

**PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR SURFACE AND
INFRASTRUCTURE LAYOUT CHANGES (EMP AMENDMENT PROCESS) FOR THE
TSHIPI BORWAMINE NEAR HOTAZEL, IN THE JOHN TOALO GAETSEWE
DISTRICT MUNICIPALITY IN THE NORTHERN CAPE PROVINCE.**

Prepared for:

PGS Heritage (Pty) Ltd

30 June 2017

Prepared by

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EXECUTIVE SUMMARY

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa Mine located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Tshipi is currently in the process of amending its approved Environmental Impact Assessment (EIA) and Environmental Management Programme Report (EMPr) to cater for changes to its approved infrastructure layout. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the development footprint and to assess the impact of the construction and operation of the mine on the palaeontological resources.

The site is completely underlain by the Late Caenozoic Kalahari Formation (Cretaceous to Tertiary). No literature record could be found of fossils from the Kalahari Formation close to Hotazel. Palaeontological evidence is restricted to a few pseudo-bone structures that are preserved in the limestone (Kudumane EIA 2010). No proof of any fossil material was collected from the rest of the Kalahari Formation.

The development is thus unlikely to pose a substantial threat to local fossil heritage. In Palaeontological terms the significance is rated as low to very low negative. Consequently, pending the discovery of significant new fossil material here, **no further specialist studies** are considered to be necessary.

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

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

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1 INTRODUCTION

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa Mine located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Tshipi currently holds a mining right (NC/30/5/1/2/2/0206MR) issued by the Department of Minerals and Energy (known as the Department of Mineral Resources), as well as an approved Environmental Management Programme (EMP), and an environmental authorisation (EA) (NC/KGA/KATHU/37/2008) issued by the Department of Tourism, Environment and Conservation (currently known as the Department of Environment and Nature Conservation).

Tshipi is currently in the process of amending its approved Environmental Impact Assessment (EIA) and Environmental Management Programme Report (EMPr) to cater for changes to its approved infrastructure layout. In broad terms, this includes the following:

Changes to Tshipi's approved layout include:

- an increase in the number, position, volume and layout of waste rock dumps;
- a change to the design, capacity and position of the sewage treatment plant;
- a change to the stormwater management system, position including additional storage;
- a change to the potable water storage facilities capacity and position;
- a change to the position of the office, plant, workshop and related infrastructure;
- a change to the number, position, volume and layout (footprint) of the ore stockpiles;
- a change to the design of the railway line and an increase in length;
- the establishment of an additional temporary run-off-mine (ROM) stockpile area;
- the establishment of a tyre bays;
- the establishment of additional weighbridges;
- the establishment of an additional topsoil stockpile area (No. 2); and
- a change in the position secondary crushing and screening plant.

This EMPr makes provision for the changes listed above including the addition of proposed facilities. Additional proposed facilities include the expansion of the approved topsoil stockpile area (No.1), expansion of topsoil stockpile No.2, the change in the position of the approved 78MI stormwater dam and establishment of a clean and dirty water separation system. In addition to this, Tshipi is proposing on mining the barrier pillar between the Tshipi Borwa Mine and South 32 (Mamatwan Mine).

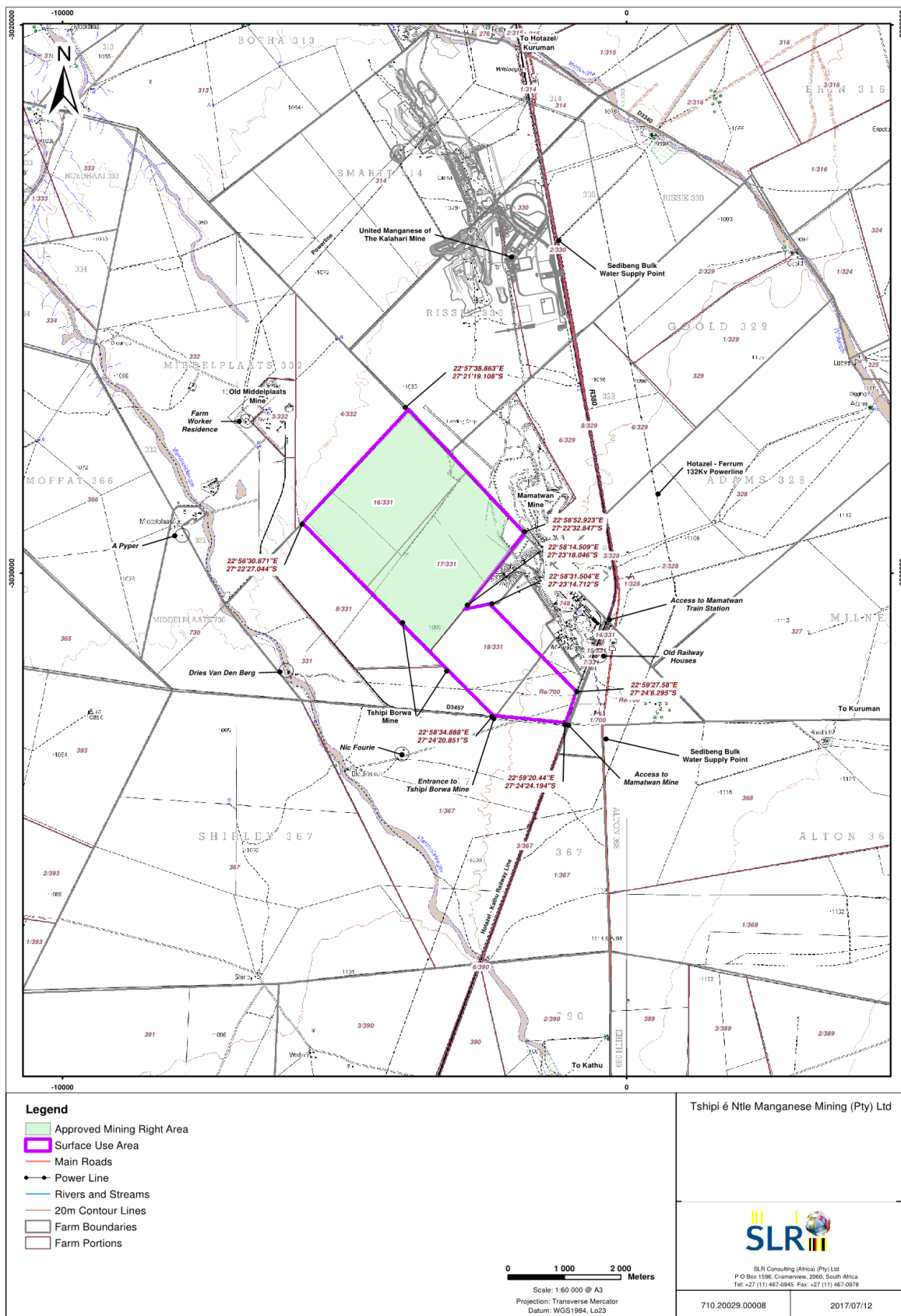


Figure 1. Local setting (provided by SLR Consulting)

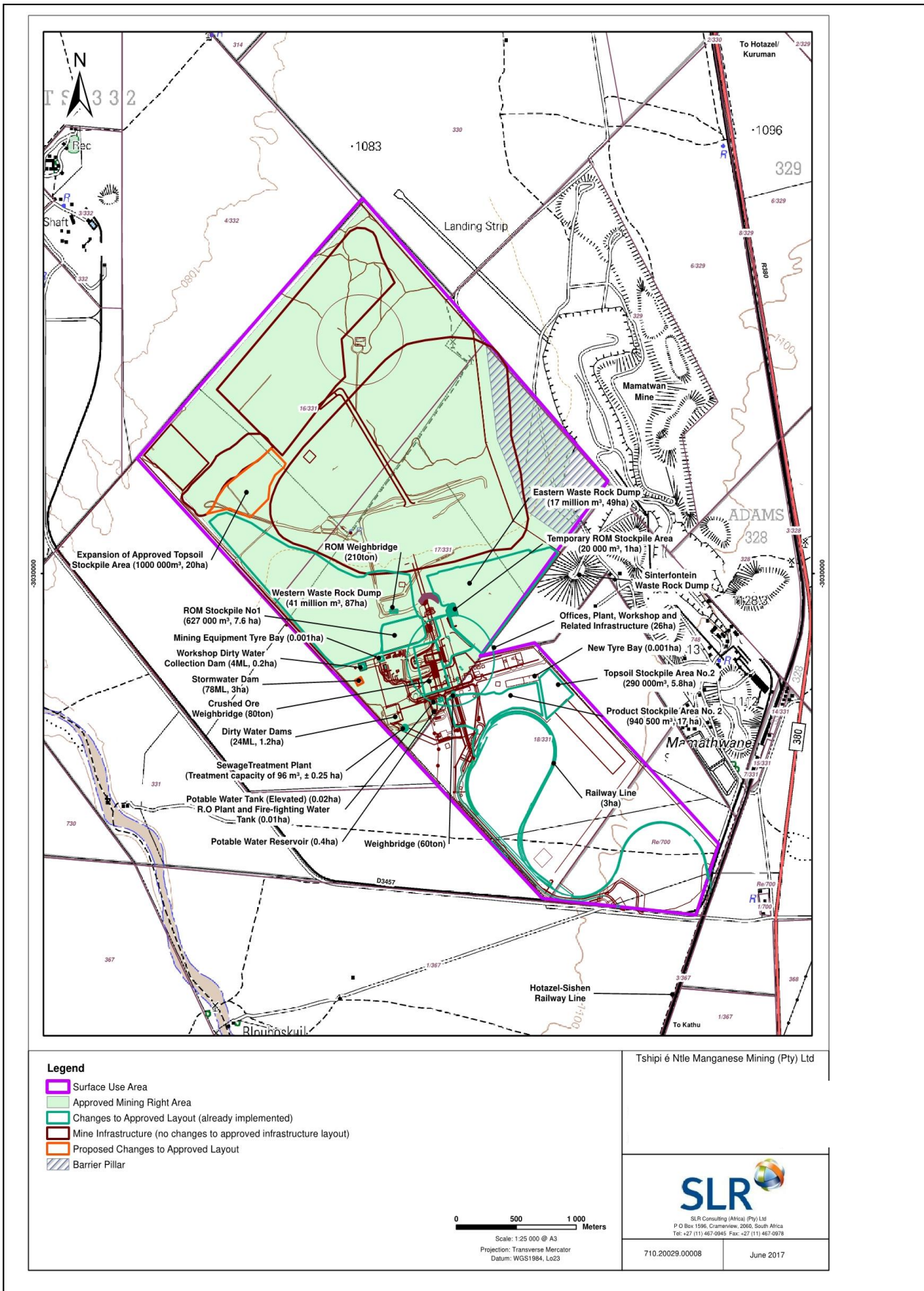


Figure 2. Layout of the Tshipi Borwa Mine (provided by SLR Consulting)

1.1 LEGISLATION

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

1.1.1 SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 25 OF 1999

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
- No person may, without a permit issued by the responsible heritage resources authority—
 - destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
 - destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
 - trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
 - bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

- serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order; and/or
- carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary.

1.1.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998)

The table below shows information required by specialists in terms of Appendix 6 of the National Environmental Management Act (No. 107 of 1998) (NEMA) as amended by Regulations 326 of 2017.

NEMA Regulations (2014) - Appendix 6 as amended by R.326 of 2017	Relevant section in report
Details of the specialist who prepared the report	Section 10
The expertise of that person to compile a specialist report including a curriculum vitae (CV)	Section 10 (Annexure A for CV)
A declaration that the person is independent in a form as may be specified by the competent authority	Section 11
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
An indication of the quality and age of base data used for the specialist report	N/A
a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 7
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 2.2
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section 7 and Section 8
An identification of any areas to be avoided, including buffers	N/A
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 3
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities	Section 5
Any mitigation measures for inclusion in the EMPr	Section 5
Any conditions for inclusion in the environmental authorisation	Section 5

NEMA Regulations (2014) - Appendix 6 as amended by R.326 of 2017	Relevant section in report
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 5
A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities	Section 5
If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 5
A description of any consultation process that was undertaken during the course of preparing the specialist report	Section 9
A summary and copies if any comments that were received during any consultation process and responses thereto	Section 9
Any other information requested by the competent authority.	N/A

2 OBJECTIVE AND METHODOLOGY

2.1 OBJECTIVE

According to the SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports' the aims of the palaeontological impact assessment are:

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

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

2.2 METHODOLOGY

When a palaeontological desktop/scoping study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, members, etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is collected from published scientific literature; fossil sensitivity maps; consultations with professional colleagues, previous palaeontological impact studies in the same region and

the databases of various institutions may be consulted. This data is then used to assess the palaeontological sensitivity of each rock unit of the study area on a desktop level. The likely impact of the development on local fossil heritage is subsequently established on the basis of the palaeontological sensitivity of the rocks and the nature and scale of the development itself (extent of new bedrock excavated).

If rocks of moderate to high palaeontological sensitivity are present within the study area, a Phase 1 field-based assessment by a professional palaeontologist is necessary. Generally, damaging impacts on palaeontological heritage occur during the construction phase. These excavations will modify the existing topography and may disturb, damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study.

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

3 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The development site is completely underlain by the Late Cenozoic Kalahari Formation (Fig. 3). The site is completely underlain by claystone, calcrete and dune sand of the Cretaceous to Tertiary Kalahari Formation. In the literature no literature record could be found of fossils from the Kalahari Formation close to Hotazel. Palaeontological evidence is thus restricted to a few pseudo-bone structures that are preserved in the limestone (Kudumane EIA 2010) and no evidence of any fossil material was collected from the rest of the Kalahari Formation.

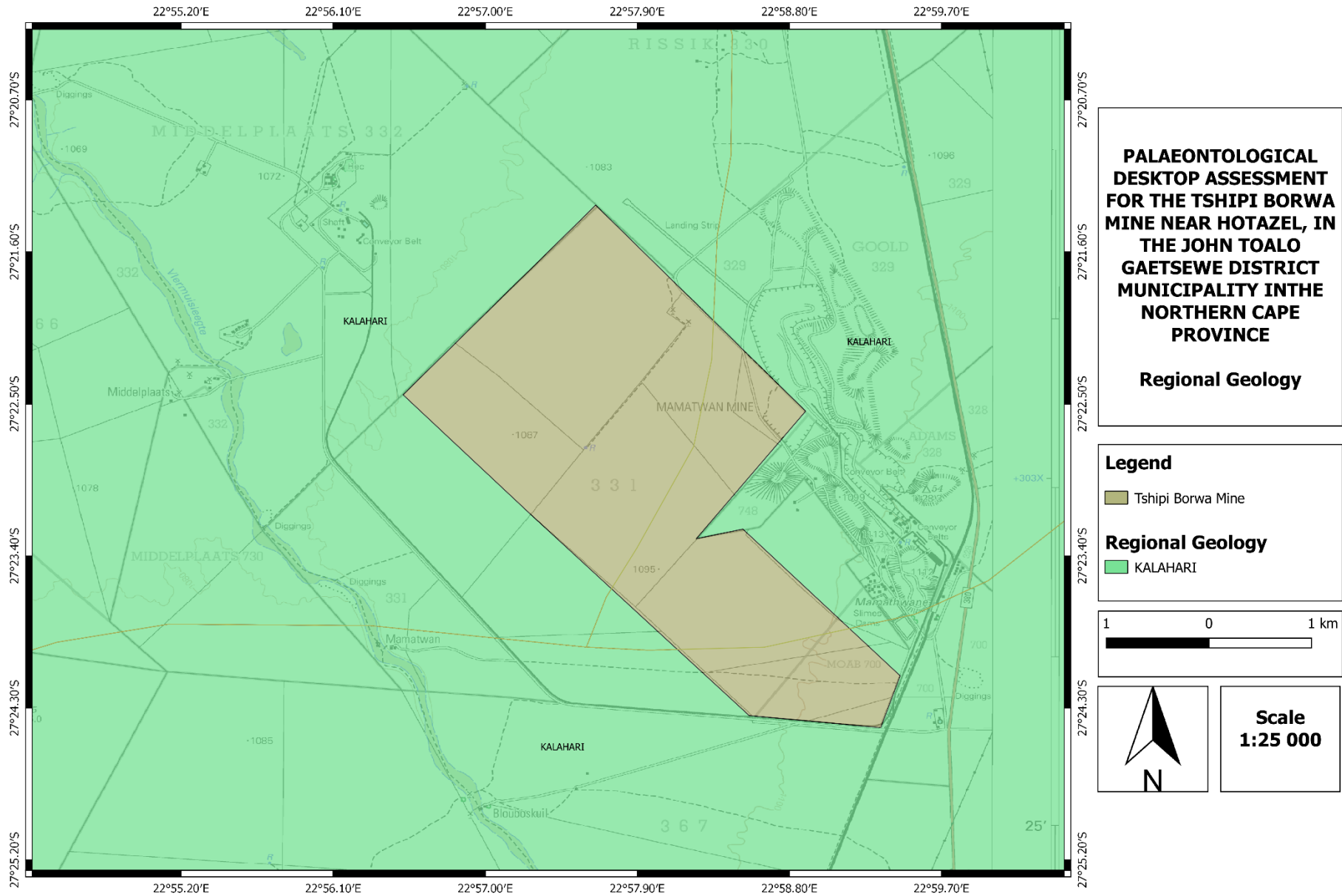


Figure 3. The surface geology of the Tshipi Borwa Mine. The mine is located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality, Northern Cape Province. The site is completely underlain by the Kalahari Formation.

4 GEOGRAPHICAL LOCATION OF THE SITE

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa Mine located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape Province.

5 FINDINGS AND RECOMMENDATIONS

The Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) is located on the farms Mamatwan 331 (mining right and surface use areas) and Moab 700 (surface use area), approximately 18 km to the south of Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape Province. The site is completely underlain by the Late Caenozoic Kalahari Formation.

The amendment to the Tshipi Borwa Mine approved infrastructure will not have any impact on the Kalahari Formation. To date literature reviews and reports associated with Heritage protection (Kudumane EIA 2010) make no mention of any palaeontological finds in the Kalahari Formation in this region.

The development is thus unlikely to pose a substantial threat to local fossil heritage. In Palaeontological terms the significance is rated as low to very low negative. Consequently, pending the discovery of significant new fossil material here, **no further specialist studies** are considered to be necessary.

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

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

Given the low to very low sensitivity of palaeontological occurrence at the Tshipi Borwa Mine, there is no reason that the project may not commence provided that mitigation measures discussed above, in the event of a chance find, are implemented.

6 ASSUMPTIONS AND LIMITATIONS

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

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

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

7 METHODOLOGY FOR IMPACT ASSESSMENT

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative

descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in Table 1.

Table 1: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	<i>Isolated corridor / proposed corridor</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>Global / National</i>	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given in the following sections.

7.1 SIGNIFICANCE ASSESSMENT

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, 10 structures younger than 60 years might be affected by a development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH.

A more detailed description of the impact significance rating scale is given in Table 2 below.

Table 2: Description of the significance rating scale

RATING	DESCRIPTION
5	VERY HIGH
4	HIGH

Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.

Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more

RATING		DESCRIPTION
		difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
	0	There is no impact at all - not even a very low impact on a party or system.

7.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 3.

Table 3: Description of the spatial significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites /	The impact will affect an area no bigger than the site.

RATING		DESCRIPTION
	proposed site	

7.3 Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment.

The temporal or duration scale is rated according to criteria set out in Table 4.

Table 4: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of the project.
4	Long-term	The environmental impact identified will operate beyond the life of operation of the project.
5	Permanent	The environmental impact will be permanent.

7.4 Degree of Probability

The probability or likelihood of an impact occurring will be outlined in Table 5 below.

Table 5: Description of the degree of probability of an impact occurring

RATING		DESCRIPTION
1		Practically impossible
2		Unlikely
3		Could happen
4		Very likely
5		It's going to happen / has occurred

7.5 Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in Table 6. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 6: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

7.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

$$\text{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 7: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Long Term	Could Happen	Low
Impact on heritage resources	1	2	5	2	1.07

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.6. The probability (2) is divided by 5 to give a probability rating of 0.4. The criteria rating of 2.6 is then multiplied by the probability rating (0.4) to give the final rating of 1.04.

The impact risk is classified according to five classes as described in Table 8 below.

Table 8: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low

RATING	IMPACT CLASS	DESCRIPTION
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for heritage structures above, an impact rating of 1.07 will fall in the Impact Class 1, which will be considered to be a very low impact.

8 FINAL IMPACT EVALUATION SUMMARY

The table below provides an assessment of the envisaged impact of the mining operations on possible palaeontological resources. The overall impact rating on palaeontological resources is calculated as low to very low.

Table 9: Assessment of impacts

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
<i>Impact on palaeontological deposits</i>					
<i>No mitigation</i>	Moderate	Local	Permanent	Could happen	
	3	3	5	2	1.47
<i>With mitigation</i>	Low	Local	Permanent	Could happen	
	1	2	5	1	0.67

9 ISSUES AND CONCERNS RAISED BY INTERESTED AND AFFECTED PARTIES

As part of the environmental assessment process for the environmental management programme amendment, a public consultation process was undertaken. Issues and concerns raised during the public consultation process are tabulated below, inclusive of a response.

Table 10: Issues and concerns raised by IAPs

IAP details	Date of comment	Issue raised	Response
Kathryn Smuts from the South African Heritage Resource Agency	28 August 2013 via email	<p>SAHRA has reviewed the Draft Scoping Report for the proposed amendment to the Tshipi Borwa Manganese Mine. The DSR refers to a heritage report compiled in 2009 by Mr Henk Steyn. Although this report was compiled for another application on the same property, the area surveyed covers enough of that affected by the current application to serve as an adequate indicator of the likely heritage resources found on the properties.</p> <p>As indicated in the SAHRA review comment for that 2009 report, SAHRA supports the application provided that:</p> <ul style="list-style-type: none"> • If archaeological and/or palaeontological heritage resources are identified in the course of mining operations and related activities, a Phase 2 rescue/ sampling operation may need to be undertaken by a specialist. For this purpose, the relevant professional will require a management actions permit from SAHRA APM Unit in terms of section 35 of the National Heritage Resources Act (NHRA, No. 25 of 1999). On receipt of a satisfactory management actions (Phase 2) permit report from the archaeologist and/or palaeontologist, SAHRA APM Unit will make further recommendations in terms of the report. • Where bedrock is to be affected, a Palaeontological Desk Top study must be undertaken to assess whether or not the development will impact upon palaeontological resources, or at least a letter from an accredited palaeontologist mitigating for an exemption is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary a Phase 2 rescue operation might be necessary. 	<p>As part of the project an independent palaeontological specialist was appointed. In this regard, the Tshipi Borwa Mine is underlain by the Late Caenozoic Kalahari Formation (Cretaceous to Tertiary). No literature record could be found of fossils from the Kalahari Formation close to Hotazel. Palaeontological evidence is restricted to a few pseudo-bone structures that are preserved in the limestone. No proof of any fossil material was collected from the rest of the Kalahari Formation. The project is therefore unlikely to pose a substantial threat to local fossil heritage. In Palaeontological terms the significance is rated as low to very low.</p> <p>It is important to note that even though the palaeontological sensitivity is low, Tshipi is committed to contact SAHRA as well as a qualified specialist in the event of a chance find. Further to this, in the event of chance find, palaeontological resources cannot be disturbed or removed without the necessary permits.</p>
Natasha Higgitt	March 2017 2017	<p>While the operational mine area has been surveyed for heritage resources previously (SAHRIS Case ID 2904 http://sahra.org.za/sahris/cases/tshipi-emp-amendment and 3629 http://sahra.org.za/sahris/cases/portion-3-8-farm-mamatwan-no331), an assessment of Palaeontological has not been conducted.</p>	<p>As part of the project an independent palaeontological specialist was appointed. In this regard, the Tshipi Borwa Mine is underlain by the Late Caenozoic Kalahari Formation (Cretaceous to Tertiary). No literature record could be found of fossils from the Kalahari Formation close to Hotazel. Palaeontological evidence is restricted to a few pseudo-bone structures</p>

IAP details	Date of comment	Issue raised	Response
			<p>that are preserved in the limestone. No proof of any fossil material was collected from the rest of the Kalahari Formation. The project is therefore unlikely to pose a substantial threat to local fossil heritage. In Palaeontological terms the significance is rated as low to very low.</p> <p>It is important to note that even though the palaeontological sensitivity is low, Tshipi is committed to contact SAHRA as well as a qualified specialist in the event of a chance find. Further to this, in the event of chance find, palaeontological resources cannot be disturbed or removed without the necessary permits.</p>

10 REFERENCES

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TANKARD, A.J., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAV, D.K., HUNTER, D.R. &MINTER, W.E.L. 1982. Crustal evolution of southern Africa – 3.8 billion years of earth history, xv+ 523pp. Springer Verlag, New York.

11 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty years. She has been conducting Palaeontological Impact Assessments since 2014. The curriculum vitae is attached in Appendix A.

12 DECLARATION OF INDEPENDENCE

I Elize Butler, declare that I am an independent consultant and have no business, financial, personal or other interest in the project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise my objectivity in this work.



E. Butler

Palaeontologist

Appendix A: Curriculum Vitae

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 24 years in Palaeontology

EDUCATION: B.Sc Botany and Zoology, 1988
University of the Orange Free State

B.Sc (Hons) Zoology, 1991
University of the Orange Free State

Management Course, 1991
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009
University of the Free State

Dissertation title: The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

Registered as a PhD fellow at the Zoology Department of the UFS

2013 to current

Dissertation title: A new gorgonopsian from the uppermost *Daptocephalus*
Assemblage Zone, in the Karoo Basin of South Africa

MEMBERSHIP

Palaeontological Society of South Africa (PSSA)

2006-currently

EMPLOYMENT HISTORY

Part time Laboratory assistant

Department of Zoology &
Entomology University of the Free
State Zoology 1989-1992

Part time laboratory assistant

Department of Virology

University of the Free State Zoology
1992

Research Assistant

National Museum, Bloemfontein
1993 – 1997

Principal Research Assistant
Bloemfontein

National Museum,

and Collection Manager

1998 – currently

TECHNICAL REPORTS

1. **PIA desktop:** Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. 2014.
2. **PAI site visit and report:** Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoot, Northern Cape Province. 2014.
3. **PIA desktop:** Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. 2015.
4. **PAI site visit and report:** Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. 2015.
5. **PIA exemption report:** Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. 2015.
6. **PAI site visit and report:** Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. 2015
7. **PAI site visit and report:** Palaeontological Impact Assessment of the proposed Gonubie residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape Province. 2015.
8. **PAI site visit and report:** Palaeontological Impact Assessment of the proposed Ficksburg raw water pipeline. 2015
9. **PAI site visit and report:** Palaeontological Heritage Impact Assessment report on the establishment of the 65 mw Majuba Solar Photovoltaic facility and associated infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province. 2015.
10. **PAI site visit and report:** Palaeontological Impact Assessment of the proposed township establishment on the remainder of portion 6 and 7 of the farm Sunnyside 2620, Bloemfontein, Mangaung metropolitan municipality, Free State, Bloemfontein. 2015.

11. **PIA desktop:** Palaeontological Impact Assessment of the proposed Woodhouse 1 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse729, near Vryburg, North West Province. 2015.
12. **PIA desktop:** Palaeontological Impact Assessment of the proposed Woodhouse 2 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. 2015.
13. **PIA desktop:** Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province. 2015.
14. **PIA desktop:** Palaeontological Impact Assessment of the proposed Spectra foods broiler houses and abattoir on the farm Maiden Manor 170 and Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province. 2015.
15. **PIA desktop:** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape. Prepared for Savannah Environmental. 2016.
16. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed Woodhouse 1 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. 2016.
17. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed Woodhouse 2 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. 2016.
18. **PIA Desktop:** Proposed 132kV overhead power line and switchyard station for the authorised Solis Power 1 CSP project near Upington, Northern Cape. 2016.
19. **PIA site visit and report:** of The Proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province. 2016.

20. **Recommended Exemption** From Further Palaeontological Studies: Proposed Construction Of The Modderfontein Filling Station On Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province. 2016.
21. **Recommended Exemption** From Further Palaeontological Studies: Proposed Construction Of The Modikwa Filling Station On A Portion Of Portion 2 Of Mooihoek 255 Kt, Greater Tubatse Local Municipality, Limpopo Province. 2016.
22. **Recommended Exemption** From Further Palaeontological Studies: Proposed Construction Of The Heidedal Filling Station On Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province. 2016.
23. **Recommended Exemption** from further Palaeontological studies: Proposed Construction of the Gunstfontein Switching Station, 132kv Overhead Power Line (Single Or Double Circuit) and ancillary infrastructure for the Gunstfontein Wind Farm Near Sutherland, Northern Cape Province. 2016.
24. **PIA site visit and report** of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. 2016.
25. **PIA monitoring:** Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW. 2016.
26. **PIA Site visit and Report:** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoot, Northern Cape. 2016.
27. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from the Motherwell to Addo within the Nelson Mandela Bay Municipality and Sunday's river valley Local Municipality, Eastern Cape Province. 2016.
28. **PIA site visit and report:** Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape province. 2016.
29. **PIA site visit and report:** Palaeontological Impact Assessment for the proposed construction of up to a 132kv power line and associated

infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces. 2016.

30. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape. 2016.
31. **PIA desktop:** Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape. 2016
32. **PIA desktop:** Palaeontological Impact Assessment for the proposed construction of two 5 Mw Solar Photovoltaic Power Plants on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, Leeudoringstad, North West Province. 2016.
33. **PIA desktop:** Palaeontological Impact Assessment for the proposed development of four Leeuwborg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province. 2016.
34. **PIA desktop:** Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province. 2016.
35. **PIA desktop:** Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal. 2016.
36. **PIA desktop :** Palaeontological impact assessment for the proposed construction of two 5 MW solar photovoltaic power plants on farm Wildebeestkuil 59 and farm Leeuwbosch 44, Leeudoringstad, North West Province. 2016.
37. **PIA desktop:** Palaeontological desktop assessment of the establishment of the proposed residential and mixed use development on the remainder of portion 7 and portion 898 of the farm Knopjeslaagte 385 jr, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province. 2016.
38. **PIA desktop:** Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape. 2017.
39. **PIA desktop:** Palaeontological Impact Assessment Of The Proposed Development Of The New Open Cast Mining Operations On The Remaining

Portions Of 6, 7, 8 And 10 Of The Farm Kwaggafontein 8 In The Carolina Magisterial District, Mpumalanga Province. 2017.

40. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province. 2017.
41. **PIA desktop:** Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province. 2017.
42. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa mine Near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. 2017.
43. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. 2017.
44. **PIA site visit and report:** Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province. 2017.
45. **PIA desktop:** Palaeontological desktop assessment of the proposed development of a 3000 mw combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal. 2017.
46. **PIA site visit and report:** Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mbhashe Local Municipality. 2017.
47. **PIA site visit and Report:** Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal. 2017.
48. **PIA site visit and Report:** Palaeontological Impact Assessment of the proposed development of the new open cast mining operations on the remaining portions of 6, 7, 8 and 10 of the farm Kwaggafontein 8 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. 2017.

49. **PIA site visit and Report:** Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. 2017.
50. **PIA desktop:** Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. 2017.
51. **PIA desktop:** Palaeontological Desktop Assessment of the proposed development of open pit mining at Pit 36W (New Pit) and 62E (Dishaba) Amandelbult Mine Complex, Thabazimbi, Limpopo Province. 2017.
52. **PIA site visit and Report:** Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. 2017.
53. **PIA site visit and Report:** Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province. 2017.

CONFERENCE CONTRIBUTIONS

NATIONAL

PRESENTATION

Butler, E., Botha-Brink, J., and F. Abdala. A new gorgonopsian from the uppermost *Dicynodon Assemblage Zone*, Karoo Basin of South Africa. 18 the Biennial conference of the PSSA 2014. Wits, Johannesburg, South Africa.

INTERNATIONAL

Attended the Society of Vertebrate Palaeontology 73th Conference in Los Angeles, America. October 2012.

CONFERENCES: POSTER PRESENTATION

NATIONAL

Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. University of the Free State Seminar Day, Bloemfontein. South Africa. November 2007.

Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. 14th Conference of the PSSA, Matjiesfontein, South Africa. September 2008:

Butler, E., and J. Botha-Brink. The biology of the South African non-mammaliaform cynodont *Galesaurus planiceps*. 15th Conference of the PSSA, Howick, South Africa. August 2008.

INTERNATIONAL VISITS

Natural History Museum, London

July 2008

Paleontological Institute, Russian Academy of Science, Moscow

November 2014