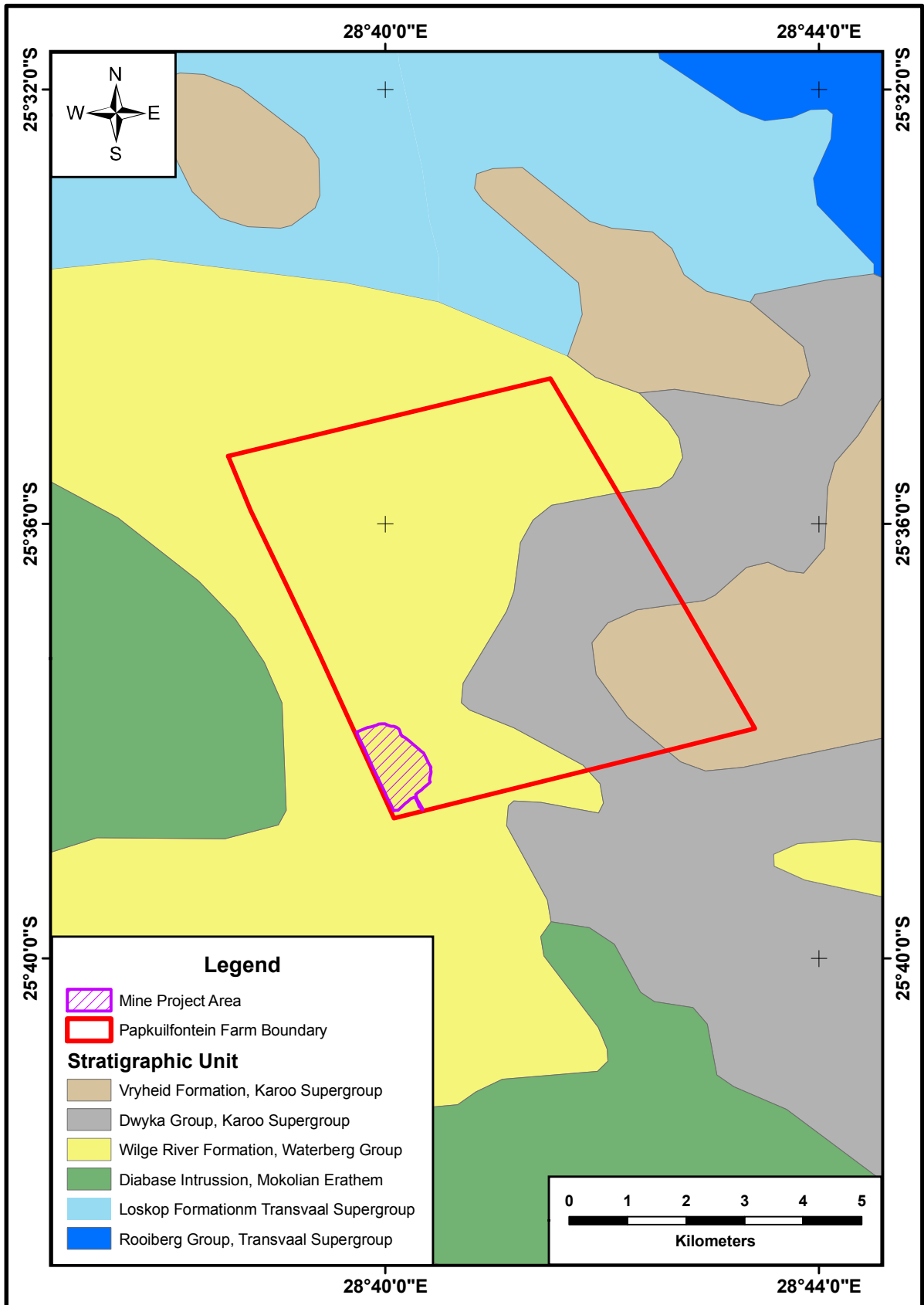


Figure 2: Map of the bedrock geology underlying the project area and its immediate environs.

6.1 Wilge River Formation

6.1.1 Geology

The entire extent of the project area is underlain by strata of the Wilge River Formation, Waterberg Group (Figure 2). The Wilge River Formation forms the basin-fill sequence of the Middleburg Basin and is the only stratigraphic unit within the basin and attains a maximum thickness of approximately 2500 m at the eastern limb of the basin. The Middleburg Basin extends from the east of Pretoria further eastwards for about 130 km to Middleburg (Figure 3).

The Wilge River Formation is believed to be correlated with the Swaershoek Formation which is the basal unit of the Waterberg Basin (Figure 3). Indeed it has been previously suggested that the Middleburg Basin is possibly an erosional outlier of the main Waterberg Basin. Lithologically the formation is dominated by texturally and mineralogically immature, coarse-grained, red-bed sandstones; occasional conglomerate interbeds are present and are more common and better developed in the west. Palaeocurrents measured in the formation indicate a predominant sediment influx from the west with some northerly input and a minor amount from the east. An overall alluvial-plain model of deposition is proposed for the formation (Vos and Eriksson, 1977; Van der Neut *et al.*, 1991).

The age of the strata comprising both the Middleburg and Waterberg Basins is believed to be between 1700 and 2000 Ma, and are, thus, Kheisian (Palaeoproterozoic) in age. They fall in that period of Earth's history when free atmospheric oxygen was available for the first time in sufficient quantities to produce oxides of the ferruginous minerals, thus creating conditions for the formation of red beds (Johnson *et al.*, 2006).

6.1.1 Palaeontological potential

No fossil materials are known to occur within the strata of the Wilge River Formation. The Palaeoproterozoic age of the unit precludes the presence of either plant or animal macrofossils. Elsewhere in South Africa, there are abundant occurrences of stromatolites in stratigraphically older carbonate sequences. The fact that the Wilge River Formation is composed of terrestrially deposited, clastic red bed lithologies precludes the presence of stromatolites.

6.2 Regolith

6.2.1 Geology

The applicant's exploration data indicates that there is a 2,4m – 3m thick cover of regolith over the whole of the deposit area only thinning out towards the south. It is

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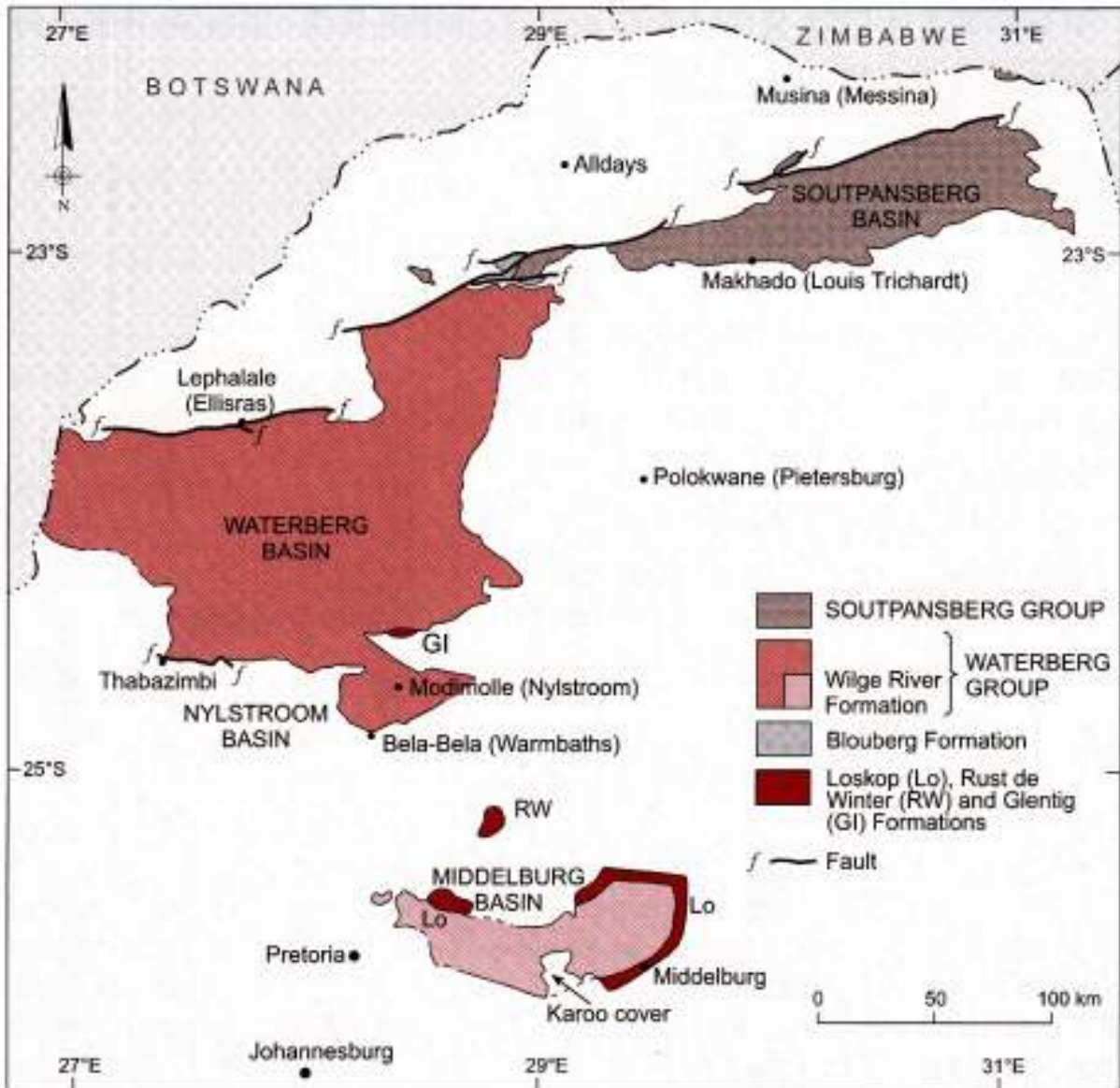


Figure 3: Map showing the location of the Middelburg Basin relative to the Waterberg Basin and Pretoria. The outcrop pattern of the Wilge River Formation is indicated in pink colour (From Barker *et al.*, 2006).

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evident in Figures 4 and 5 that the entire project area has been extensively agriculturally cultivated (ploughed). There is no data to hand pertaining to the nature of the regolith cover (e.g, whether it is composed of soils or if it is alluvial/colluvial in origin).

6.2.2 Palaeontological potential

As the presence of a regolith cover is only inferred there is no data to hand concerning the genesis or age of the unit. The fossiliferous potential of the unit cannot be determined herein due to a paucity of data.

7 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The project area is large with an aerial extent of approximately 97 ha. Examination of Google Earth imagery of the project area (Figure 4), as well as Figure 5, suggests that the project area is comprehensively utilised for agriculture and appear to be extensively ploughed.

Examination of the spacing between topographic contour intervals (Figure 5) indicates that the project area consists of generally featureless landscape that slopes gently to the northeast towards Malanspruit. No fluvial drainage lines are located within the project area itself. Mucina and Rutherford (2006) indicate that the vegetation cover of the project area consists entirely of Rand Highveld Grassland. There is a large region of Subtropical Freshwater Wetlands associated with the Malanspruit that lies outside of, but adjacent to, the north-eastern margin of the site (Figure 6). The conservation status of the Rand Highveld Grassland is classified as vulnerable and that of the Subtropical Freshwater Wetlands as least threatened.

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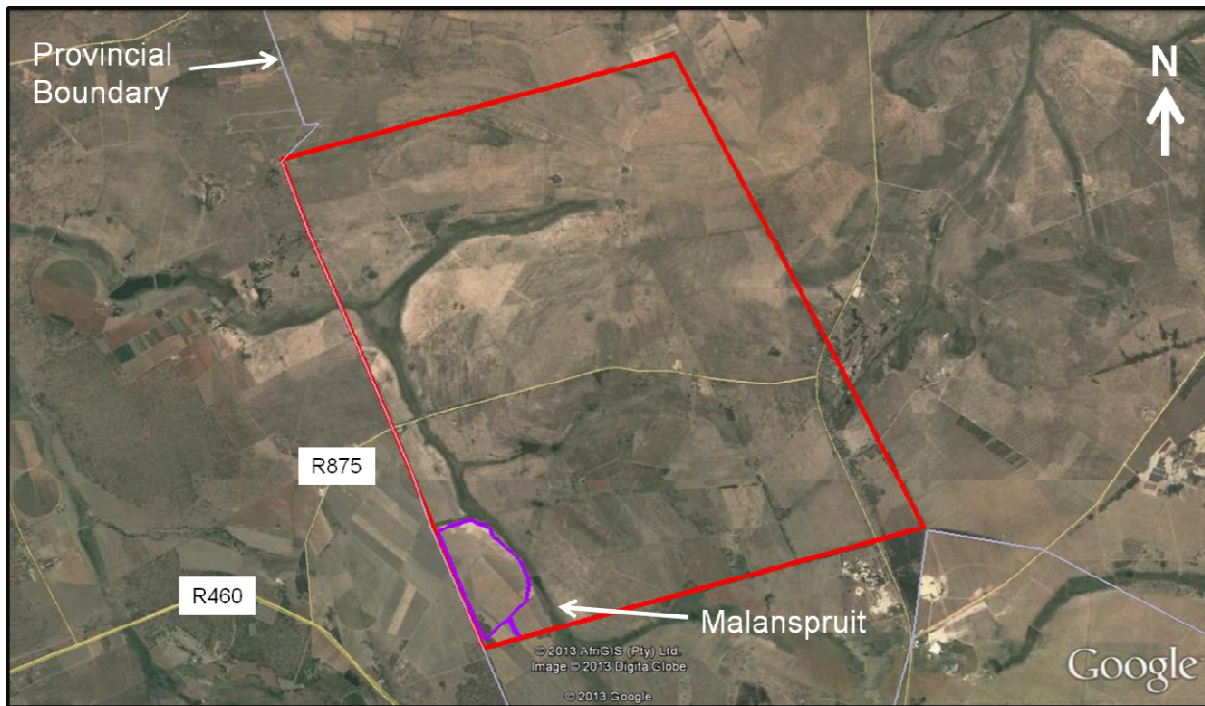


Figure 4: Google Earth image of the project area (purple polygon) and its immediate environs. The boundary of the farm Papkuilfontein 469 JR is shown as the red polygon. It is evident from the image that the project area has been completely utilised for agricultural cultivation (ploughed) and, accordingly, there is no possibility for scientifically or culturally significant fossils to be observable at the surface.

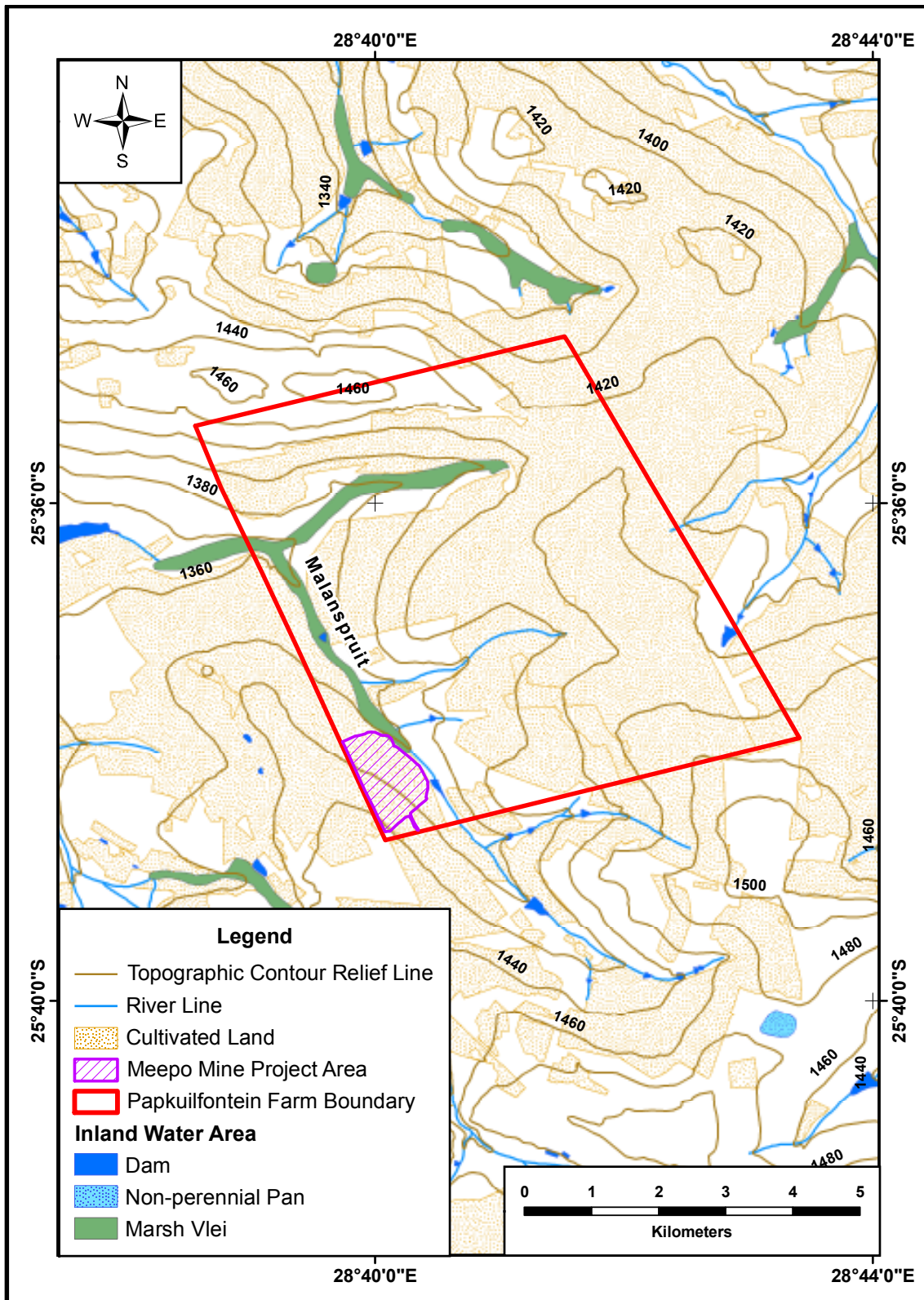


Figure 5: Map of the project area and its immediate environs. The topographic contour interval is 20 m and, as such, it is clear that the region is generally flat, but the project area slopes gently to the northeast towards Malanspruit. It is evident that the total extent of the project area has been agriculturally cultivated (ploughed).

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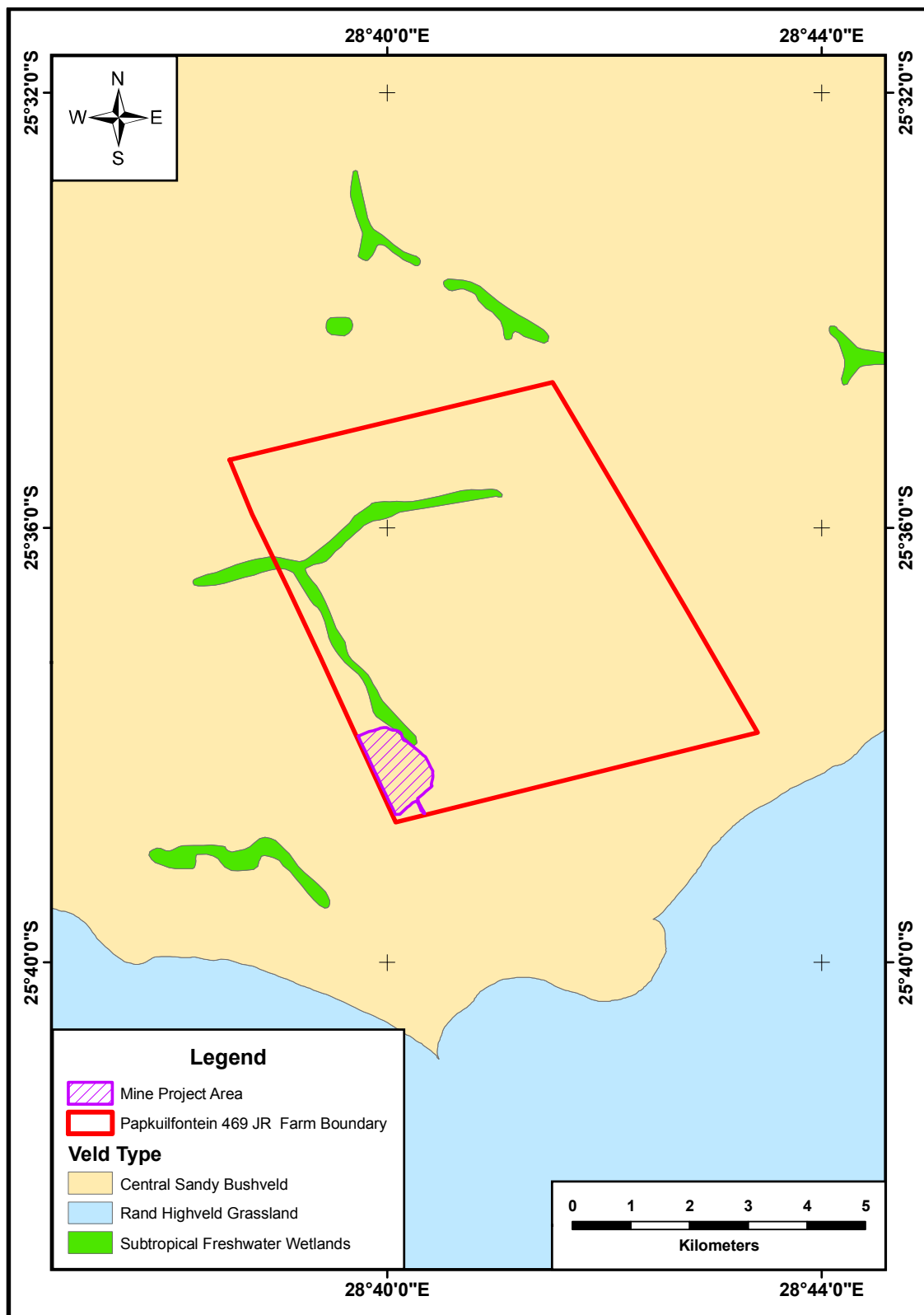


Figure 6: Map of the distribution of the vegetation veld types located within the project area and its immediate environs (after Mucina and Rutherford, 2006).

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8 OVERVIEW OF SCOPE OF THE PROJECT

The principle mineral deposit found on the site is sand and clay, which is mined using open cast methods in order to produce construction material. It is proposed that the ultimate depth of the mining area will be between approximately 5m and 10m. The current Mining Right application is for an area of approximately 1,5 ha, with an expected life of mine of 2 years.

8.1 Anticipated Effects of the Project Infrastructure on geological units

The maximum anticipated depth of the proposed mining activities is 5m - 10m. The average depth of the regolith determined by the applicant's inspection pit (data from the company's exploration data) is uniformly approximately 2,4m - 3m over the whole of the deposit area only thinning out towards the south. Accordingly, the mining operations will negatively impact upon both the regolith cover and the underlying bedrock strata of the Wilge River Formation.

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 impact is assessed as potentially **permanent to long term**. This 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.

9.4 Probability of Impact

No fossil materials are expected to occur within the rocks of the Wilge River Formation. Accordingly, the probability of the mining project negatively impacting on the palaeontological heritage of that formation is **nil**.

There is no data available pertaining to the nature of the regolith cover (i.e., whether it is composed of soils, if it is fluvial/colluvial in origin) and, thus, its fossiliferous potential cannot be ascertained. However, it is evident in Figures 4 and 5 that the area has been extensively ploughed. It must follow that should any fossil materials have been originally present within the near surface regolith it would have been destroyed, damaged or moved during the ploughing, but there may be fossil material preserved *in situ* beneath the effects of the ploughing. In general the probability of any negative impact to the palaeontological heritage of the area contained within the regolith cover posed by the development is characterised as **low** due to the general scarcity of fossils in the geological record. The north-eastern corner of the project area has been extensively disturbed by what appears to be pre-existing mining activities (Figure 7). Any fossils that may have existed in this area within the mined interval will have been destroyed.

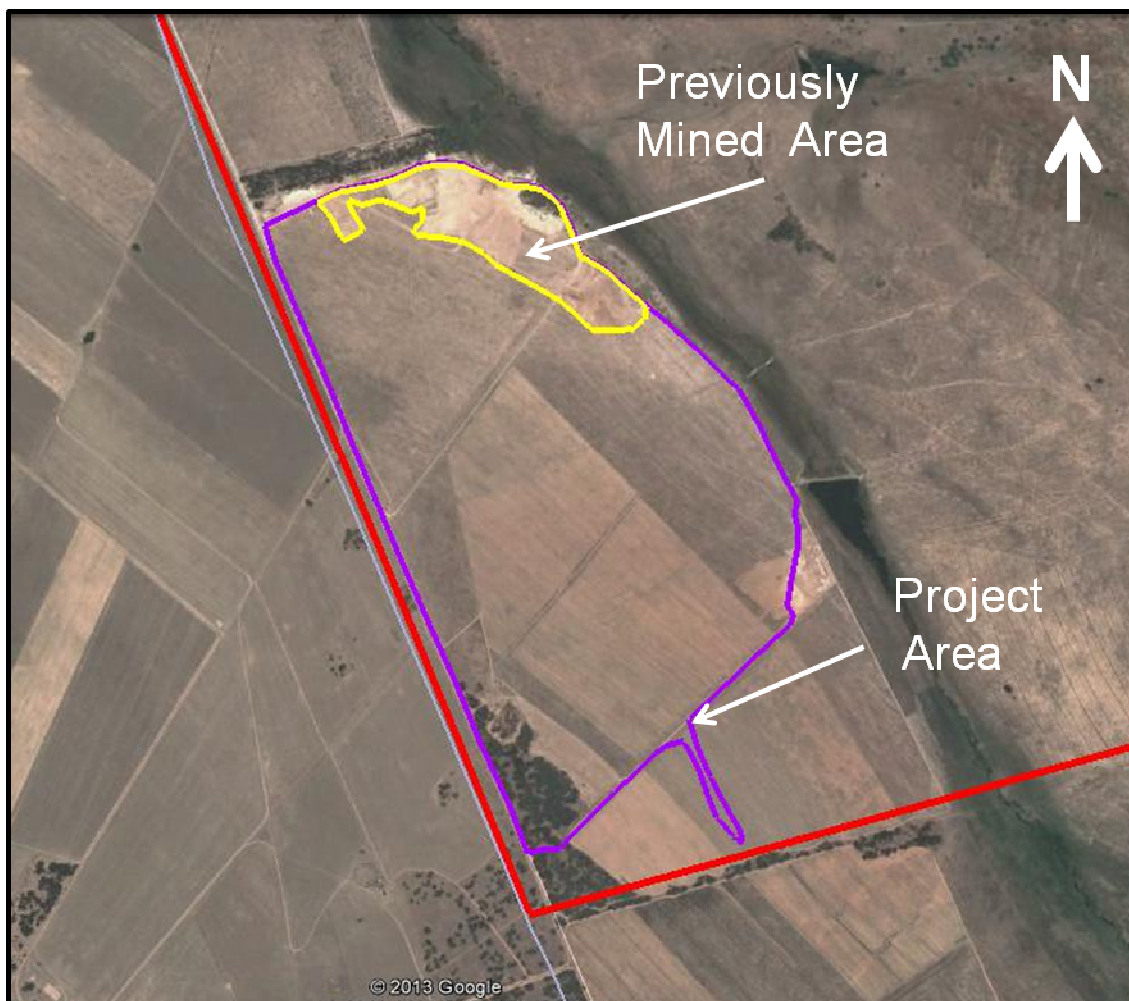


Figure 7: The location of previously mining activities within the project area as interpreted from Google Earth imagery.

9.5 Significance of Impact

No fossil materials are expected to be present within the rocks of the Wilge River Formation. Accordingly, the significance of the proposed project on the palaeontological heritage of this unit is **nil**.

The fossiliferous potential of the regolith cover cannot be determined, herein, other than to state that fossils are generally uncommon and sporadic in their occurrence in the geological record and the probability of any negative effects on the palaeontological heritage of this unit, in the absence of other evidence, would be expected to be **low**. In those areas of regolith that have been affected by ploughing or mined the expected resulting destruction, damage or movement of any shallowly occurring fossils will mean that the probability of any negative impacts resulting from the proposed project is **nil**. This said any fossils present within the regolith that have not been historically affected by agricultural cultivation are potentially of **high** scientific significance.

The scientific and cultural significance of fossil materials is underscored by the fact that many fossil 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 project infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).

The certainty of the exact *in situ* location of fossils and their precise location within the stratigraphic sequence is essential to the scientific value of fossils. The movement of any fossil material during the construction of the facility that results in the exact original location of the fossil becoming unknown will either greatly diminish or destroy the scientific value of the fossil.

9.6 Severity / Benefit Scale

The proposed mining operations will supply raw materials for the construction industry. Transport costs play a vital role in the economics of the viability of supply of construction materials. It is therefore important that these basic materials are in regular supply at affordable prices, close to the point of consumption. The proposed mine is surrounded by developing urban areas in need of building materials.

The proposed mining operation will provide direct employment for approximately 10 individuals. The majority of the workforce will be recruited from the surrounding communities. Additionally, it can be expected that secondary employment opportunities may also be generated within the local community.

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The proposed project is categorised, herein, as being potentially **beneficial**.

The possibility of any negative impact on the palaeontological heritage of the area can, however, be minimised by the implementation of adequate damage mitigation procedures. If appropriate damage mitigation is properly undertaken the benefit/severity scale for the project will lie within the beneficial category.

A potential secondary benefit of the project would be that the excavations resulting from the progress of the project may uncover fossils materials that were hidden beneath the surface exposures and, as such, would have remained unknown to science. If the planned excavations are inspected, while they are occurring, with a view to identifying any possible palaeontological materials present the possibility would be generated of being able to study and excavate fossil materials that would otherwise be hidden to scientific study.

9.7 Status

Given the combination of factors discussed above, it is anticipated that as long as adequate mitigation processes are emplaced prior to commencement of the project little to no negative effect on the palaeontological heritage of the area is anticipated. The proposed project would supply raw materials for the local construction industry as well as generate employment opportunities; 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

It is recommended that a close examination of all excavations be made during the construction phases of the project while they are occurring. Should any fossil materials be identified, the excavations should be halted and SAHRA informed of the discovery allowing the organisation to make appropriate recommendations. A significant potential benefit of the examination of the excavations associated with the construction of the project is that currently unobservable fossils may be uncovered. As long as the construction process is closely monitored it is possible that potentially significant fossil material may be discovered and be available for scientific study.

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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**.

The chances of negatively impacting on a fossil in any particular area have been assessed herein as **nil within the Wilge River Formation and generally low in the regolith cover**. However, any fossil material that may be contained within the regolith covering the project area is potentially of the **high scientific and cultural importance**. Thus, the potential always exists during construction and excavation 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 necessarily culturally or 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.

Comments contained herein regarding the fossiliferous potential of the regolith cover of the area are speculative (due to a lack of available data). However, the comments made and the resultant recommendations are designed to err on the side of caution.

12 ENVIRONMENTAL IMPACT STATEMENT

The project area is large (i.e., approximately 97 ha). However, as the potential palaeontological heritage impacts are wholly restricted to the immediate area of the mining operations and these are confined within the project the extent of any impact is characterised as **local**.

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The effects of the mining operation elements will be restricted to the Wilge River Formation and the regolith cover. The effects of the mining will be restricted to the immediate land surface and the upper 5m – 10m of the geological substrate.

The Wilge River Formation Formation is unfossiliferous; as such, the potential for any negative impact to the palaeontological heritage of the formation is categorised as **nil**. The regolith cover is present over the entire project area. The fossiliferous potential of this unit is assumed to be low due to the generally sporadic and scarce nature of fossils in the geological record in general and, accordingly the potential for any negative impacts is assessed as **low**. In areas where the regolith has been disturbed by ploughing or has been mined it is probable that any shallowly occurring fossils that may have been present have been destroyed, damaged or moved. Thus, in the ploughed and previously mined areas the probability of the proposed project resulting in any negative impacts is considered to be nil. The possibility remains for scientifically and culturally significant fossils to be present within the regolith cover and any negative impact on these would be **significant**.

Any damage that occurs to such fossil material during the excavation and construction phase of the project would be permanent and irreversible. The potential negative impact to the palaeontological heritage of the area can be minimised by the implementation of appropriate mitigation processes. Thorough examinations should be made of all excavations within the regolith cover as they are being performed. Should any fossil materials be identified the excavations should be halted and SAHRA informed of the discovery. A potential positive outcome of these mitigation protocols could be that fossil materials become available for scientific study that would otherwise have been hidden within or beneath the regolith. Should such new palaeontological material be located as a result of this site investigation this could prove to have a positive effect on the understanding of the fossil record of South Africa and positively affect the palaeontological heritage of the country.

The social benefits of the project have been classified as beneficial, herein, as the project aims to provide employment opportunities. As such **this desktop study has not identified any palaeontological reason to prejudice the progression of this project, subject to adequate mitigation programs being put in place.**

13 REFERENCES

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