



**DESKTOP PALAEOLOGICAL
HERITAGE IMPACT ASSESSEMENT
REPORT ON THE SITE OF A
PROPOSED PIPELINE TO BE
LOCATED TO THE IMMEDIATE
EAST OF MOKOPANE, ON
PORTIONS 24, 80 (REMAINDER)
AND 140 OF THE FARM PIET
POTGIETERSRUST TOWN AND
TOWNLANDS 44 KS, LIMPOPO
PROVINCE**

19 October 2014

Prepared for:
Heritage Contracts and Archaeological
Consulting CC

On behalf of:
Mogalakwena Local Municipality

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

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

**DESKTOP PALAEOLOGICAL HERITAGE IMPACT ASSESSEMENT REPORT ON
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Prepared for:

Heritage Contract and Archaeological Consulting CC

On Behalf of:

Mogalakwena Local Municipality

Prepared By:

Prof B.D. Millstead

Desktop Palaeontological Impact Assessment Report –On the site of a proposed water supply pipeline to be located immediately to the east of Mokopane on Portions 24, 80 (Remainder) and 140 of the Farm Piet Potgietersrust Town and Townlands 44 KS, Limpopo Province.

EXECUTIVE SUMMARY

The Mogalakwena Local Municipality proposes to construct a water supply pipeline linking existing pipelines at the Percy Fyfe Y-junction and the Mokopane High reservoir. The pipeline is proposed to be located immediately proximal to the eastern margin of the town of Mokopane in the Mogalakwena Local Municipality area, Waterberg District, Limpopo Province. The proposed route will run through the following properties: Portions 24, 80 (Remainder) and 140 of the Farm Piet Potgietersrust Town and Townlands 44 KS. The pipeline will be approximately 3.5 km in length. The width of the area underlying the pipeline is unknown, but is unlikely to be greater than 10 m wide (including any associated servitude road). However, any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of the required infrastructure and the extent of any impacts is accordingly characterised as being local.

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 for the project.

The effects of the required construction operations to the geological strata underlying the project area will be restricted to the late Achaean to early Proterozoic rocks of the Pretoria Group, Transvaal Supergroup. The Pretoria Group rocks are known to be almost completely unfossiliferous. Thus the probability and significance of any negative impact upon the palaeontological heritage of the area is assessed as being nil over the vast majority of the project area. Within a narrow stratigraphic band near the top of the Daspoort Formation (near its boundary with the Silverton Formation) discontinuous, localised richly stromatolitic carbonate beds are known to occur. However, the length and depth of any excavations that may intersect these carbonates will not be significant and, as such, only a small proportion of the rocks would be negatively affected (if at all). Similarly, the stromatolites within the Transvaal Supergroup are not diverse and tend to be similar throughout the units in which they occur. Any destruction of a small area these fossils would not unduly diminish the palaeontological heritage of the unit. The probability and significance of any negative impact occurring in the upper portions of the Daspoort Formation is assessed as being low.

The social benefits of the project have been classified as beneficial, herein, as the project aims to facilitate the provision of water to the community of Mokopane. **This desktop study has not identified any palaeontological reason to prejudice the progression of the water supply pipeline project. No damage mitigation protocols need to be implemented to minimise the potential negative impact of the project.**

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1 INTRODUCTION

The Mogalakwena Local Municipality proposes to construct a water supply pipeline linking existing pipelines at the Percy Fyfe Y-junction and the Mokopane High reservoir. The pipeline is proposed to be located immediately proximal to the eastern margin of the town of Mokopane in the Mogalakwena Local Municipality area, Waterberg District, Limpopo Province (Figure 1). The proposed route will run through the following properties: Portions 24, 80 (Remainder) and 140 of the Farm Piet Potgietersrust Town and Townlands 44 KS. The pipeline will be approximately 3.5 km in length.

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 for the project.

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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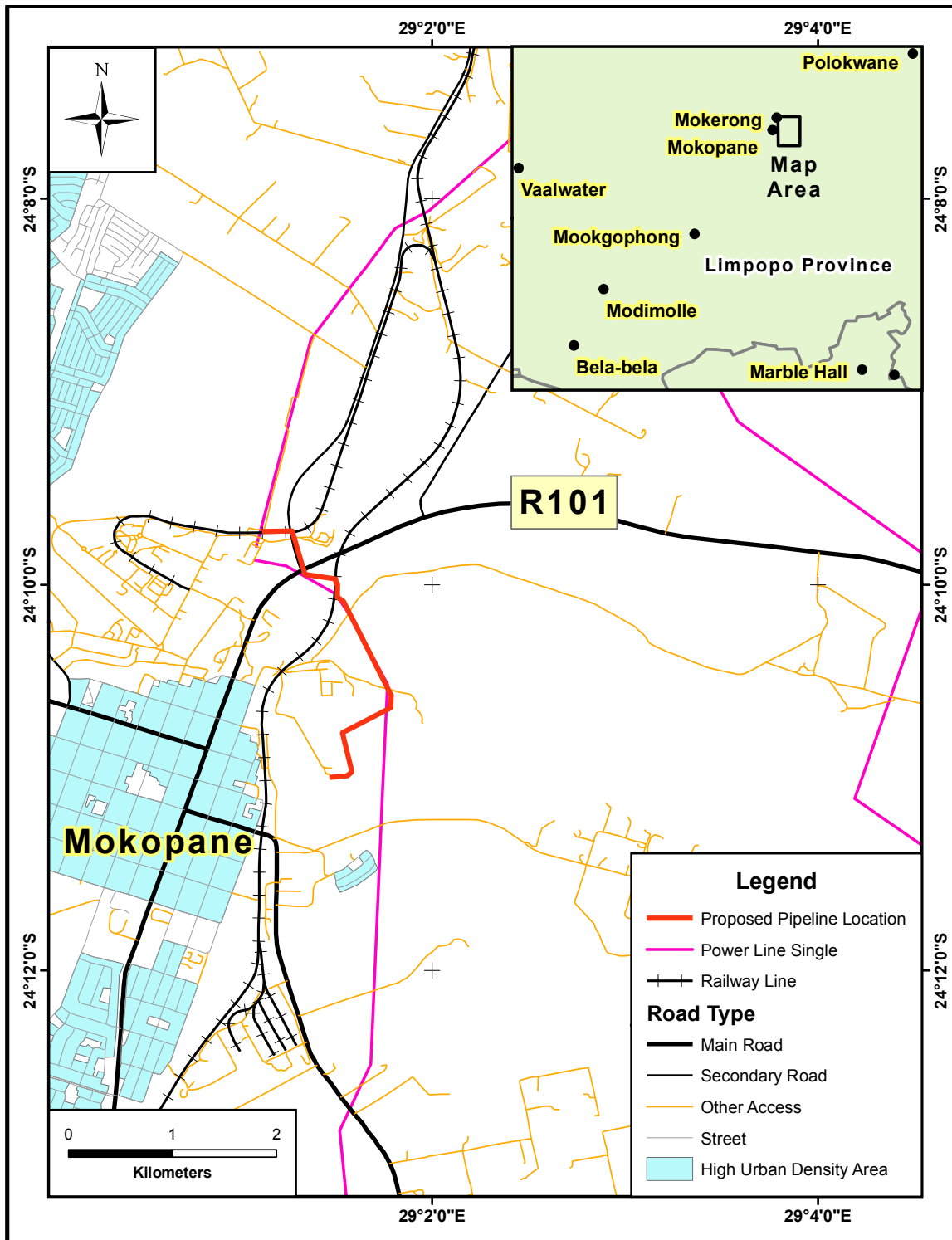


Figure 1: Location map showing the position of the proposed water supply pipeline.

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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,
- The construction of a bridge or similar structure exceeding 50 m in length,

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- 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

Prof 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. Prof 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

Prof 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 Prof Millstead nor BM Geological Services has any financial interest either in the construction of the water supply pipeline nor any companies or individuals associated with the project.

6 GEOLOGY AND FOSSIL POTENTIAL

Figure 2 shows that the project area is completely underlain by rocks of the late Achaean to early Proterozoic rocks of the Transvaal Supergroup. The strata present beneath the path of the proposed pipeline belong to the Silverton and Daspoort Formations (both part of the Pretoria Group) as well as undifferentiated strata also belonging to the Pretoria Group which are older than the Daspoort Formation, but younger than the Duitschland Formation (which crops out to the immediate east). A summary of the characteristics of the Vryheid Formation and its fossiliferous potential follows.

6.1 Pretoria Group

The Pretoria Group consists of an approximately 6-7 km thick succession comprised mainly of mudrocks alternating with quartzitic sandstones, significant interbedded basaltic–andesitic lavas and subordinate conglomerates, diamictites, and carbonate rocks (Eriksson *et al.*, 2006).

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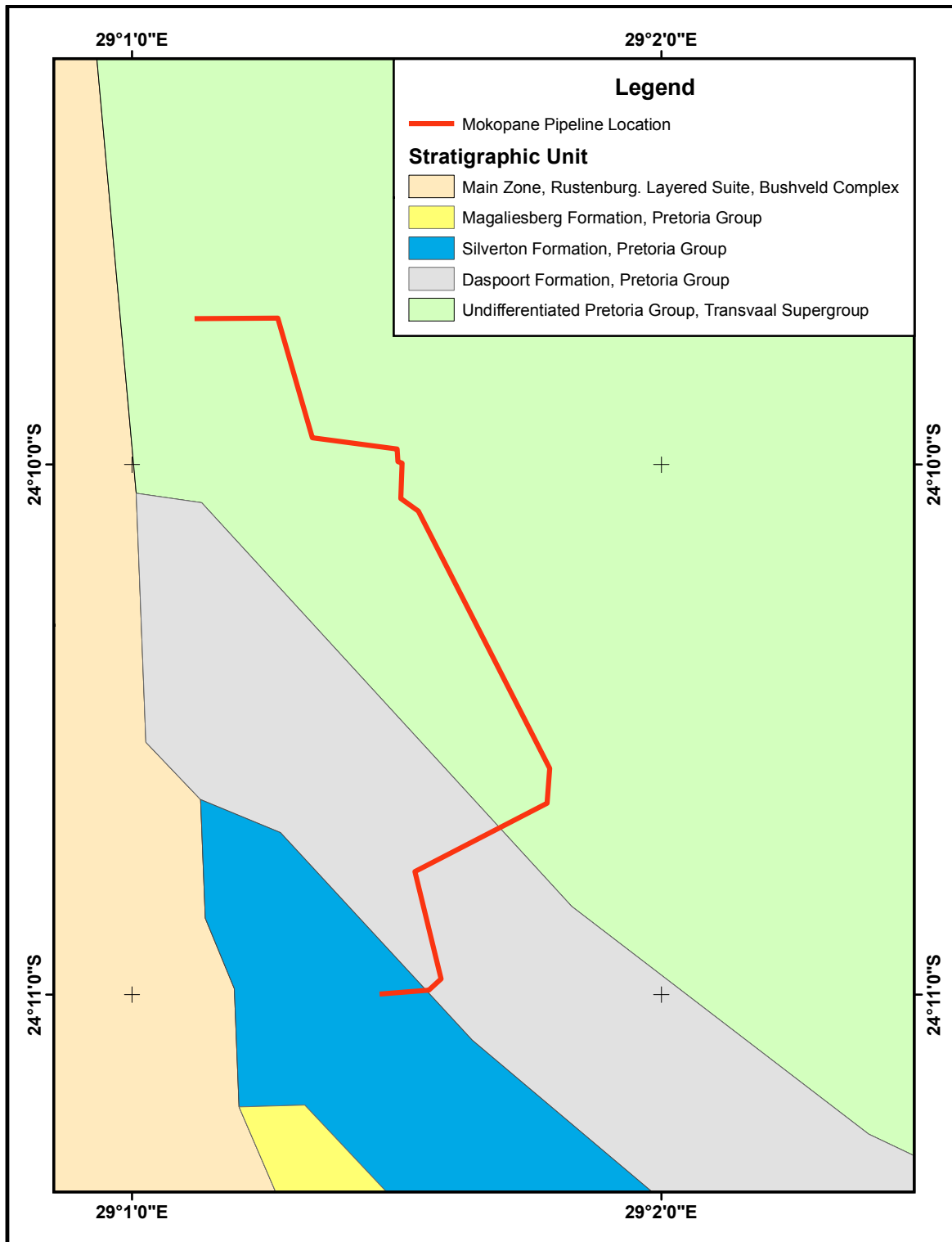


Figure 2: Geological map of the area underlying the path of the proposed water supply pipeline and its immediate environs.

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6.2 Undifferentiated Pretoria Group

6.2.1 Geology

The identity and lithology of the rocks present within this geological succession is not known in detail. However, the strata occur between the underlying carbonates of the Duitschland Formation (which crops out to the immediate east) and the overlying sandstones of the Daspoort Formation. Accordingly, the lithological sequence may well possibly contain any of the rocks of the Rooihogte, Timeball Hill, Boshhoek, Hekpoort, Dwaalheuwel and Strubenkop Formations. Thus, the sequence may consist of any of an alternating sequence of sandstones and mudstones save for the additional possibility of andesites of the Hekpoort Formation.

6.2.2 Palaeontological potential

No palaeontological materials are known to occur in any of the possible strata that may constitute this geological sequence anywhere within their aerial extent. Accordingly, the palaeontological potential of this lithological sequence is assessed as being nil.

6.3 Daspoort Formation

6.3.1 Geology

The Daspoort Formation overlies the Strubenkop Formation unconformably. 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).

6.3.2 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.

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6.4 Silverton Formation

6.4.1.1 Geology

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 epiroc sea onto the Kaapvaal Craton with the associated deepening of sea levels (Eriksson *et al.*, 2006).

6.4.1.2 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.

7 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The area reported upon herein which will underlie the proposed water pipeline is approximately 3.5 km in length. The width of the area to be affected by the pipeline project is unknown to the author, but is assumed herein to be less than 10 m (including any associated servitude road).

Examination of Google earth imagery (Figure 3) and of Figure 4 indicates that the proposed location of the water supply pipeline is located immediately adjacent to the eastern border of the town of Mokopane. The southern end of the pipeline commences on the top of a small hill and extends to the north. It crosses a small spruit and the Dorps River, then what traverses what appears to be a small dirt road and then the R101 road. Located to the immediate east of the path of the proposed pipeline is a prominent ridge.

The majority of the area underlying the path of the pipeline and its surrounding environs appear to be heavily vegetated with native vegetation. The vegetation cover of the northern portion of the project area consists of Polokwane Plateau Bushveld in its southern extent and Makhado Sweet Bushveld in the northern portion (Figure 5). Mucina and Rutherford (2006) describe the conservation status of the Makhado Sweet Bushveld as being vulnerable while that of the Polokwane Plateau Bushveld is described as possibly becoming vulnerable despite it being currently regarded as least threatened.

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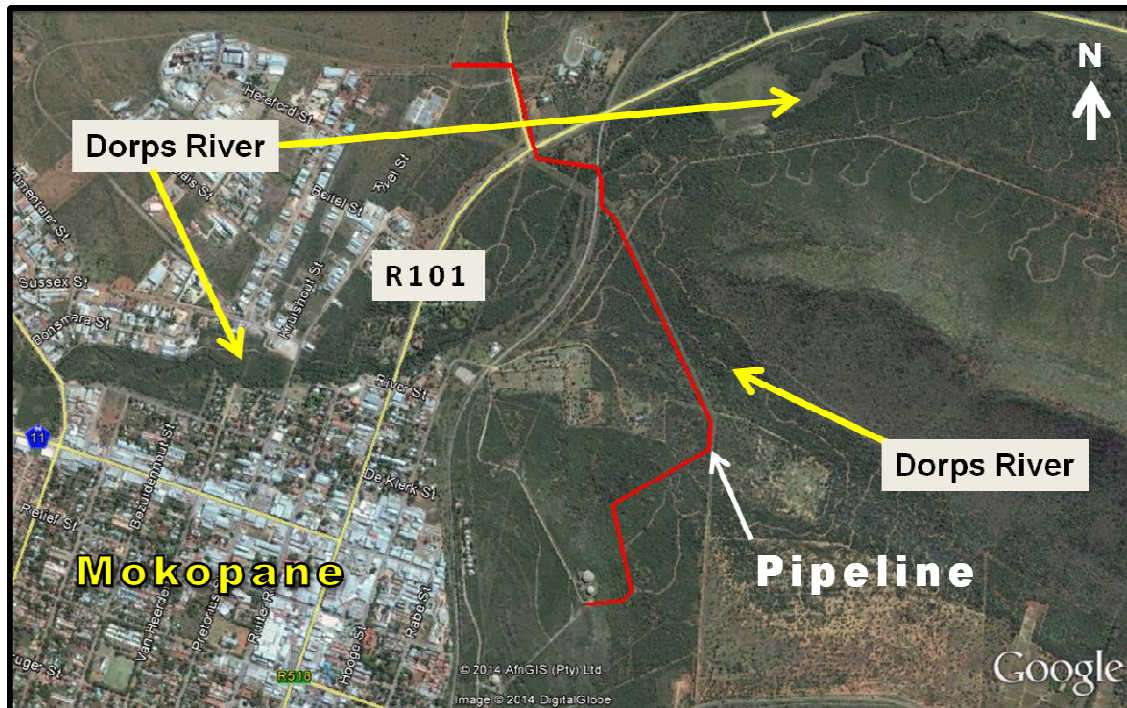


Figure 3: Google earth image of the site of the proposed water supply (red line). Shown also is the R101 and the Dorps River.

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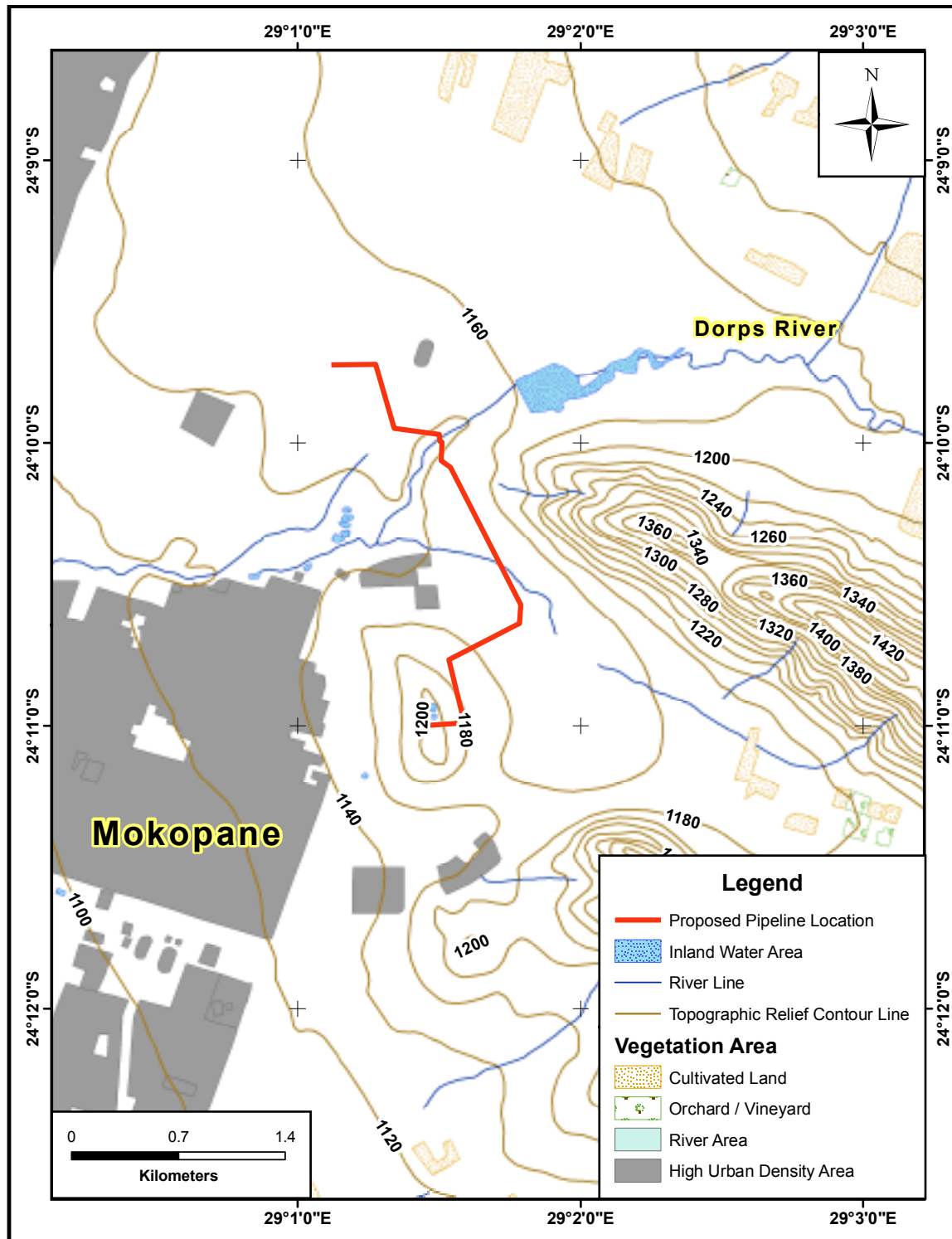


Figure 4: Map of the project area and its immediate environs. The pipeline crosses the Dorps River, a small spruit that drains into the Dorps River and the R101 road. The topographic contour interval is 20 m.

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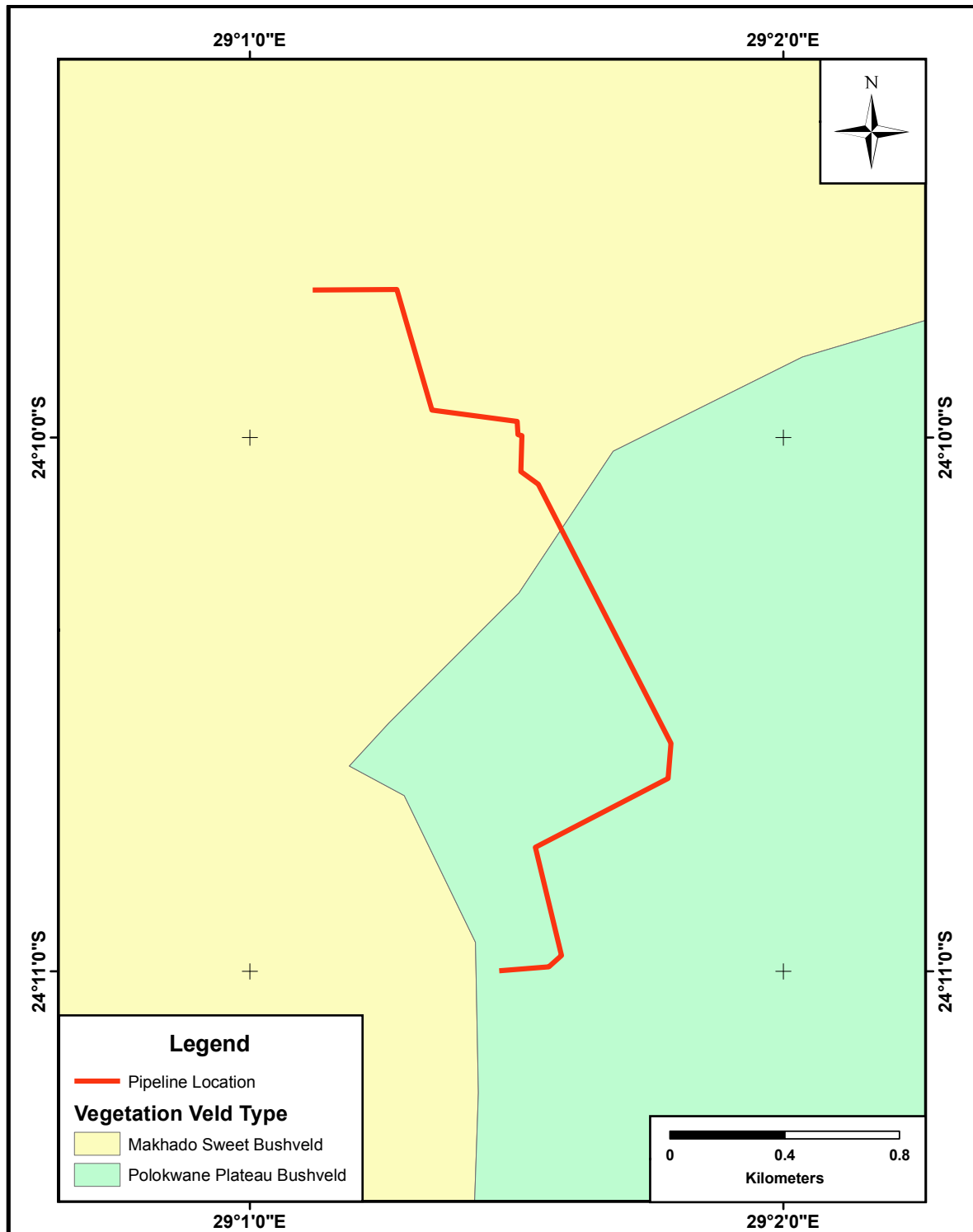


Figure 5: Map of the distribution of the vegetation veld types located beneath the project area and within its immediate environs (after Mucina and Rutherford, 2006).

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8 OVERVIEW OF SCOPE OF THE PROJECT

The development footprint of the proposed pipeline will be approximately 3.5 km long. The width of the area to be affected by the development is unknown to the author but is assumed, herein, to be less than 10 m (including any associated servitude road).

8.1 Effect of project on the geology

The construction methods to be employed during the construction of the pipeline are unknown to the author. However, assuming a worst case scenario in which the pipeline is buried in a trench rather than being sited upon pylons it may be expected that any negative impacts associated with the trench would be restricted to the upper few meters of the land surface and result from the excavation of the trench. Any negative impacts associated with the development of associated servitude roads (assumed herein to be twin spoor dirt roads) would be restricted to the immediate earth's surface.

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 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.

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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 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 water pipeline and its associated servitude road will be unavailable for scientific study for the life of the existence of those features. The life of the facility is expected to be permanent herein.

9.4 Probability of impact

There are uncommon, localised occurrences of stromatolitic carbonate that are known to occur near the upper boundary of the Daspoort Formation. It is evident from Figure 2 that the only place where these carbonate rocks may occur within the path of the project is in a small portion of the southern-most third of the pipeline route (within the outcrop of the Daspoort Formation, near to the outcrop of the overlying Silverton Formation). It is possible that these stromatolitic carbonates may be present within the area. These carbonates are sporadic and localised in occurrence and the area underlying the proposed pipeline that may be underlain by such carbonates is not aerially extensive. As the pipeline will traverse the unit approximately perpendicular to strike and as the width of the pipeline's impact will be narrow (<10 m) it would be expected that a minimal proportion of the carbonate lithology will be impacted. Similarly, the depth of any impact upon the geological units upon the geology will be relatively shallow (less than a few meters at worst case) should trenches be excavated to bury the pipeline. Thus, the probability of the project negatively impacting upon the palaeontological heritage of strata occurring in the uppermost portions of the Daspoort Formation is characterised as **low**. The sediments of the remainder (i.e., the overwhelmingly dominant percentage) of the Pretoria Group are dominantly composed of unfossiliferous sandstones and

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mudstones. The probability of a negative impact throughout the majority of the group is accordingly assessed as being **nil**.

9.5 Significance of the impact

The majority of the strata underlying the path of the proposed pipeline are considered to be unfossiliferous. Accordingly, any negative impacts upon the geology underlying the majority of the proposed pipeline project will have **nil significance** on the palaeontological heritage of the area.

Where stromatolitic carbonates occur elsewhere in the Transvaal Supergroup they are richly stromatolitic throughout their extent. Despite the abundance of these stromatolites within the associated carbonate lithologies the pipeline will traverse the underlying geological units in the south of the project area approximately perpendicular to their strike. As the width of the pipelines impact will be narrow (<10 m) it would be expected that a minimal proportion of the carbonate lithology will be impacted by any excavations. Similarly, the depth of any impact upon the geological units will be shallow (less than a few at worst case) should trenches be excavated to bury the pipeline. Thus, only a relatively small volume of the fossiliferous rock would be impacted. A further mitigating factor is that the stromatolite assemblages tend not to be diverse and tend to be reasonably uniform over large areas. As such, it could be expected that any negative impacts on the palaeontological heritage of the carbonates would be of **low significance**.

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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9.6 Severity / Benefit scale

The proposed project is categorised, herein, as being potentially **beneficial**. This classification is based on the intention that the project will facilitate the local municipality to provide water to the community of Mokopane.

The probability of a negative impact on the palaeontological heritage of the project areas has been categorised as nil over the majority of the area; as such the significance of any impact would also be nil. In the small area of the Daspoort Formation near its boundary with the Silverton Formation the probability of any negative impact has been assessed as low and that any potential negative impacts will have low significance. It is suggested that the benefits to the local community will significantly outweigh the chance and significance of any negative impacts.

9.7 Status

The proposed project would provide water to the community of Mokopane. As such, 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

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

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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**.

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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.

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 Palaeontological Impact Assessment Study has been conducted on the site of a proposed water supply pipeline proposed to be constructed immediately proximal to the eastern margins of the town of Mokopane. The proposed project area is moderately large extending for a length of approximately 3.5 km. The width of the area underlying the pipeline is unknown, but is unlikely to be greater than 10 m wide (including any associated servitude road). However, any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of the required infrastructure and the extent of any impacts is accordingly characterised as being local.

The effects of the required construction operations to the geological strata underlying the project area will be restricted to the late Achaean to early Proterozoic rocks of the Pretoria Group, Transvaal Supergroup. The Pretoria Group rocks are known to be almost completely unfossiliferous. Thus overwhelmingly the probability and significance of any negative impact upon the palaeontological heritage of the area is assessed as being nil. Within a narrow stratigraphic band near the top of the Daspoort Formation (near its boundary with the Silverton Formation) may occur discontinuous, localised richly stromatolitic carbonate beds. However, the length and depth of any excavations that may intersect these carbonates will not be significant and, as such, only a small proportion of the rocks would be negatively affected (if at all). Similarly, the stromatolites within the Transvaal Supergroup are not diverse and tend to be similar throughout the units in which they occur. Any destruction of a small area these fossils would not unduly diminish the palaeontological heritage of the unit. The probability and

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significance of any negative impact occurring in the upper portions of the Daspoort Formation is assessed as being low.

The social benefits of the project have been classified as beneficial, herein, as the project aims to facilitate the provision of water to the community of Mokopane. **This desktop study has not identified any palaeontological reason to prejudice the progression of the water supply pipeline project. No damage mitigation protocols need to be implemented to minimise the potential negative impact of the 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.

Eriksson, P.G., Altermann, W. and Hartzler, F.J., (2006). *The Transvaal Supergroup and its precursors*. in Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J. (eds) *The Geology of South Africa*, Johannesburg: Council for Geoscience, Pretoria: Geological Society of South Africa: 237–260.

Prof B.D. Millstead

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