

**DESKTOP PALAEOLOGICAL
HERITAGE IMPACT ASSESSMENT
REPORT ON THE SITE OF A
PROPOSED TOWNSHIP
EXPANSION, ON PORTIONS 76
REMAINDER, 77 REMAINDER AND
169 OF THE FARM ZANDFONTEIN
317 JR, NEAR PRETORIA,
GAUTENG**

5 May 2018

Prepared for:
Heritage Contracts and Archaeological
Consulting CC

On behalf of:
Exigent Engineering Consultants

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**DESKTOP PALAEONTOLOGICAL HERITAGE IMPACT ASSESSMENT REPORT ON
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Prepared for:

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On Behalf of:

Exigent Engineering Consultants

Prepared By:

Dr B.D. Millstead

Desktop Palaeontological Heritage Impact Assessment Report on the site of a proposed township expansion on portions 76 Remainder, 77 Remainder and 169 of the farm Zandfontein 317 JR, near Pretoria, Gauteng

EXECUTIVE SUMMARY

It is proposed to construct a residential township development project west of Pretoria on Portions 76 Remainder, 77 Remainder and 169 of the farm Zandfontein 317 J, Magisterial District of Pretoria, City of Tswane Local Municipality, Gauteng Province. The sizes of Portions 169, 76 Remainder and 77 Remainder are approximately 33,5 ha, 21 ha and 28,9 ha respectively. As a result, the combined area of the sites in question is approximately 83,4 ha. The project area is located approximately 10 km west of Pretoria where it is approximately 5 km north-west of Hercules, 5 km south-west of Akasia and ca. 6 km north-east of Atteridgeville. The project area lies within Gauteng Province, but is also immediately proximal to the provincial boundary with North West Province.

Exigent Engineering Consultants has appointed Heritage Contract and Archaeological Consulting CC to produce a Heritage Impact Assessment Report for the project that will form part of the Environmental Impact Assessment (EIA) for the project. Heritage Contract and Archaeological Consulting CC has contracted 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 that will be incorporated into the EIA for the project.

The precise details of either the infrastructure planned for the development nor the associated construction methods are unknown to the author at the time of compilation of this report. However, assuming a worst-case scenario it may be expected that any negative impacts associated with the development of the new infrastructure elements would be restricted to the upper few meters (1-2 m) of the land surface (due to the construction of foundations for new buildings, roads, and the digging of trenches for the emplacement of underground water/sewage and power lines). Thus, any impacts caused by the proposed project will be restricted to the surficial soil horizon and the immediately adjacent portions of the underlying rocks of the Silverton Formation and will not impact upon the more deeply underlying rocks of the Daspoort Formation. It is probable that the project area has a surface cover of regolith. Observations of the land surface elsewhere in the region by the author suggests that this regolith is most likely derived from weathering of the underlying rocks (i.e., it is soil rather or colluvium than being alluvium).

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 extent of the area of potential impact is, accordingly, categorised as local (i.e., restricted to the project site). The anticipated duration of the identified potential impact is assessed as potentially

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permanent to long term as it is anticipated that collectively the infrastructure associated with the project will be permanent features.

The effects of the implementation of the proposed project upon the geological strata underlying the project area will be restricted to the early Proterozoic rocks of the Pretoria Group, Transvaal Supergroup and any associated regolith. The Silverton Formation rocks are known to be unfossiliferous. Thus, the probability and significance of any negative impact upon the palaeontological heritage of these rocks is assessed as being nil. Similarly, the authors experience of the region containing the project area suggests that the regolith underlying the project area is probably either derived from *in situ* decomposition of the unfossiliferous Silverton Formation rocks (soil) or from erosion and down-hill transport of unfossiliferous bedrock of the prominent topographic ridge to the south (colluvium). The probability and significance of any negative impact upon the palaeontological heritage of the regolith is assessed as being nil.

This desktop study has not identified any palaeontological reason to prejudice the progression of the proposed township development project. No damage mitigation protocols need to be implemented to minimise the potential negative impact of the project.

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1 INTRODUCTION

It is proposed to construct a residential township development project west of Pretoria on Portions 76 Remainder, 77 Remainder and 169 of the farm Zandfontein 317 JR, Magisterial District of Pretoria, City of Tswane Local Municipality, Gauteng Province (Figure 1). The sizes of Portions 169, 76 Remainder and 77 Remainder are approximately 33,5 ha, 21 ha and 28,9 ha respectively. As a result, the combined area of the sites in question is approximately 83,4 ha.

The project area is located approximately 10 km west of Pretoria where it is approximately 5 km north-west of Hercules, 5 km south-west of Akasia and ca. 6 km north-east of Atteridgeville. The project area lies within Gauteng Province, but is also immediately proximal to the provincial boundary with North West Province (Figure 2).

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2 TERMS OF REFERENCE AND SCOPE OF THE STUDY

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

- 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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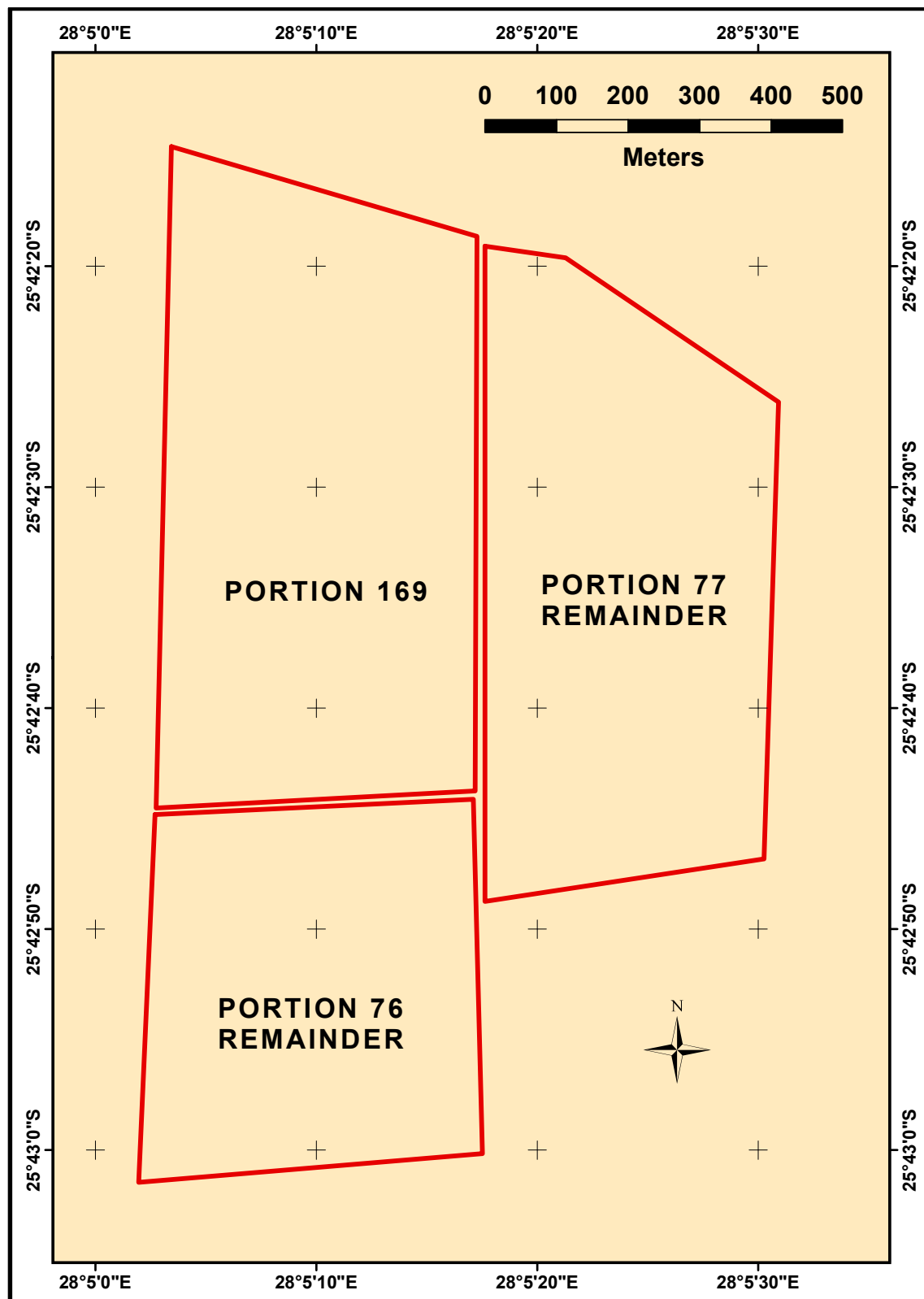


Figure 1: The location of the three farm portions, relative to each other, that constitute the project area.

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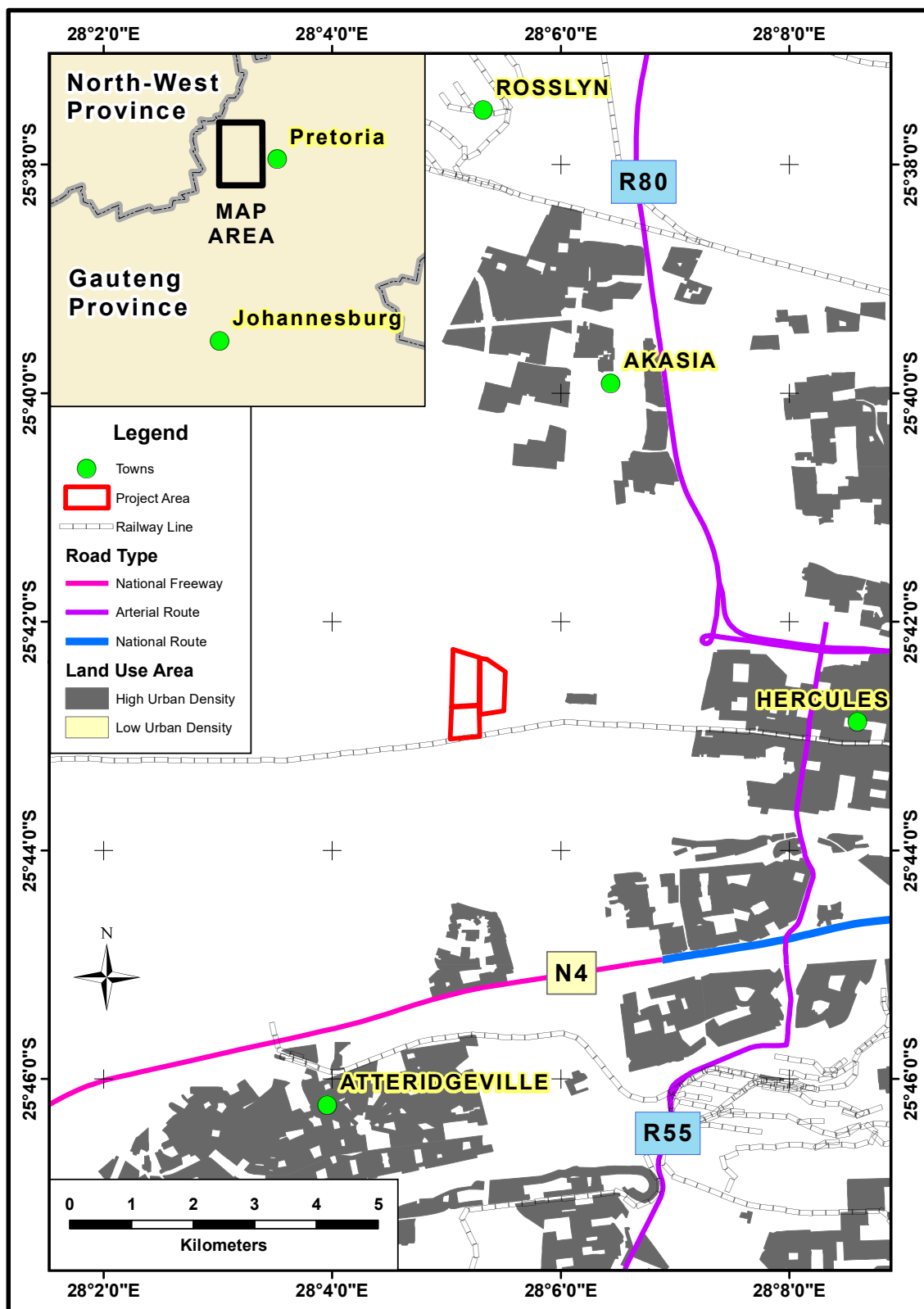


Figure 2: Location map showing the position of the proposed township development.

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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).

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.).

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,

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- 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 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.

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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 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.

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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), is a member of the Palaeontological Society of South African and is a Fellow of 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 either in the construction of the township development project nor any companies or individuals associated with the project.

5.1 GEOLOGY AND FOSSIL POTENTIAL

Figure 3 shows that the project area is completely underlain by early Proterozoic rocks of the Transvaal Supergroup. The strata immediately underlying the project area consist of the Silverton Formation. Strata occurring immediately to the south of the Silverton Formation consist of the Daspoort Formation, and this unit dips to the north beneath the Silverton Formation any will only be occurring at considerable depth. The rocks of the Magaliesberg Formation occur to the north of the Silverton Formation and also dip to the north; as such, they do not occur below the project area. A summary of the characteristics of the Silverton and Daspoort Formations and their fossiliferous potential follows.

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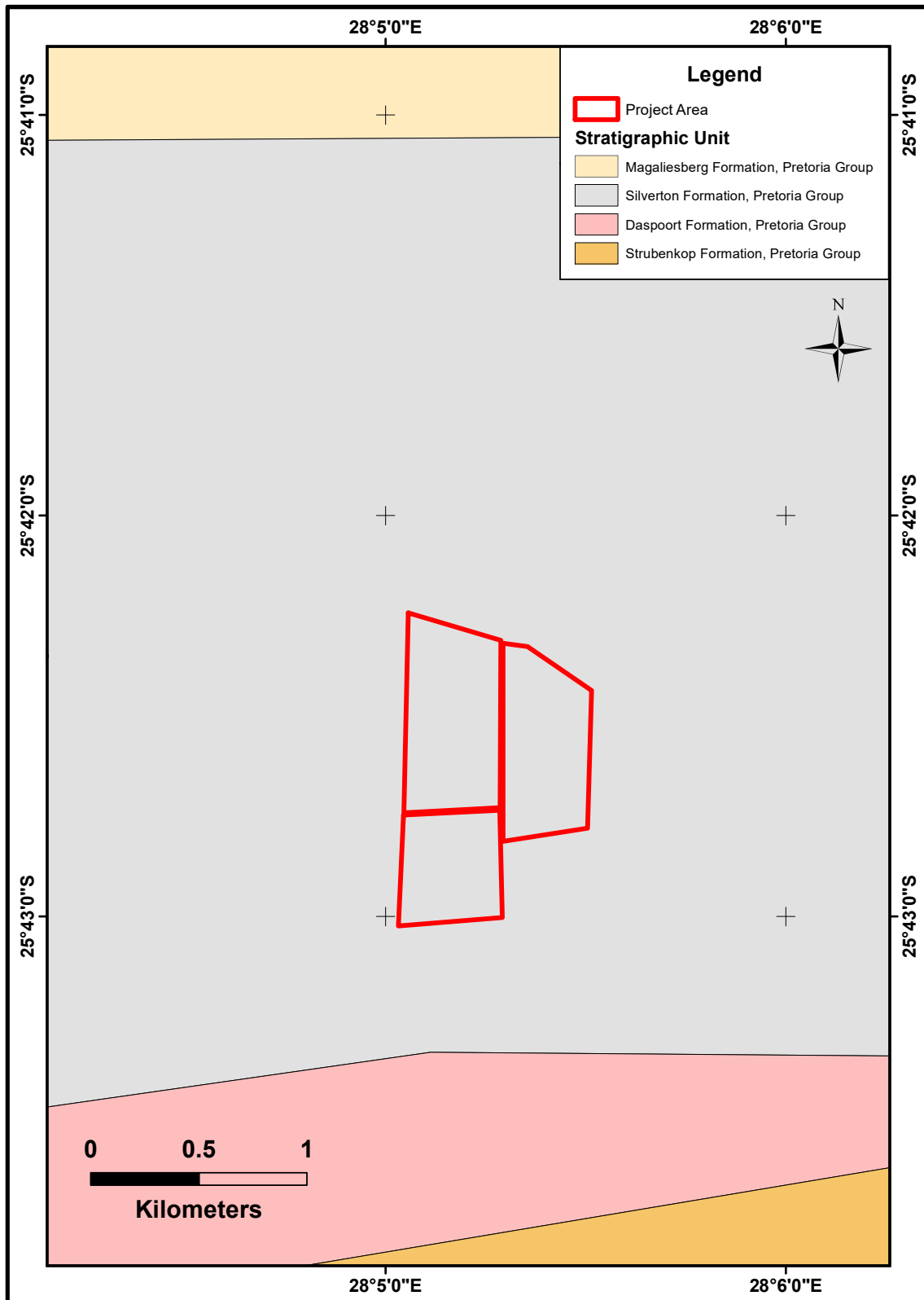


Figure 3: Geological map of the area underlying the proposed project area and its immediate environs.

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5.2 Daspoort Formation

5.2.1 Geology

The Daspoort Formation underlies the Silverton Formation and dips to the north beneath it and, as such, occur at significant depth below the project area. The unit is characterised by mature quartz arenites with subordinate mudrocks and ironstones also present in the east of the Transvaal Basin. The Daspoort Formation probably reflects the beginning of a major marine transgression onto the Kaapvaal Craton. This scenario is supported by the local occurrence of thin stromatolitic carbonates at the top of the formation Eriksson *et al.*, 2006).

5.2.2 Palaeontological potential

No fossil materials are known to occur within the terrigenous sediments of the Daspoort Formation; the thin, localised carbonate occurrences near the top of the formation are known to be stromatolitic. Accordingly, the palaeontological potential of the majority of the unit is nil. The stromatolites within the carbonates in the Transvaal Supergroup tend to be abundant where they occur and can dominate the lithology. The palaeontological potential of the carbonate facies is in the upper Daspoort Formation, accordingly, high but the chances of this facies being present beneath the pipeline are low due to their localised nature.

5.3 Silverton Formation

5.3.1.1 Geology

In the central portion of the basin (near Pretoria) the Silverton Formation consists of (listed in order from oldest to youngest) a basal Boven Shale member, an overlying Machadodorp Volcanic Member, the Lydenburg Shale Member and an uppermost thin sequence of carbonate rocks. The shales of the Silverton Formation reflect a period of higher sea levels than those which existed during the deposition of the Daspoort Formation. They were deposited during the further advance of an epi-iric sea onto the Kaapvaal Craton with the associated deepening of sea levels (Eriksson *et al.*, 2006). The upper-most portion of the Lydenburg Shale Member contains high magnesium/manganese tuffs (Reczko, 1994). The Machadodorp Volcanic Member is composed of basalts which have been interpreted as shallow marine volcanic extrusive rocks (Reczko *et al.*, 1995).

5.3.1.2 Palaeontological potential

No fossil materials are known to occur within the Silverton Formation. The palaeontological potential of the formation is accordingly assessed as being nil.

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6 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The area to be utilised for the proposed township development reported upon, herein, is approximately 83,4 ha in extent. The area lies approximately 1 km north of a prominent east-west oriented ridge (Daspoort Ridge) and ca. 2 km south of the Magaliesburg Ridge (Figure 4). The project area lies in an area of the valley lying between the two ridges known as "The Moot". The site is bordered by Hornsnek Road (M17), Van Der Hoff Street (R514) and Kenneth Street. Cornelia Street is located proximally to the western margin of the project area (Figure 5). The southern margin of the project area is parallel and extremely proximal to a railway line (Figure 2).

Lying parallel to the toe of the Daspoort Ridge and approximately 90 m south of the project area is the Swartspruit (Figure 6). A northwest-southeast oriented ephemeral tributary of the Swartspruit lies 200 m west of the project area. However, neither of these waterways nor any other significant drainage lines traverse the project area (Figure 6). Thus, no potentially fossiliferous fluvial terraces area expected to occur in the project area. It is apparent from Figure 6 that the project area itself is topographically flat and featureless, and this is also evident from examination of Google earth imagery of the area (Figure 7). There is an east-west oriented historical excavation located in the southern portion of Portion 77 REM (Figure 6). Aggregations of small buildings are present in the central portion of Portion 169 and the southern portion of Portion 66 REM (Figure 7).

The entire extent of the project area was originally underlain vegetation cover of the Moot Plain Bushveld Biome (Figure 8). Mucina and Rutherford (2006) describe the conservation status of the Moot Plain Bushveld as being vulnerable.

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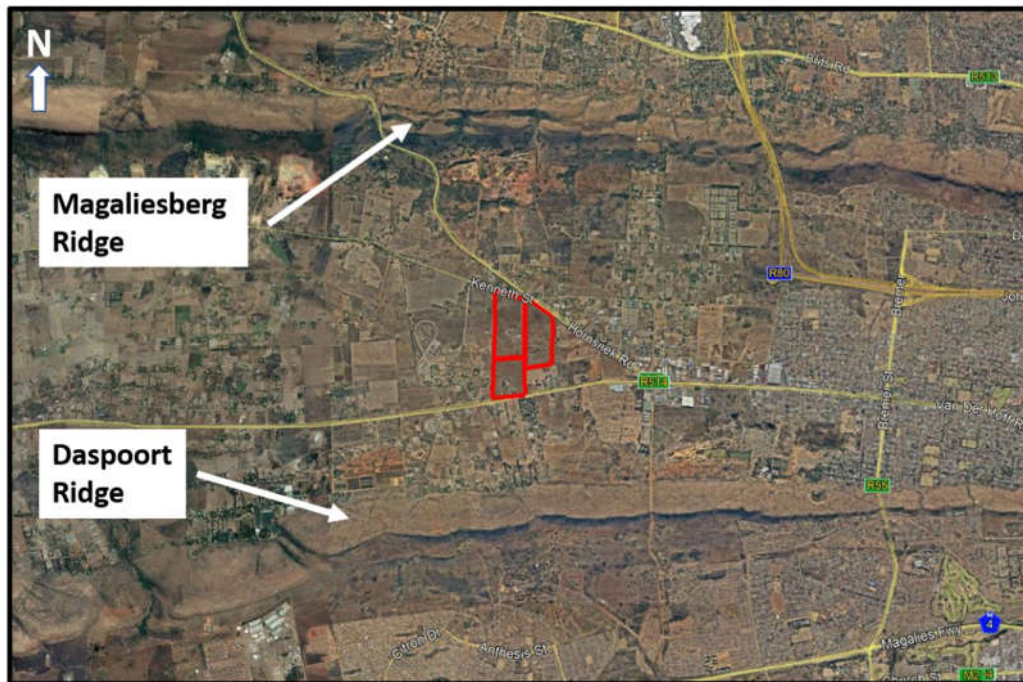


Figure 4: Google earth image of the project area (red polygons) relative to the Magaliesberg and Daspoort Ridges.

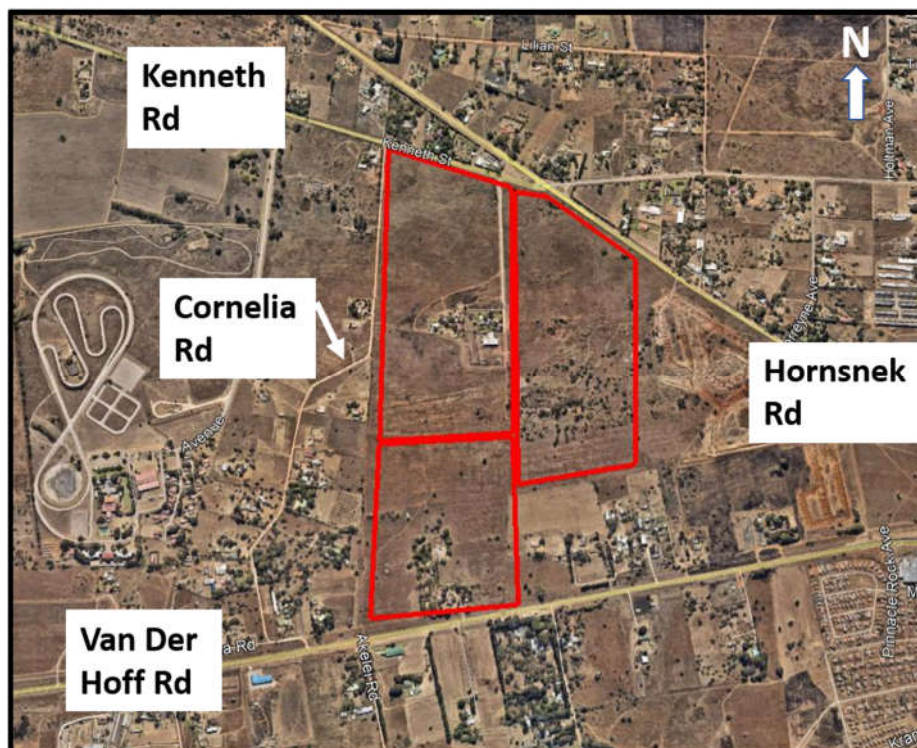


Figure 5: Google earth image showing the location of the project area (red polygons) relative to the surrounding road network.

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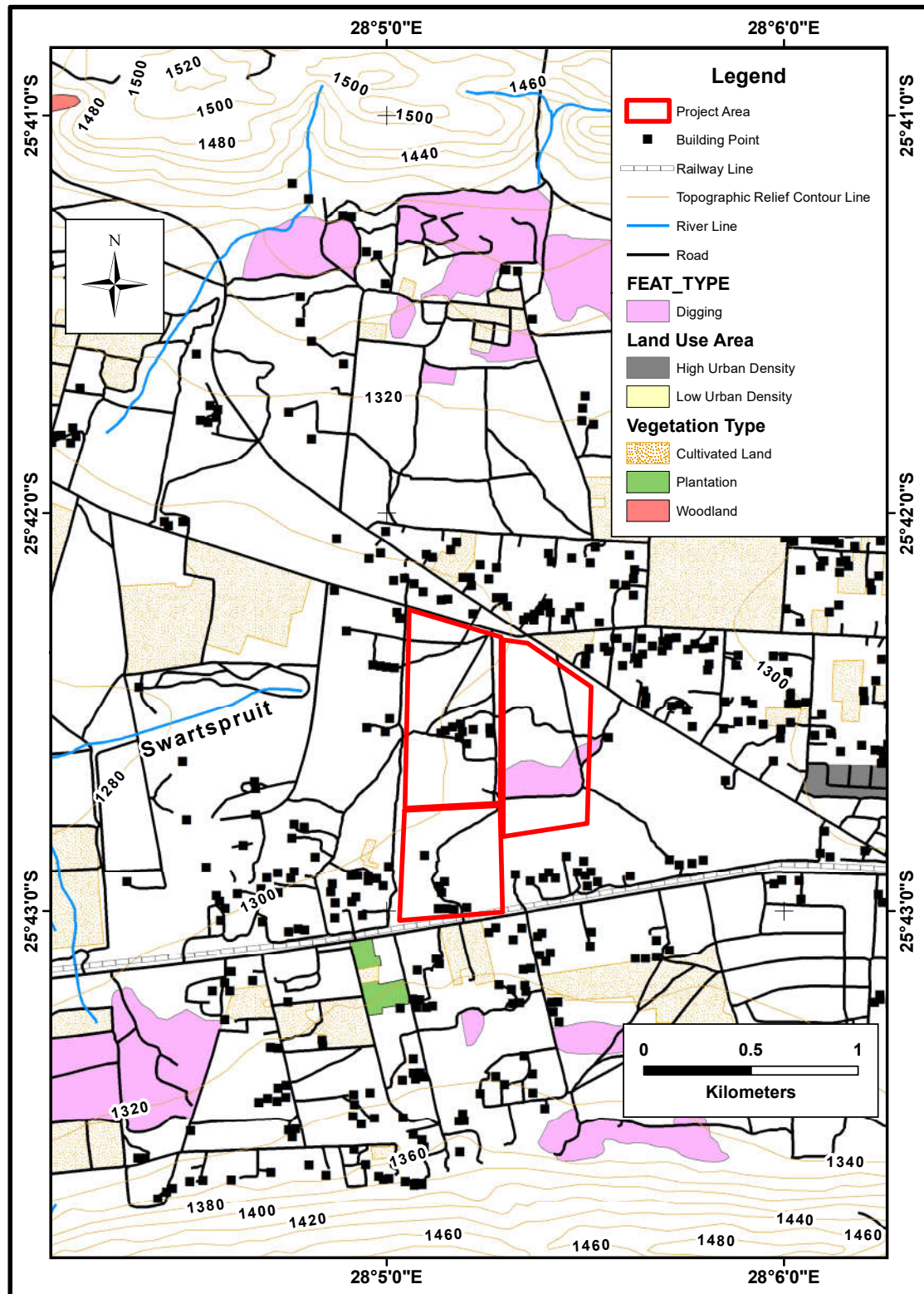


Figure 6: Map of the environment of the project area and its immediate environs. The topographic contour interval is 20 m.

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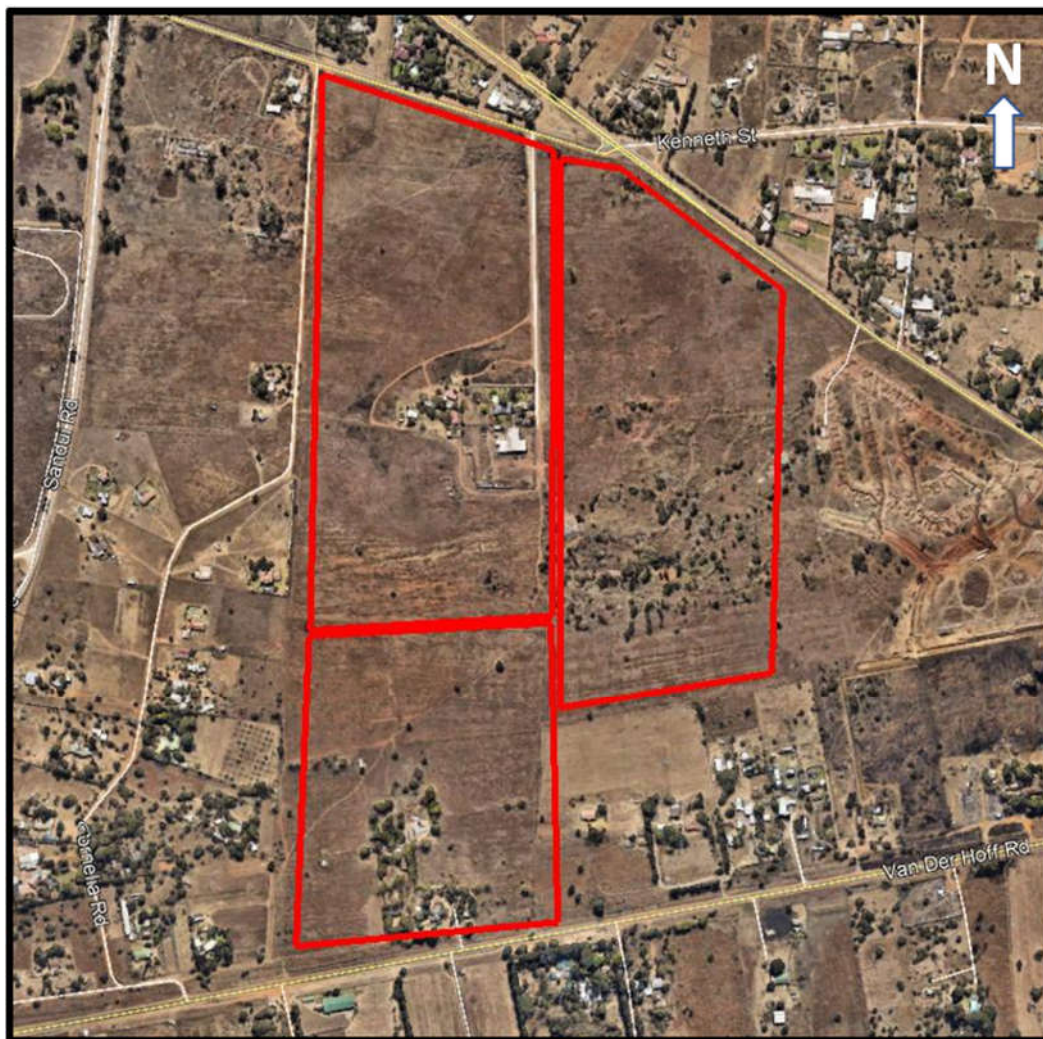


Figure 7: Google earth image of the project area (red polygons) and its immediate environs.

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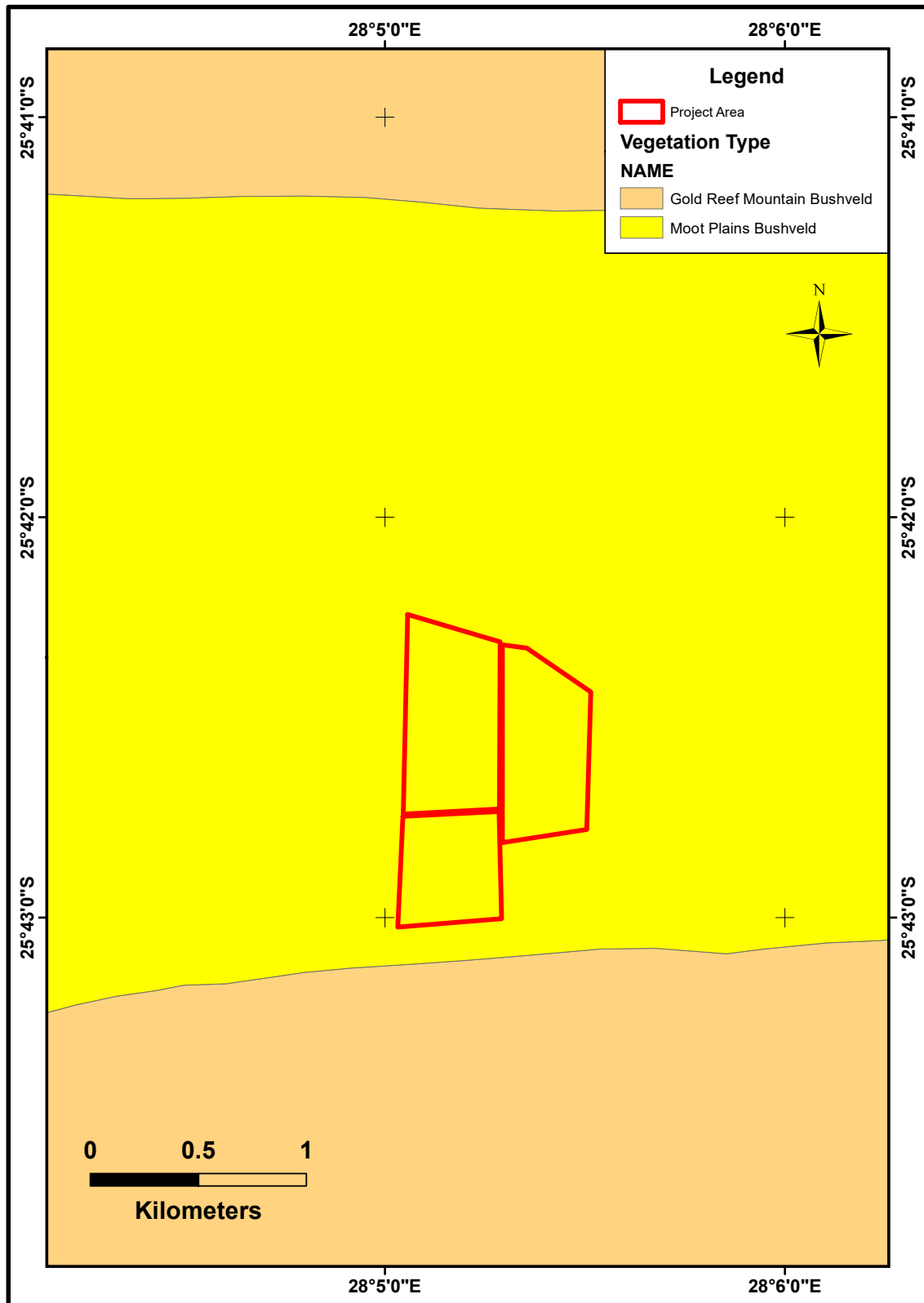


Figure 8: Map of the distribution of the vegetation veld types located beneath the project area (red polygons) and its immediate environs (after Mucina and Rutherford, 2006).

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7 OVERVIEW OF SCOPE OF THE PROJECT

The township development project will result in residential construction as well as infrastructure required for associated uses.

7.1 Effect of project on the geology

The construction methods to be employed during the construction of the various planned infrastructure elements are unknown to the author. However, assuming a worst-case scenario it may be expected that any negative impacts associated with the development of the new infrastructure elements would be restricted to the upper few meters (1-2 m) of the land surface (due to the construction of foundations for new buildings, roads, and the digging of trenches for the emplacement of underground water/sewage and power lines). Thus, any impacts caused by the proposed project will be restricted to the surficial soil horizon and the immediately adjacent portions of the underlying rocks of the Silverton Formation and will not impact upon the more deeply underlying rocks of the Daspoort Formation.

It is probable that the project area has a surface cover of regolith. Observations of the land surface elsewhere in the region by the author suggests that this regolith is most likely derived from weathering of the underlying rocks (i.e., it is soil rather or colluvium than being alluvium).

8 IMPACT ASSESSMENT

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

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8.1 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 project's 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.

8.2 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).

8.3 Duration of impact

The anticipated duration of the identified potential 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. Similarly, any fossil materials that exist below the structures and infrastructural elements that will constitute the expanded farming enterprise will be unavailable for scientific study for the

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life of the existence of those features. The life of the project infrastructure is expected to be permanent herein.

8.4 Probability of impact

The bedrock underlying the project area is entirely comprise of the Silverton Formation. The rocks of the Silverton Formation are not known to be fossil-bearing anywhere in their extent and are considered to be unfossiliferous herein. Thus, the probability of the project negatively impacting upon the palaeontological heritage of strata occurring in the uppermost portions of the Silverton Formation is characterised as **nil**.

Regolith forming the land surface within the project area is probably derived from *in situ* weathering of the underlying unfossiliferous bedrock (i.e., it is soil) or it is colluvium (formed by erosion and subsequent downhill movement of unfossiliferous rock material eroded from adjacent elevated ground). Any colluvium would, therefore also be unfossiliferous and the probability of the project negatively impacting upon the palaeontological heritage of the regolith is characterised as **nil**.

8.5 Significance of the impact

Both the bedrock and regolith underlying the project area are considered to be unfossiliferous. Accordingly, any negative impacts upon the geology underlying the majority of the proposed project will have **nil significance** on the palaeontological heritage of the area.

The scientific and cultural significance of fossil materials is underscored by the fact that 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 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.

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9 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.

9.1 Mitigation

No damage mitigation protocols are required to preserve the palaeontological heritage of this area and none are suggested herein.

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9.2 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**. However, no negative impacts upon the palaeontological heritage of the project area are anticipated.

9.3 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 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.

10 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.

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11 ENVIRONMENTAL IMPACT STATEMENT

A Desktop Palaeontological Impact Assessment Study has been conducted on the site of a proposed residential township development project west of Pretoria upon Portions 76 Remainder, 77 Remainder and 169 of the farm Zandfontein 317 JR, Magisterial District of Pretoria, City of Tswane Local Municipality, Gauteng Province. The sizes of Portions 169, 76 Remainder and 77 Remainder are approximately 33,5 ha, 21 ha and 28,9 ha respectively. As a result, the combined area of the sites in question is approximately 83,4 ha. The project area is located approximately 10 km west of Pretoria where it is approximately 5 km north-west of Hercules, 5 km south-west of Akasia and ca. 6 km north-east of Atteridgeville. The project area lies within Gauteng Province, but is also immediately proximal to the provincial boundary with North West Province.

The precise details of either the infrastructure planned for the development nor the associated construction methods are unknown to the author at the time of compilation of this report. However, assuming a worst-case scenario it may be expected that any negative impacts associated with the development of the new infrastructure elements would be restricted to the upper few meters (1-2 m) of the land surface (due to the construction of foundations for new buildings, roads, and the digging of trenches for the emplacement of underground water/sewage and power lines). Thus, any impacts caused by the proposed project will be restricted to the surficial soil horizon and the immediately adjacent portions of the underlying rocks of the Silverton Formation and will not impact upon the more deeply underlying rocks of the Daspoort Formation. It is probable that the project area has a surface cover of regolith. Observations of the land surface elsewhere in the region by the author suggests that this regolith is most likely derived from weathering of the underlying rocks (i.e., it is soil rather or colluvium than being alluvium).

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 extent of the area of potential impact is, accordingly, categorised as local (i.e., restricted to the project site). The anticipated duration of the identified potential impact is assessed as potentially permanent to long term as it is anticipated that collectively the infrastructure associated with the project will be permanent features.

The effects of the implementation of the proposed project upon the geological strata underlying the project area will be restricted to the early Proterozoic rocks of the Pretoria Group, Transvaal Supergroup and any associated regolith. The Silverton Formation rocks are known to be unfossiliferous. Thus, overwhelmingly the probability and significance of any negative impact upon the palaeontological heritage of these rocks is assessed as being

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nil. Similarly, the authors experience of the region containing the project area suggests that the regolith underlying the project area is probably either derived from *in situ* decomposition of the unfossiliferous Silverton Formation rocks (soil) or from erosion and down-hill transport of unfossiliferous bedrock of the prominent topographic ridge to the south (colluvium). The probability and significance of any negative impact upon the palaeontological heritage of the regolith is assessed as being nil.

This desktop study has not identified any palaeontological reason to prejudice the progression of the proposed township development project. No damage mitigation protocols need to be implemented to minimise the potential negative impact of the project.

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