



DEPARTMENT: NGT HERITAGE MANAGEMENT SOLUTIONS

PROJECT TITLE:

PROPOSED UPGRADE OF THE NATIONAL ROUTE N2 SECTION 34 (BETWEEN PIET RETIEF AND ERMELO): LINK AND GRADE-SEPARATION FOR EXISTING INTERSECTION AT PROVINCIAL ROAD P97/2 AND D803 FOR KANGRA MINE COAL HAULAGE AT PANBULT, MPUMALANGA PROVINCE

DATE OF ISSUE:

03 SEPTEMBER 2017

SPECIALIST REPORT:

Palaeontological Impact Assessment for the Proposed Upgrade of the National Route N2 Section 34 (Between Piet Retief and Ermelo): Link and Grade-Separation for Existing Intersection at Provincial Road p97/2 and D803 for Kangra Mine Coal Haulage at Panbult, Mpumalanga Province, South Africa

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DECLARATION OF INDEPENDENCE

This report has been compiled by Professor Marion Bamford, lead Palaeontologist for NGT Holdings. The views expressed in this report are entirely those of the author and NGT Holdings; no other interest was displayed during the decision making process for the project.

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SPECIALIST SIGNATURE	

EXECUTIVE SUMMARY

NGT Holdings (Pty) Ltd, Department- Heritage Management Solutions, (hereafter referred to NGT) has been appointed LYMA Consulting Engineers (Pty) Ltd, on behalf of SANRAL (SOE), to undertake a Desktop Palaeontological Assessment for the proposed upgrade of the National Route N2 Section 34 (Between Piet Retief and Ermelo): link and grade-separation for existing intersection at Provincial Road P97/2 and D803 for Kangra Mine Coal Haulage at Panbult, Mpumalanga Province. LYMA has been appointed as the Environmental Assessment Practitioner to conduct the Environmental Impact Assessment Study for the proposed project and the PIA forms part of the Specialist Studies for the project.

Based on a preliminary field survey conducted, no fossil remains were identified on site through the assessment of exposed layers of sands in areas that have been previously disturbed. However, the depth of these areas was not deep enough sufficient to expose fossil materials. Based on available literature, it is concluded that fossil plants of the *Glossopteris* flora are common in the Ecca Group of the Vryheid Formation dated to the Early Permian and are frequently associated with the shale bands between the coal seams. This site lies to the east of the Ermelo Coalfield and does not have economically viable coal seams and, as such, little active research has been completed in this area. Furthermore, dolerite dykes are common in the area. No fossil finds will be associated with Dolerite Dykes, however *Glossopteris* fossils may be impacted during the construction phase.

It is recommended that a Fossil Finds Monitoring Programme be implemented during the construction phase of the project based on the Fossil Finds Procedure (attached in Appendix). Should scientifically significant fossil material be impacted, work must cease and a palaeontologist must be contacted to assess the finds and determine a way forward.

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1. INTRODUCTION

1.1 Background Information on Project

NGT, Department- Heritage Management Solutions, has been appointed by LYMA Consulting Engineers (Pty) Ltd to undertake a Palaeontological Assessment study (No assessment of soil samples took place). The study forms part of an Environmental Impact Assessment (EIA) process for the proposed upgrade of the National Route N2 Section 34 (Between Piet Retief and Ermelo): link and grade-separation for existing intersection at Provincial Road P97/2 and D803 for Kangra Mine Coal Haulage at Panbult, Mpumalanga Province, South Africa (Figure 2).

1.2 Description of Property and Affected Environment

The proposed development area has been previously highly transformed through infrastructure developments of the N2 highway. It must be noted that this study deals only with possible impacts to palaeontological heritage resources.

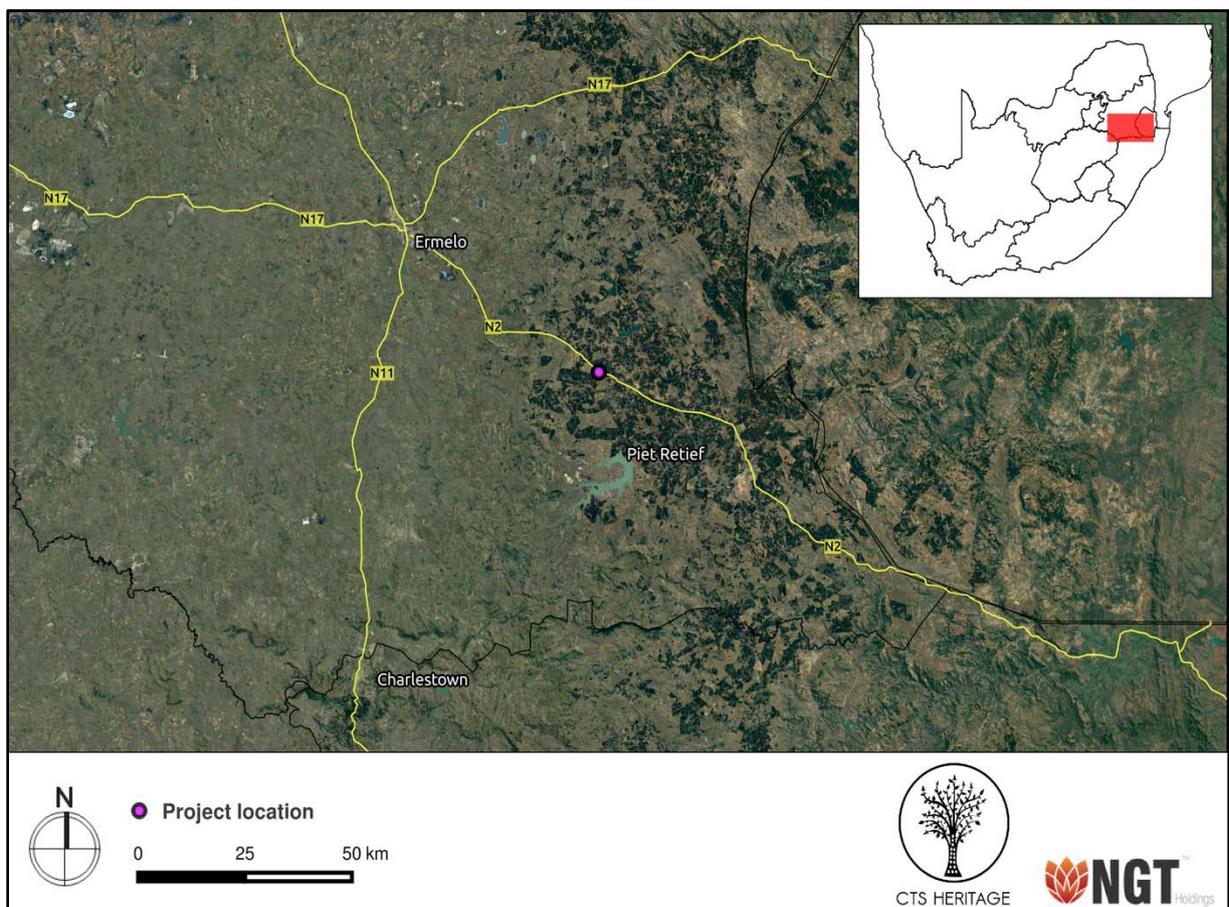


Figure 1-Satellite image indicating proposed development location

2. METHODOLOGY

2.1 Purpose of this study

The purpose of this study is to form part of the specialist studies supporting the Heritage Impact Assessment. The HIA is completed in order to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

2.2 Summary of steps followed

- A palaeontologist conducted a foot survey of the site and its environs on 19 August 2017 to determine the palaeontological resources likely to be impacted by the proposed development.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Definition of the property

The proposed 1.6km upgrading of the N2 Section 24 Panbult interchange will traverse the following properties (*Figure 2*):

- Portion 7 of Farm Valschvlei 352;
- Remaining extent of Farm Valschvlei 352;
- Portion 16 of Farm Valschvlei 352;
- Portion 1 of Farm Valschvlei 352;
- Portion 2 of Farm Basel 313;
- Remaining extent of Farm Basel 313;
- Remaining extent of Portion 5 of the farm Valschvlei 352
- Remaining extent of Farm Basel 313;

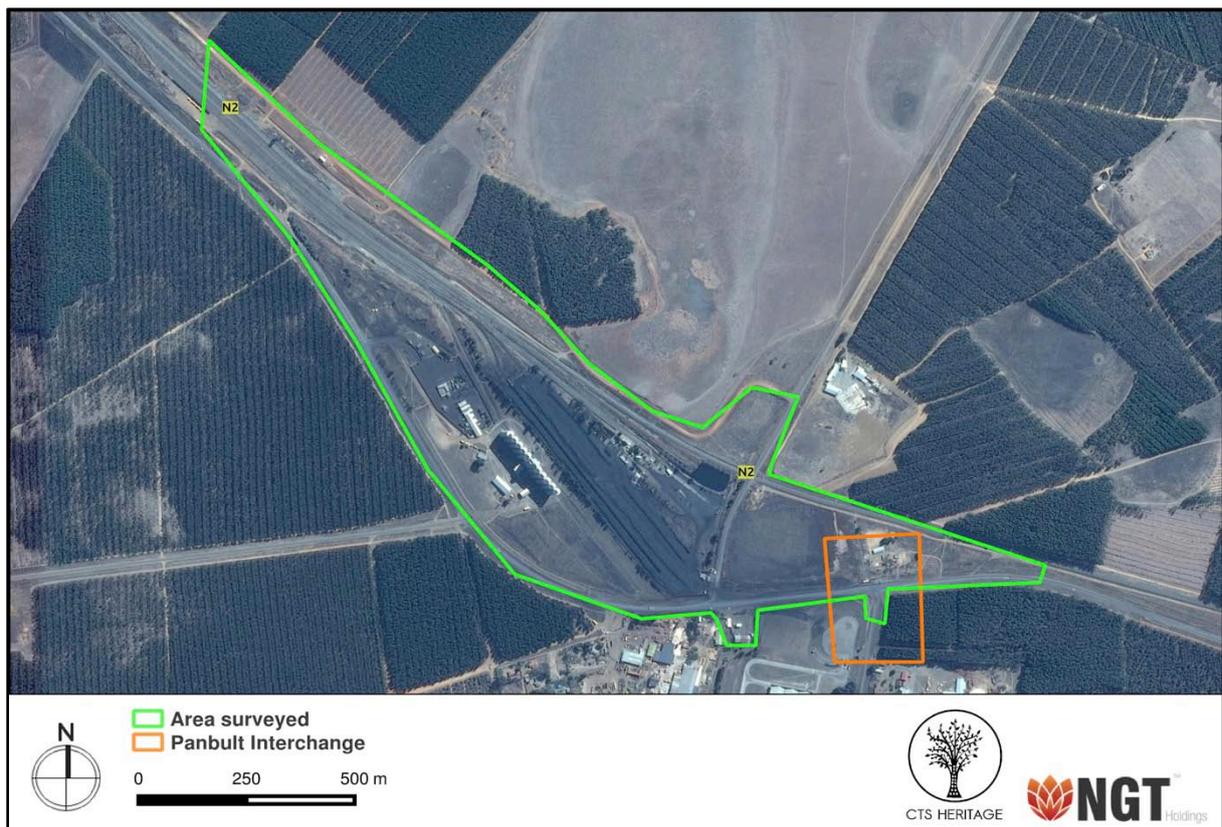


Figure 2-Close up satellite image indicating proposed development location.

3.2 Geology, geomorphology, climate and vegetation

The oldest rocks in the area, to the south east of the proposed Interchange, are volcanic rocks of the Nsuzu Group in the Pongola Sequence. These consist of extensive mafic to felsic volcanic rocks with subordinate calcareous and siliciclastic sedimentary beds. Granites of the Mpuluzi Granite Suite and the felsic volcanics of the Amsterdam Formation are also known from the vicinity of the proposed development. The Usushwana complex, also evident in this area, is a mafic to ultramafic intrusion.

The proposed interchange is situated on the sedimentary rocks of the Vryheid Formation (Pv) which are sandstones, shales and coals of Early Ecca age, in the extreme east of the main Karoo Basin. These sediments have an uneven underlying topography and have been intruded extensively by Jurassic dolerite dykes (*Figure 3; Table 1*).

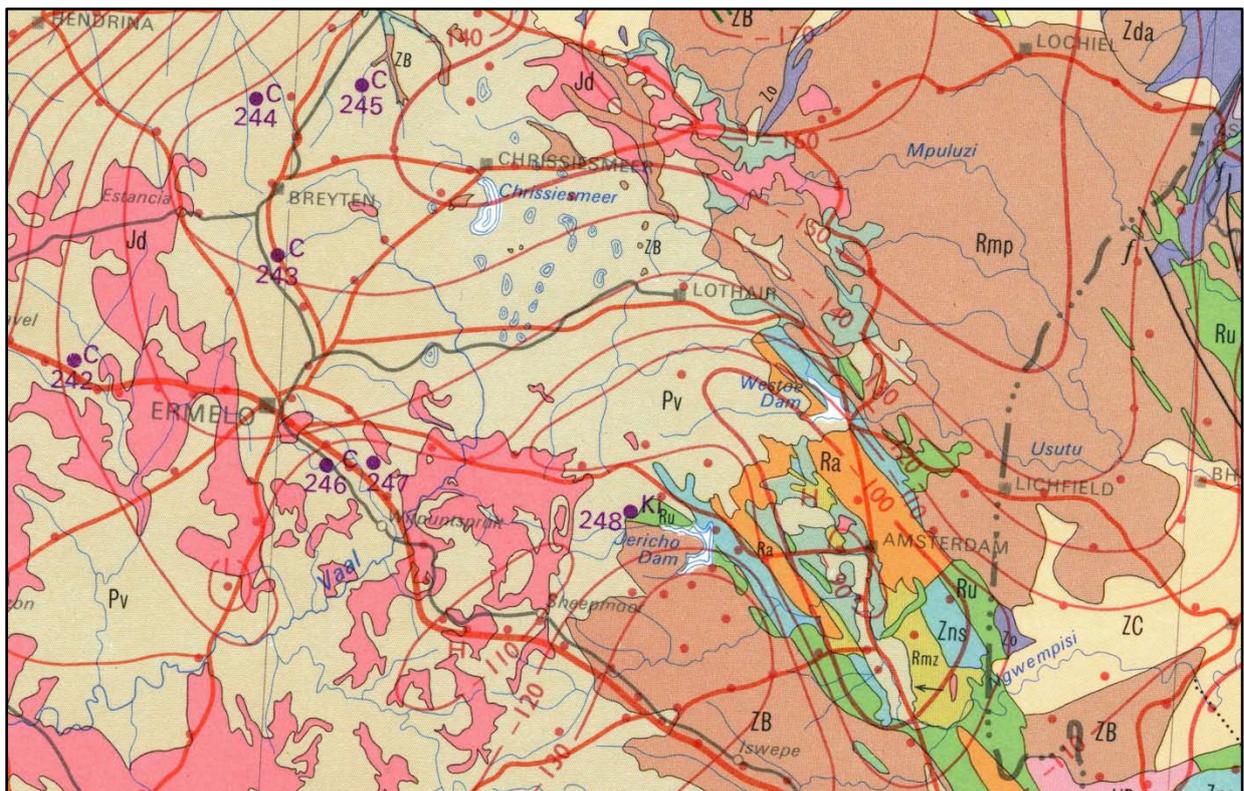


Figure 3-Simplified geological map with a blue oval outline indicating the wide area for the proposed Panbult Interchange in Pv (Vryheid Fm). The whole area is potentially fossiliferous, excluding the dolerite dykes (Jd, dark pink). Map from detailed Geology Survey Map 1984, 1: 1 000 000 map 1984.

Table 1-Abbreviations for the geological formations (from detailed Geology Survey Map 1984, 1: 1 000 000 map 1984, lithology and approximate ages taken from Gold (2006); Johnson et al. (2006), Robb et al. (2006).

Symbol	Group/Formation/Member	Lithology	Approximate Age
Pv	Vryheid Fm, Ecca Group, Early Permian	Sandstone, shale, coal, <i>Glossopteris</i> flora fossils	Ca 280 Ma
Jd	Jurassic Dykes	Intrusive Dolerite	183Ma
Ru	Usushwana Complex	Mafic to ultramafic intrusion; gabbro	2931 Ma
Ra	Amsterdam Fm	Rhyolite, dactite	2800 Ma
Rmp	Mpuluzi Granite Suite	Quartz monzonite	3105 – 3075 Ma
Zns	Nsuze Group, Pongola Sequence	Basalt, andesite, quartzite	Ca 2900 Ma

3.3 Palaeontological Background

The volcanic rocks and batholiths do not contain any fossils but the Vryheid Formation, in parts, is rich in coals and plants of the coal flora, namely the *Glossopteris* flora. While the coal seams do not contain any fossils of scientific interest because they have been compressed and altered by heat, the shale lenses between the coals and the more distal facies could potentially preserve fossil plants. The site is just to the east of the Ermelo Coal Field (Snyman 1998) and is not mined for coal as the seams are thin, however the coals in the eastern part of the Ermelo coalfield have been subjected to greater heat and pressure so are a better quality than other coalfields (Snyman, 1998). The quality of the coal is usually inversely proportional to the quality of the fossils. Little research has been done in this area but there is a good chance of fossil plants occurring there.

As indicated in the palaeosensitivity map (*Figure 9*) the proposed development lies within an area that is highly sensitive in terms of palaeontological resources, so there is a chance of finding fossils in

the site. Until excavations for the roadway commence it is not possible to determine if there are fossils of scientific importance that could be affected.

4. IDENTIFICATION OF HERITAGE RESOURCES

Based on the field survey conducted, no fossil remains were identified on site through the assessment of exposed layers of sands in areas that have been previously disturbed (*Figure 4*). However, the depth of these areas was not deep enough sufficient to expose fossil materials. Based on available literature, it is concluded that fossil plants of the *Glossopteris* flora are common in the Ecca Group of the Vryheid Formation dated to the Early Permian and are frequently associated with the shale bands between the coal seams (*Figure 9*). This site lies to the east of the Ermelo Coalfield and does not have economically viable coal seams and, as such, little active research has been completed in this area. Furthermore, dolerite dykes are common in the area. No fossil finds will be associated with Dolerite Dykes, however *Glossopteris* fossils may be impacted during the construction phase.



Figure 4- Exposed pipes within the proposed development area (Excavations not deep enough for Palaeontological assessment of sediments)

The study area is generally flats and below are images of the area and the type of heritage resources that were found:

- A wetland was found west of the homestead and the school on site and it is situated north of the N2 (*Figure 5*).
- A school (St Andrews School) (*Figure 6*)
- A cemetery with 53 graves (*Figure 7*)
- A homestead with one formal dwelling (*Figure 8*)

The impact to these other resources is discussed in their specialist reports such as the HIA (heritage impact assessment) and the wetland study, which are all contained in the EIA and EMP.



Figure 5-General image of the site. Image taken from the western end of the site facing east and the N2 and the affected school and homestead.



Figure 6- Image of the affected school within the development footprint



Figure 7- Images of a household within the development footprint



Figure 8- Images of graves within the development are

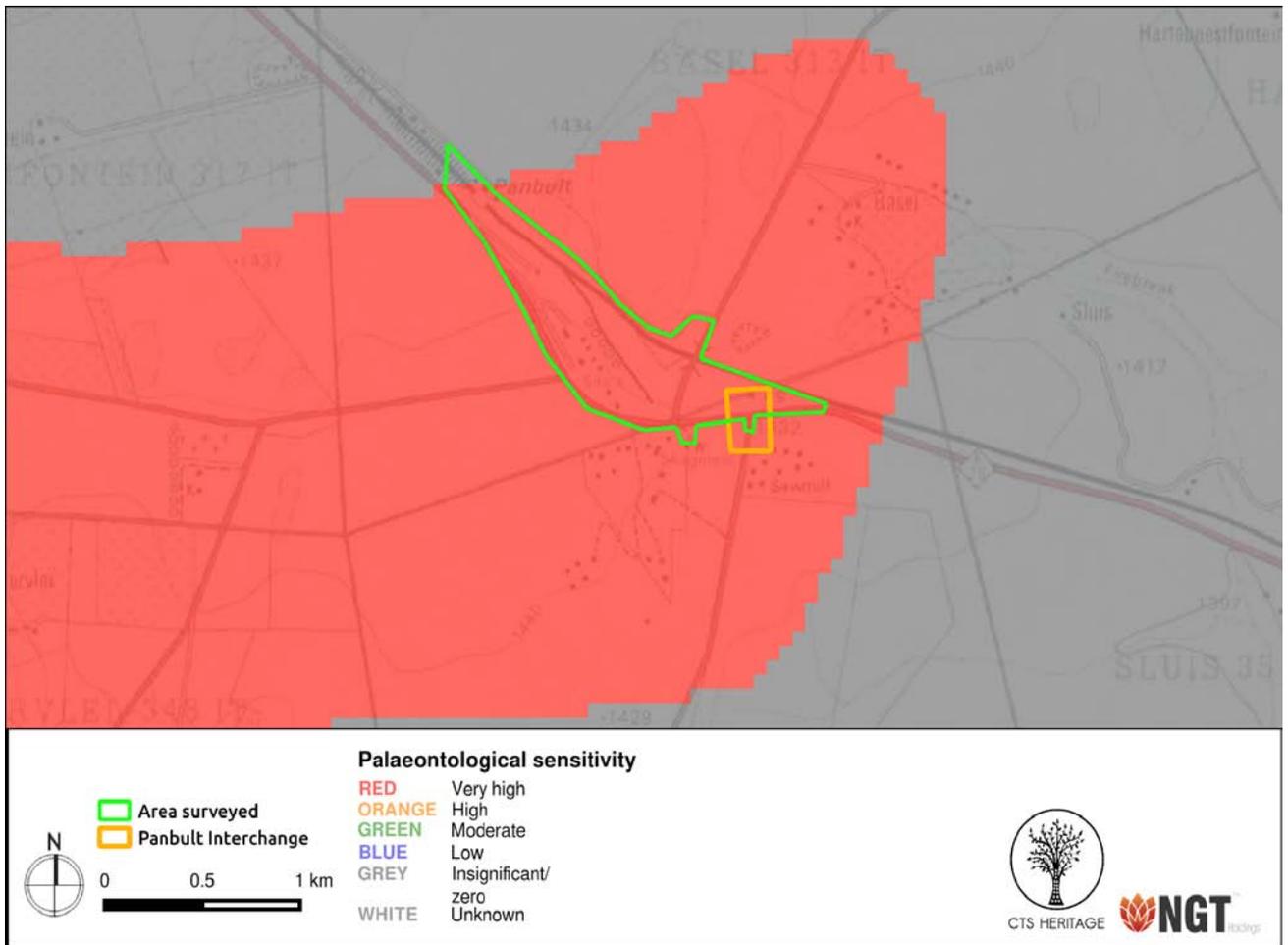


Figure 9-Palaeo Map. Palaeosensitivity of the study area, showing varied fossil sensitivity underlying the municipality.

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

The heritage resources assessed as part of this specialist study are palaeontological heritage resources. Please see the below table indicating potential impacts and proposed mitigation measures.

Table 3-Table of risks and mitigation measures

Potential impact/risk	Proposed mitigation
Damage to or destruction of fossils when roadworks begin	The ECO must monitor the site and if vertebrate, trace or plant fossils are seen then they must be removed immediately, photographed and the photographs sent to a palaeontologist for an expert opinion
If scientifically important fossils are found	The palaeontologist must obtain a permit from SAHRA and remove the fossils
No fossils in the area	No mitigation required and project can continue. No further palaeontological assessment require

5.2 Sustainable Social and Economic Benefit

The Final Environmental Scoping Report (FESR) contains an independent Socio-Economic Impact Assessment (SEIA) study for the project. The results of the SEIA are contained in Appendice 13 of the FESR published on the South African Heritage Resources Agency (SAHRA) website:

http://www.sahra.org.za/sahris/sites/default/files/additionaldocs/Panbult%20Interchange%20Final%20Scoping%20report_Jan2017.pdf. Date: 02/ September / 2017).

5.3 Proposed development alternatives

The current study footprint is the study which was selected as the preferred development site following inputs from various specialist report in the FESR.

6. RESULTS OF PUBLIC CONSULTATION

The FESR conducted a detailed Public Participation Process (PPP) with the following Interested and Affected Parties (IAPs):

- Surrounding and affected landowners, local councilors and chiefs, Provincial and Local Governments Departments. Refer to Appendices 4 to 9 of the FESR for details of the PPP.

No heritage public participation took place as part of the current PIA study – this is deemed not necessary for the current study. A consideration of heritage public participation process should be consider for the heritage impact assessment study which will impact on burial grounds and graves located within the proposed development footprint.

7. CONCLUSION AND RECOMMENDATIONS

While the Ecca Deposits of the Vryheid Formation are very palaeontologically sensitive in general, no palaeontological resources were identified during the field assessment. However, there remains a strong possibility of fossils occurring throughout the Vryheid Formation, except where there are dolerite dykes. These fossils may occur near the surface or well below ground. Site visits by a qualified and accredited Palaeontologist are required if the geologist or environmental officer notices any fossil plants (vertebrates could occur here but it is very rare for plants and vertebrates to be preserved together). If fossils are found *in situ* and identified then mitigation measures can be implemented and the project may continue, alternatively, no-go areas may have to be instated.

It is therefore recommended that a Fossil Finds Monitoring programme be implemented during the construction phase of the project based on the Fossil Finds Procedure (attached in Appendix). Should scientifically significant fossil material be impacted, work must cease and a palaeontologist must be contacted to assess the finds and determine a way forward.

8. REFERENCES

Anderson, J.M., Anderson, H.M., 1983. Palaeoflora of Southern Africa. Molteno Formation (Triassic). Vol. 1. Part 1. Introduction. Part 2. *Dicroidium*. A.A.Balkema, Rotterdam.

Anderson, J.M., Anderson, H.M., Cruickshank, A.R.I., 1998. Late Triassic ecosystems of the Molteno/Elliott biome of southern Africa. *Palaeontology* 41, 387-421.

Bamford, M.K., 2004. Diversity of the woody vegetation of Gondwanan southern Africa. *Gondwana Research* 7, 153-164.

Gold, D.J.C., 2006. The Pongola Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 135-148.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

Robb, L.J., Brandl, G., Anhaeusser, C.R., Poujol, M., 2006. Archaean Granitoid Intrusions. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 57-94.

APPENDICE 1: FOSSIL FINDS PROCEDURE

NB: The following procedure is only required if fossils are seen on the surface and when excavations commence.

1. When excavations begin, the excavated material must be given a cursory inspection by the environmental officer or designated responsible person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place and their source location noted. This way the construction activities will not be interrupted.
2. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures.
3. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
4. Should high quality fossils be identified, the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible. However, if the onsite designated person is diligent and extracts the fossil material then inspections can be a once off occurrence.
5. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be carefully removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site, a SAHRA permit must be obtained. Annual reports or a final report must be submitted to SAHRA as required by the relevant permits.
6. If no good fossil material is recovered then site inspections by the palaeontologist are NOT necessary.
7. If no fossils are found and the excavations that form part of the construction phase of the project are complete, then no further monitoring is required.