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ARCHAEOLOGICAL FOOTPRINTS (PTY) LTD

HERITAGE & PALEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF NEW LOCAL ROAD 3296 (MATHUNZANENI) (KM0.00 – KM1.62)

MAY 2020

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AUTHOR'S CREDENTIALS

The report was authored by Mr. Roy Muroyi (Archaeologist) and Dr. Heidi Fourie (Palaeontologist).A holder of an Honors Degree, Archaeology, Cultural Heritage and Museum Studies (Midlands State University) an MSc Archaeology Degree candidate at the University of Witwatersrand, he attended further training as a Laboratory Specialist for Human anatomy and human skeletal analysis through the University of Cape-Town human biology department in-conjunction with Cape Archaeological Surveys. Mr Muroyi has over six years industry experience , after leaving the Department of National Museums and Monuments of Botswana where he worked as an Archaeological Impact assessments adjudicating officer Mr . Muroyi then moved to South Africa where has been involved in a range of Cultural Resources Management (CRM) projects. He has so far exhumed over 500 historical burials as a professional archaeologist and carried out close to 100 Heritage Impact Assessments.

Dr Fourie obtained a Ph.D from the Bernard Price Institute for Palaeontological Research (now ESI), University of the Witwatersrand. Her undergraduate degree is in Geology and Zoology. She specialises in vertebrate morphology and function concentrating on the Therapsid Therocephalia. At present she is curator of a large fossil invertebrate collection, Therapsids, dinosaurs, amphibia, fish, reptiles, and plants at Ditsong: National Museum of Natural History. For the past 13 years she carried out field work in the North West, Western Cape, Northern Cape, Eastern Cape, Limpopo, Mpumalanga, Gauteng and Free State Provinces. Dr Fourie has been employed at the Ditsong: National Museum of Natural History in Pretoria (formerly Transvaal Museum) for 25 years.

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Author(s)	Signature(s)
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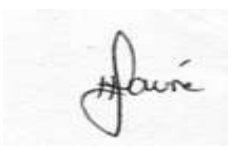
Paleontological Impact Assessment Dr. Heidi Fourie	

DOCUMENT INFORMATION

DOCUMENT INFORMATION ITEM	DESCRIPTION
Proposed development and location	Construction of new Local Road 3296 (Mathunzaneni) (KM0.00 – KM1.62)
Purpose of the study	To carry out a Heritage Impact Assessment to determine the presence/absence of cultural heritage and paleontological sites and the impact of the proposed road construction
Topography	The general topography of the area can be classified as flat to rolling for majority of the alignment. The grades for the last 220m of the alignment is in excess of the 10% and can therefore be classified as a mountainous terrain.
Municipalities	Estcourt Region / uThukela District Municipalities, Kwazulu Natal Province
Predominant land use of surrounding area	
Applicant	KwaZulu-Natal Department of Transport (KZN DoT).
Reference No.	C237/1500/S/1
EAP	Hanslab Environmental Consultants 1 Sugar Close Umhlanga Ridge Umhlanga, 4139
Heritage Consultant	Tsimba Archaeological Footprints (Pty) Ltd 24 Lawson Mansions 74Loveday Street, Johannesburg, CBD Gauteng, 2000
Author (s)	Mr. Roy Muroyi (Archaeology and Heritage Specialist) Dr. Heidi Fourie (Paleontologist)

EXECUTIVE SUMMARY

This Heritage and Paleontological Impact Assessment (HIA&PIA) Report has been prepared to address requirements of Section 38 of the National Heritage Resources Act, Act 25 of 1999 (NHRA) and the KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act No 5 of 2018) which The KwaZulu-Natal Department of Transport (KZNDOT) (the proponent),proposes to construct a road. The project is known as the proposed construction of new Local Road 3296 (Mathunzaneni) (KM0.00 – KM1.62). Hanslab Environmental Consultants is preparing the Environmental Impact Assessment terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

This report constitutes a summary of the Cultural Heritage Impact Assessment and Paleontological desktop assessment study completed for the above mentioned project. There are two separate, but interlinked, objectives of the Cultural Heritage Impact Assessment Study. Firstly, it is to provide a baseline understanding of the known and potential KwaZulu Natal and historical cultural heritage landscape of the project development area. Secondly, it is to design and set in place a strategy and management regime for cultural heritage that is consistent with the provisions of relevant in terms of the requirements of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and the KwaZulu-Natal Heritage Act, 1997 (Act No. 4 of 2008). The terminology used and the methodology followed with regards to the compilation of the HIA are explained and the legal framework stated.

Legislative Frame works used

1. ICOMOS, 1996.International Charter for the Conservation and Restoration of Monuments and sites (the Venice charter).
2. ICOMOS, 1999.The Australia ICOMOS charter for places of cultural significance (the Burra Charter).
3. ICOMOS Charter, Principles for the analysis, conservation and structural restoration of architectural heritage (2003)
4. National Heritage and Resources Act of South Africa No.25 of 1999
5. KwaZulu-Natal Heritage Act, 1997 (Act No. 4 of 2008).

An archival ,historical and paleontological desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. The review of a range of cultural heritage information was undertaken. This included Amafa Research Institute and National heritage databases, lists and registers, as well as a range of other documented information (including heritage impact assessment reports and a range of ethno-historic and archaeological sources at both local and regional levels). These components indicated that the landscape within which the project area is associated with hasa variety of known heritage sites including national monuments, regional and local heritage resources that carry high rating value. The resources include old buildings, vootrekker monuments and battlefield heritage. Archaeologically the greater Estcourt are is rich in all archaeological periods namely the Stone Age and the Iron Age.

Geological maps, scientific literature, institutional fossil collections, satellite images, aerial maps and topographical maps were used in combining the Paleontological desktop study . This study provides an assessment of the observed or inferred palaeontological heritage within the study area, with recommendations (if any) for further specialist palaeontological input where this is considered necessary.

A Palaeontological Impact Assessment is generally warranted where rock units of **LOW** to **VERY HIGH** palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil

remains in the proposed area is unknown. The specialist will inform whether further monitoring and mitigation are necessary.

Conclusions

Summary of cultural heritage findings: This desktop noted the existence of archaeological sites representing a full archaeological sequence from the Stone Age to the Iron Age period. The historical periods of the greater Estcourt are was found to be very rich. The greater area is home to a number of colonial heritage sites. No cultural heritage sites, tools or part of living heritage sites were noted within the proposed development footprint during the site visit. It was however noted that the ground has been greatly disturbed through a road upgrade that removed the top soils. It is therefore the author(s) conclusion that the project is acceptable and should be allowed to proceed. A public participation process was carried out by Hanslab and no- comments or objections to the project were received. No graves were also reported within the proposed development footprint.

Recommendations

- No further archaeological recommendations are given except for;
- An accredited archaeologist should be consulted to monitor the projects during the construction phase. Monitoring should include
- A Chance finds procedure (CFP) should also be implemented in the event that stone tools are identified underground (See Appendix 1)

Summary of Paleontological findings: - There is no objection (see Recommendation B) to the development, but it is necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity of the shale is **VERY HIGH and MODERATE**. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation (Karoo Supergroup) and fossils or if fossils are found during construction or mining. Protocol is attached (Appendix 2).

b. This project may benefit the economy, the life expectancy of the community, the growth of the community and social development in general.

c. Preferred choice: No Alternatives are possible.

d. The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale / mudstone should be set aside if mined.

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ABBREVIATIONS

Acronyms	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GIS	Geographic Information System
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Late Stone Age
LIA	Late Iron Age
MIA	Middle Iron Age
MSA	Middle Stone Age
SAHRA	South African Heritage Resources Agency
KZNDOT	KwaZulu-Natal Department of Transport
PIA	Paleontological Impact Assessment

GLOSSARY

Achievement	▪ Something accomplished, esp. by valour, boldness, or superior ability
Aesthetic	▪ Relating to the sense of the beautiful or the science of aesthetics.
Community	▪ All the people of a specific locality or country
Culture	▪ The sum total of ways of living built up by a group of human beings, which is transmitted from one generation to another.
Cultural	▪ Of or relating to culture or cultivation.
Diversity	▪ The state or fact of being diverse; difference; unlikeness.
Geological (geology)	▪ The science which treats of the earth, the rocks of which it is composed, and the changes which it has undergone or is undergoing.
High	▪ Intensified; exceeding the common degree or measure; strong; intense, energetic
Importance	▪ The quality or fact of being important.
influence	▪ Power of producing effects by invisible or insensible means.
Potential	▪ Possible as opposed to actual.
Integrity	▪ The state of being whole, entire, or undiminished.
Religious	▪ Of, relating to, or concerned with religion.
Significant	▪ important; of consequence
Social	▪ Living, or disposed to live, in companionship with others or in a community, rather than in isolation.
Spiritual	▪ Of, relating to, or consisting of spirit or incorporeal being.
Valued	▪ Highly regarded or esteemed

1.0 INTRODUCTION

1.1 Project Background

Hanslab Environmental Consultants the independent Environmental Assessment Practitioner, was appointed by KZN Department of Transport (KZNDOT). Hanslab Environmental Consultants in turn sub-consulted Tsimba Archaeological Footprints to undertake a Heritage Impact Assessment (HIA) which forms part of the Environmental Impact Assessment (EIA) for the proposed construction of a new Local Road 3296 (Mathunzaneni) with reference number :- *C237/1500/S/1* .KZNDOT is currently addressing the needs of previously disadvantaged rural areas through service delivery in the form of infrastructure development to ensure the safety of all road users. As such, it was concluded that suitable infrastructure must be developed to deal with service delivery issues. The project is located in Estcourt Region / Uthukela District (DC23).

A full HIA and a desktop PIA were requested by the heritage authority as part of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) requirements and it also follows the requirements of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).The terminology used and the methodology followed with regards to the compilation of the HIA are explained and the legal framework stated (see Appendix A). International conventions regarding the protection of cultural resources have also been followed. The ICOMOS Burra Charter (1979) was also consulted in producing this report as part of the international conventions for the protection of cultural heritage places.

1.2 Scope of works

The Proposed project scope of the activities is given in the table below:-

L3296	**Carriageway lane widths**	**Type 7A Local Road (2.5m lane widths)**
Shoulders - left	0.45 m wide gravel shoulder	
Shoulders - right	0.45 m wide gravel shoulder	
Cross fall	4 %	
Super elevation	6 % maximum	
Cut / Fill	1 in 1.5 typical	
Pavement Design	Pavement Depth	300 mm
Gravel Wearing Course Layer	150 mm	
Base Layer	150 mm	

Table 1: Road design standards adopted for the project

Related Infrastructure:

- Gravel road, 2-lane each 2.5m wide,
- Existing services (electrical poles, stay wire, fence line, dwellings, stormwater pipes, low level structures, grave sites, watermarks),
- Reseeding of embankments,
- 0.45 m wide shoulders,
- Culverts 600mm and 900 mm in diameter,
- Road reserve of 5m and 10m on either side, and

- Bus stops on shoulder.

2.0 DESCRIPTION OF THE RECEIVING ENVIRONMENT

2.1 Location and depth

The proposed construction of Construction of new Local Road 3296 (Mathunzaneni) (KM0.00 – KM1.62) will take place in Estcourt/ uThukela District Municipalities, Kwazulu Natal Province.

Figure 1: Map showing the proposed road

Outline of the geology and the palaeontology:
The geology was obtained from map 1:100 000, Geology of the Republic of South Africa (Visser 1984) and 2830 Dundee, 1:250 000 geological map (Wolmarans and Linstrőm 1988).

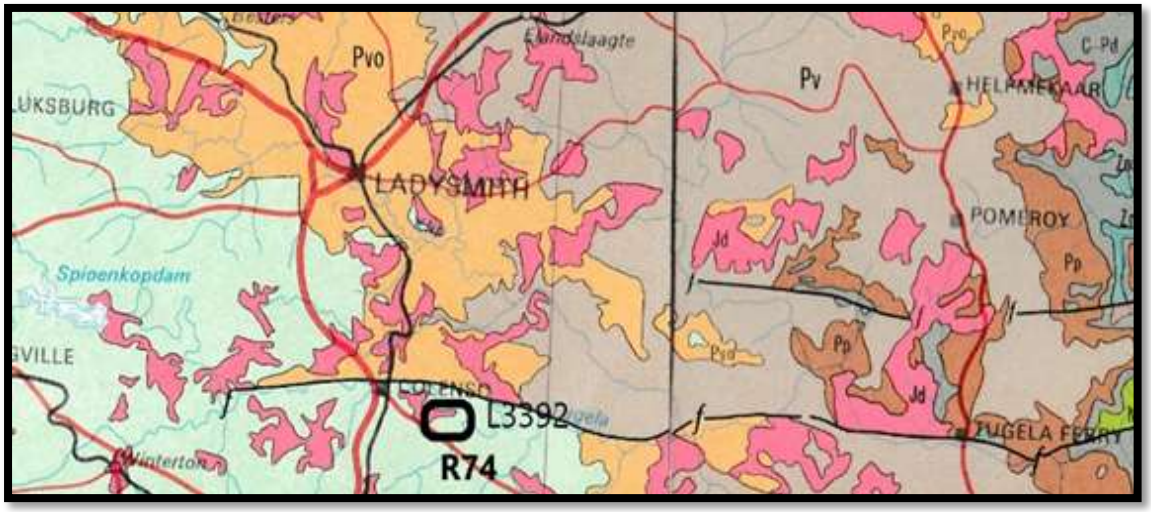

Figure 2: The geology of the development area.

3.0 METHODOLOGY

3.1 Literature review

The background information search of the proposed development area was conducted following the site maps from the client. Sources used in this study included:

- Published academic papers and HIA and PIA studies conducted in and around the region where the proposed infrastructure development will take place;
- Available archaeological literature covering the Kwa-Zulu Natal province area was also consulted;
- The SAHRIS website and the National Data Base was consulted to obtain background information on previous heritage surveys and assessments in the area; and
- Map Archives - Historical maps of the proposed area of development and its surrounds were assessed to aid information gathering of the proposed area of development and its surrounds.

4.0 LEGISLATIVE FRAMEWORK

According to ICOMOS (2011), the impacts of planned developments (internationally) on heritage have typically been assessed within the framework of Environmental Impact Assessment (EIA) (CEU 1997; Bond et al. 2004) and/or Social Impact Assessment (Vanclay et al. 2015). This report is therefore is part of the National EIA regulation, it is developed in terms of the Section 38 (1) of the NHRA, No. 25 of 1999.

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study be undertaken for: -

> *(a) Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*

KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act No 5 of 2018) which lists developments or activities that may require an HIA. Section 41:-

> *(1) The project involves construction of a road, wall, powerline, pipeline, canal or other simila form of linear development or barrier exceeding 300m in length*

The HIA should be submitted, as part of the impact assessment report or EMPr, to KwaZulu-Natal Heritage. The heritage body will finally be responsible for the professional evaluation of Phase 1 HIH reports upon which review comments will be issued. 'Best practice' requires Phase 1 HIH reports and additional development information, as per the impact assessment report and/or EMPr, to be submitted in duplicate to KwaZulu-Natal Heritage after completion of the study. KwaZulu-Natal Heritage accepts Phase 1 HIH reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level). Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession.

5.0 ARCHEOLOGICAL AND HISTORICAL BACKGROUND

The available data, as captured in the inventories of heritage sites of the KwaZulu- Museum, suggests that the area near the study area contains a wide variety of archaeological sites spanning various periods of time and cultural traditions. These include 11 Early Stone Age site, 28 Middle Stone Age sites, 14 Later Stone Age sites, and 48 Later Iron Age sites (including some Middle Iron Age Sites belonging to the Moor Park Tradition), and numerous historical sites dating back to the colonial period.

5.1 Stone Age Period

The Early Stone Age sites occur close to permanent water sources. Some Middle Stone Age flakes, probably dating back to ca. 40 000 – 200 000 years ago, occur in disturbed context in dongas and road cuttings. The majority of Later Stone Age sites as well as rock art sites occur further west in the foothills of the Drakensberg. These typically occur in small shelters in the sandstone formations some leading up to the Drakensberg.

- *Early Stone Age: - Early Stone Age (ESA) dating between 2 million years ago to about 200 000 years ago.*

Gavin Anderson recorded two ESA sites on the R 3 road in Eastcourt, the site consists of two stone-walled archaeological sites on the same ridge of a hill. The first site is near the location of pylon no. 240. This site is a low stone-walled structure. The walling is not well-preserved, but there appears to be an archaeological deposit associated with the walling. This site may date to between 1250 AD and 1440 AD. This site is of medium archaeological significance and any impact will be negative. The second site in this group is near pylon no. 242. The site extends from the existing transmission line to the Ariadne-Venus line path, and has already been negatively affected by the current pylon. The site consists of three to four circular stone-walled structures that may be the remains of houses and a cattle-byre.

There is a potential archaeological deposit at this site. The site is of medium archaeological significance and any impact will be negative.The stone-walled features of this site were accurately mapped. The tower would not affect the site itself, however the access road has the potential to damage portions of the site. After the site was mapped, I walked the access road with the contractors, indicating where the access road may be placed. We specifically demarcated areas where stones were not to be removed, and where the road should be placed when it passed between two stone walls. While the pylon does not directly affect either site, they may be affected by the construction of servitudes such as access roads.

Figure 3: Example of a dry stone walled circle (Pic Credit Beater & Muroyi 2019)

- *Middle Stone Age :- Middle Stone Age (MSA) dating between 200 000 years ago to about 30 000 years ago.*

Justine Wintjes recorded an archaeological site at the junction of Great and little Bushmans rivers just east of the town. Exact locality of the findings was not not recorded however Justine notes that this must be Wells' site 1, described as on top of a ridge between the two rivers, just upstream from the weir. He recorded some chips, flakes, and Ecca shales. The artefacts seems to have been MSA, and are probably referred to on p 152 of Gooch, as palaeolithic from the diluvium, Estcourt. Wells describes from site 1 artefacts of lydiantie with wide range of patintation. He illustrates roughly hollowed side-scrapers, and mentions rough side- and end-scrapers. The industry is not clear from the drawings; I should say Late MSA, not Wilton and not Smithfield N so far as one cn judge. He also found a few sherds and a fragment of mussel (presumably frsh-water). He associates these with huts close to the site, probably rightly. His material was probably given to the Dept Anatomy, University of the Witwatersrand.

There also many dongas on the slopes around and south of Moorleigh. It is not certain certain if any soil-stratification in them has been observed, though there have been seen large pockets of calcrete nodules. These dongas cut into rock, have yielded a good many Beaufort fossils, but little archaeological material. A very few apparently Late Acheulian pieces, heavily weathered of Beaufort sandstone. Some MSA Flakes and tools were discovered byt Wintjes in a very messy donga, quite deep just north of the road and due north of Cornfields were found only a few poor MSA flakes.

- *Later Stone Age :- Later Stone Age (LSA) which dates from 30 000 to about 2 000 year ago.*

Open site with possible deposit. Site consists of a series of stonewalled features and probably an archaeological deposit along the eastern side of the road. The stonewalled features are still well-preserved and a spatial pattern may exist along the the R3 road from Estcourt. Within the same road exists LSA sites of approx 6 stone-walled features on both sides of the road, these were recorded by Gavin Anderson. Archaeological deposit is probably present.

5.2 Iron Age Period

With the arrival of the first Bantu-speaking settlers in the subregion, the southern African demographic landscape was changed some 2 000 years ago. In the most part, these subsistence farmers lived in the low altitude, wooded regions of the eastern seaboard. Around 1250 AD certain agriculturists started occupying the higher altitude, grassland areas. Sites belonging to this period in KwaZulu-Natal are referred to as Moor Park settlements and they typically occupy hill tops with a low stone walling effect.

In grounds of an experimental farm 13 miles west of Estcourt, about 2 miles east of the house on east side of the valley there is a small low shelter beneath a fallen bouder 200' below the kranz. There are 2 groups of paintings, on the right 3 red running men and white eland. On the left a mixed group of faded paintings many of which are red buck en echelon. Several of them are red and brown men, white buck, 2 black buck-heads full-face with fine. One is superposed on a brown man with probably animal-mask and large prickly penis at rest, 2 seated figures with knees drawn up, in profile. Superposed on a polychrome is a lanky brown man holding upright a feathered javelin and with very dishevelled hair (horns).

Many painted rock-chips have fallen and may be buried at this site. In the Natal Museum: 13 pieces: 1 smalll sandstone cup, lamp, hollow scrapers, 2 side-scrapers, 5 end-scrapers, 1 chip, are kept there and are perhaps never been used. Probably from this site came material labelled de Hoek in Archaeological Survey, Johannesburg. It is reported that there is buried at the site a large slab used as an assegai-sharpener. There was another just up the hill, which the Soil Conservation blasted out.

6.0 HISTORICAL BACKGROUND OF THE GREATER ESTCOURT IN RELATION TO THE STUDY AREA

The historical period covers the colonialist era that began around 1830 AD when the first missionaries and Dutch immigrants arrived from the Maloti Drakensberg area of the Cape Colony.Today Estcourt houses a number of colonial heritage sites. Some of these are

- Greystone, Farm Vegt Lager 801, Estcourt District :- 29°04'10"S 29°48'00"E

This provincial heritage site is a single storey farmhouse with verandas to front and side, wide stone steps leading to main entrance, This impressive Victorian farmhouse, with its ornamental wood-decorated veranda, was built in 1873 by Sir Frederick Moor. He was the last Prime Minister of the Colony of Natal. Type of site: House Previous use: house. Current use: house & other: conference centre. This impressive Victorian farmhouse, with its ornamental wood-decorated verandah, was built in 1873.

- Bulwer Bridge and Old Toll House, Colenso, Estcourt Distric :- 28°44'10"S 29°49'10"E

This provincial heritage site is the oldest stone and steel structure in the Republic, while the Toll House is the oldest building in Colenso and also the only surviving toll house in Natal. Type of site: Bridge, Toll Previous use: other: toll house. Current use: bridge. From the N3 take the Colenso Ladysmith turn-off. Pass the first turn-off to Colenso and take the sec. The Bulwer Bridge is the oldest stone and steel structure in the Republic.

- Fort Durnford, Kemps Road, Estcourt :- 29°00'00"S 29°53'00"E

In 1847 a detachment of the 45th Regiment was sent from Fort Napier in Pietermaritzburg to protect the Boers in that region from the raids of the Bushmen. For their station they chose the flat top of a hill across the Bushman's River from Saailaer. This w Type of site: Fort Previous use: fortifications and stables. Current use: Museum.

Coming into Estcourt from Pietermaritzburg turn right onto Kemps Road just before crossing the railw. This extensive fortification was designed by Colonel A.W. Durnford and erected in 1874.

- Settler Cottage, 87 Lorne Street, Estcourt :- 29°52'37"S 29°00'40"E

Small cottage under thatch; open front stoep of shale and sandstone with tiled top and wooden pillar The erf was surveyed in 1863 and it appears the house was built shortly thereafter as it is recorded as one of the earliest house in Estcourt. Architectural style: vernacular cottage. Type of site: House Previous use: house. Current use: shop?. Entering Escourt from Pmb. route becomes Lorne Street after crossing river. 87 is on left. From town. A very rare early settler cottage under thatch, reputed to be the oldest house in Estcourt.

- Brynbella Battlefield Stone Wall, Farm Tamboekieskraal 1927 , Estcourt District :- 29°06'00"S 29°56'00"E

Undressed dolorite boulders, comparatively narrow, approx 5 ft (2 m) high and in several places capped by t At least part of the wall was in existence when the farm was acquired by the Symmons family in 1870. This dolomite wall was presumably erected during the period 1870–1880 as boundary between the farms Tamboekies Kraal and Zuurbraak. The Boers, after the Type of site: Battlefield Previous use: battlefield (on). Current use: wall. This dolorite wall was presumably erected during the period 1870–1880 as boundary between the farms.

- Marianne Church Ruins, Farm Doveton, Estcourt Distric :- 29°00'00"S 29°53'00"E

These ruins are the remains of the second Dutch Reformed church erected in Natal and which was in use from 1852 to 1874. It was named after the wife of the then minister of Pietermaritzburg, Dr Faure. Type of site: Church, Ruins Previous use: church. Current use: abandoned. These ruins are the remains of the second Dutch Reformed Church erected in Natal.

- Old Agricultural Hall, Harding Street, Estcourt : - 29°00'00"S 29°53'00"E

One-and-a-half storeyed hall of unique design; roof of varied rhythms with ventilation turret Architectural style: neo-Classical. Type of site: Hall Agriculture Current use: hall. Entering Escourt from Pmb. Turn right into Harding Street at railway station. Site is immediately on. An impressive sandstone building designed by Kent and Price and officially opened in December 1901; designed in the neo-Classical style the Agricultural Hall forms a unique civic complex together with the adjacent City Hall.

7.0 DISCUSSION OF FINDINGS

The study area part of the Bushmans and Mooi river drainage into the Tugela river. The area is of marked relief, ranging in altitude from 700 to 1 300 m above sea level and is located geologically in the Ecca Group (Edwards 1967).The ubiquitous feature of most of the site is woody cover, for all topographic units (plains, hill slopes, river bank and river terrace). The woody cover is greater on hill slopes than on the plains and on north facing slopes rather than on south-facing slopes. The woody cover is accompanied by a change in composition from open or mixed woodland, to one dominated by Acacia species. In some cases, scrub Acacia individuals are evident and some have grown into mature trees. Bush clumps have also developed. Broad-leafed species dominate on moist south-facing slopes and at higher altitudes. Various vegetation changes have taken place due to overgrazing since this is a rural area.

Large river valleys are drier and hotter than mountain crests because of orographic effects on rainfall and temperature. Aspect and slope further influence moisture and radiation balance. Land-use practices of relevance to the present study include communal and commercial rangeland. A detailed description of the study area can be found in Edwards (1967). The vegetation of the highest points tends toward open grassland, while that of the valleys is a complex range of savanna types related to topography and local climate (Edwards 1967).

A complete description of an impact on an archaeological site will include an indication of the amount of change, its extent in three-dimensional space, its duration (temporary, permanent, or as measured in hours or years), and something of its characteristic behavior (rapidity of onset, potential reversibility, and possible synergistic action with other impacts). On the day of the survey we noticed that the road had already been cleared off, some work had been done in the past few days before we got on site. This would obviously have disturbed any occurances of archaeological sites within the proposed road reserve.

The clearing of the road would also mean that possible archaeological tools lying beneath the earth's surface would have been exposed during the excavations. The archaeological record of the proposed project area would have been modified. Schiffer (1976:15-16) has also noted some of the natural processes ("n-transforms") that act to modify the archaeological record. That is, that translate systemic context into archaeological context. Soil is not a static body; it is a dynamic, open system, in which a variety of processes may act to move not only soil matter, but objects (including artifacts), from one position to another. It must therefore be noted that the removal of the soil from its context means that if there were archaeological artifacts they would have been moved as well.

The field survey did note any existence of cultural heritage landscapes, living heritage or archaeological sites. It is possible that graves may still exist within homesteads, these would need to be identified and and marked for possible excumation.

7.1 PHOTOGRAPHIC PRESENTATION OF THE PROJECT SITE

Figure 4: View of the study area already disturbed

Figure 5: Part of the road reserve showing the cleared road and the mountainous landscape in some area

Figure 6: A view of the vegetation of the study area

Figure 7: The different terrain of the landscape

Figure 8: View of some of the geological features along the proposed road reserve

Figure 9: View of a neighbourhood the study area traverses through

8.0 HERITAGE ASSESSMENT OF SIGNIFICANCE

The significance of a site can be modified or added to. Its importance can be increased by communicating the significance to more people through the media or archaeological reports. Site significance classification standards prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purposes of this report.

- The main aim in assessing significance is to produce a succinct statement of significance, which summarises an item's heritage values. The statement is the basis for policies and management structures that will affect the item's future.

SAHRA's Site significance classification minimum standards			
Filed Rating	**Grade**	**Classification**	**Recommendation**
National Significance (NS)	Grade 1		Conservation; National Site nomination
Provincial Significance (PS)	Grade 2		Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)		High/ Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)		Medium Significance	Recording before destruction
Generally Protected C (GP.A)		Low Significance	Destruction

Site significance is calculated by combining the following concepts in the given formula.

S= (E+D+M) P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

The significance weightings for each potential impact are as follows:		
Aspect	**Description**	**Weight**
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8

Impact Significance		
It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. (S) is formulated by adding the sum of numbers assigned to Extent (E), Duration (D), and Intensity (I) and multiplying the sum by the Probability. S= (E+D+M) P		
<30	Low	Mitigation of impacts is easily achieved where this impact would not have a direct influence on the decision to develop in the area.
30-60	Medium	Mitigation of impact is both feasible and fairly easy. The impact could influence the decision to develop in the area unless it is effectively mitigated.
>60	High	Significant impacts where there is difficult. The impact must have an influence on the decision process to develop in the area.
Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low(2)
Probability	Not Probable (2)	Not probable (2)
Significance	Low (16)	Low(16)
Status	Negative	Negative
Reversibility	Not irreversible	Not irreversible
Irreversible loss of resources	No resources were recorded	No resources were recorded
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.	Yes
Mitigation: Impacts are rated as <30 (Low) Mitigation of impacts is easily achieved where this impact would not		

have a direct influence on the decision to develop in the area.

Due to the lack of apparent significant heritage resources no further mitigation is required prior to construction. A Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.

8.0 Conclusions

Summary of cultural heritage findings: The desktop study noted the existence of archaeological sites representing a full archaeological sequence from the Stone Age to the Iron Age period. The historical periods of the greater Estcourt are was found to be very rich. The greater area is home to a number of colonial heritage sites. No cultural heritage sites, tools or part of living heritage sites were noted within the proposed development footprint during the site visit. It was however noted that the ground has been greatly disturbed through a road upgrade that removed the top soils. It is therefore the author(s) conclusion that the project is acceptable and should be allowed to proceed. A public participation process was carried out by Hanslab and no- comments or objections to the project were received. No graves were also reported within the proposed development footprint.

8.1 Recommendations

- No further mitigation is given except for ;
- An accredited archaeologist should be consulted to monitor the projects during the construction phase. Monitoring should include
- A Chance finds procedure (CFP) should also be implemented in the event that stone tools are identified underground (See Appendix 1)

Summary of Paleontological findings: - There is no objection (see Recommendation B) to the development, but it is necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity of the shale is **VERY HIGH and MODERATE**. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation (Karoo Supergroup) and fossils or if fossils are found during construction or mining. Protocol is attached (Appendix 2).

b. This project may benefit the economy, the life expectancy of the community, the growth of the community and social development in general.

c. Preferred choice: No Alternatives are possible.

d. The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale / mudstone should be set aside if mined.

9.0 PALEONTOLOGICAL STUDY

9.1 Summary

When rock units of moderate to very high palaeontological sensitivity are present within the development footprint, a desk top and or field scoping (survey) study by a professional palaeontologist is usually warranted. The main purpose of a field scoping (survey) study would be to identify any areas within the development footprint where specialist palaeontological mitigation during the construction phase may be required (SG 2.2 SAHRA AMPHOB, 2012).

9.2 Outline of the geology and the palaeontology

The geology was obtained from map 1:100 000, Geology of the Republic of South Africa (Visser 1984) and 2830 Dundee, 1:250 000 geological map (Wolmarans and Linstrőm 1988).

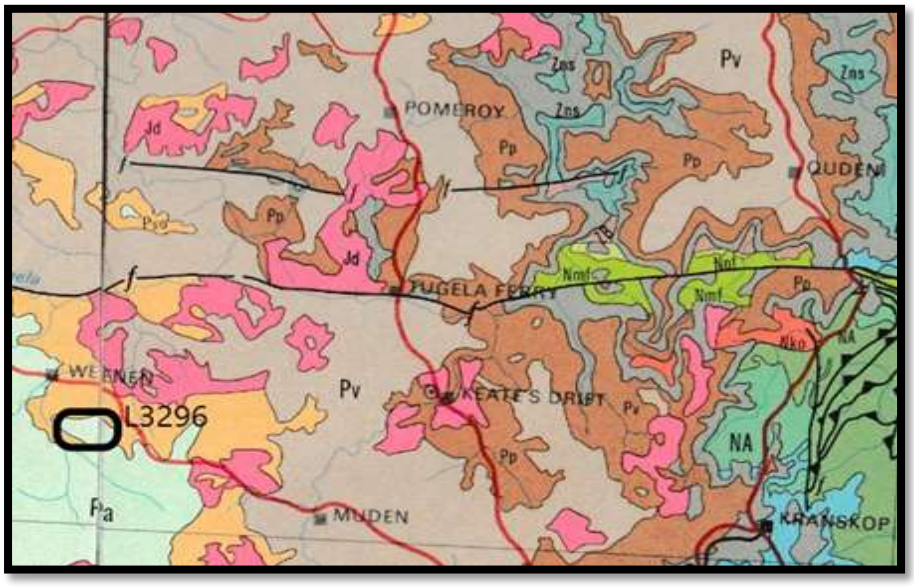

Figure 10: The geology of the development area

Legend to Map and short explanation.
Pa – Sandstone, mudstone, svx
iltstone (green). Adelaide Subgroup, Beaufort Group, Karoo Supergroup. Early Triassic.
Pvo – Mudstone, siltstone, shale (amber). Volksrust Formation, Ecca Group, Karoo Supergroup. Permian.
Pv – Shale, shaly sandstone, grit, sandstone, conglomerate and coal in places near base and top (brown). Vryheid Formation, Ecca Group, Karoo Supergroup. Permian.
…… – (black) Lineament (Possible dyke).
--f— Fault.
⊥10˚ - Strike and dip.
□ – Approximate position of road upgrades.

Mining Activities on Figure:
None.
Mining past and present has no influence on the project.

The Adelaide Subgroup consists of up to three formations (Koonap, Middleton, Balfour). Mudrock predominates with subordinate sandstone and is Upper Permian in age. It overlies the Ecca Group conformably and is overlain by the Katberg Formation of the Tarkastad Subgroup. Siltstone beds are common (Cole *et al.* 2004). The Balfour Formation is distinguished from the Middleton Formation by the lack of 'red' mudstone and is ±2150 m. thick, whereas the Middleton Formation is ±1600 m. thick (sheet info, Kent 1980). The Abrahamskraal and Teekloof Formations also form part of the Adelaide Subgroup (Snyman 1996). Chert is present in the Abrahamskraal Formation. The Adelaide Subgroup has a maximum thickness of 1750 m. in the south (Visser 1989).

The Ecca Group is early to mid-Permian (545-250 Ma) in age. Sediments of the Ecca group are lacustrine and marine to fluvio-deltaic (Snyman 1996). The Ecca group is known for its coal (mainly the Vryheid Formation) (five coal seams) and uranium. Coalfields formed due to the accumulation of plant material in shallow and large swampy deltas (see Appendix 1). The Ecca Group conformably overlies the Dwyka Group and is conformably overlain by the Beaufort Group, Karoo Supergroup. It consists essentially of mudrock (shale), but sandstone-rich units occur towards the margins of the present main Karoo basin in the south, west and north-east, with coal seams also being present in the north-east (Kent 1980, Johnson 2009).

Kent (1980) described the Volksrust Formation as the 150-270 m of shale which overlies the Vryheid Formation. The deposition of this formation coincides with that of the Fort Brown and Waterford Formations in the south (Snyman 1996). It occurs from the south of Kwazulu-Natal into the Free State and is concordant (Visser 1989). Very little is written on the Volksrust Formation. It rests conformably on the Vryheid Formation. Fossils consist of fish scales and wood. This formation reaches thicknesses of 170-270 m (Visser 1989). A monotonous sequence of grey shale is present and fossils are significant, but very rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, petrified wood, and low-diversity marine to non-marine trace fossil assemblages (Groenewald and Groenewald 2014).

The Vryheid Formation is named after the type area of Vryheid-Volksrust. In the north-eastern part of the basin the Vryheid Formation thins and eventually wedges out towards the south, southwest and west with increasing distance from its source area to the east and northeast (Johnson 2009). The Vryheid Formation consists essentially of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500 m. It forms part of the Middle Ecca (Kent 1980). This formation has the largest coal reserves in South Africa. The pro-delta sediments are characterised by trace and plants fossils (Snyman 1996).

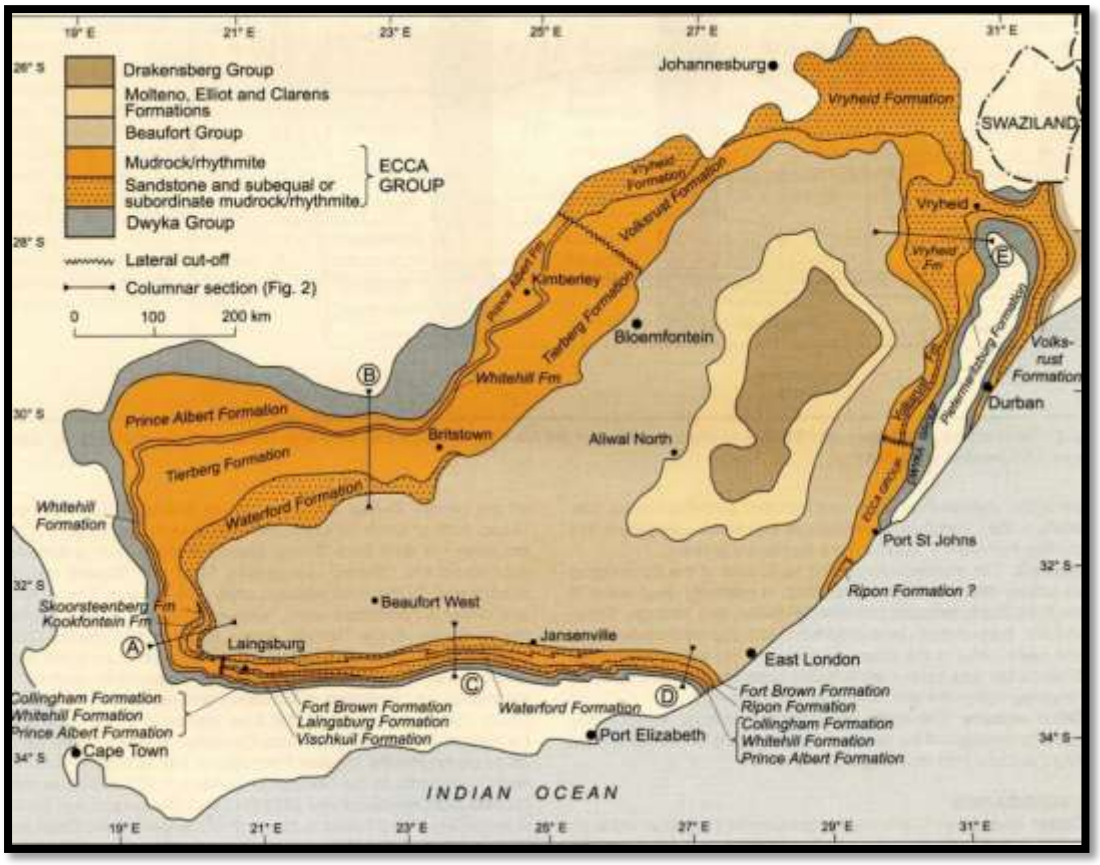

Figure 11: Extent of the Karoo Supergroup (Johnson 2009)

The rocks of the Karoo Supergroup are internationally acclaimed for their richness and diversity of fossils. The rocks of the Beaufort Group of South Africa cover approximately one-third of the land surface and have yielded an abundance of well-preserved therapsids and other tetrapods which have been used to subdivide this Group into eight faunal Assemblage Zones.

Fossil vertebrates are found in the thick mudrock of the Adelaide Subgroup. Fossils of *Diictodon, Ictidosuchops, Gorgonops* and the amphibian *Rhinesuchus* are frequently preserved as articulated skeletons within the mudrock present in the *Daptocephalus* Assemblage Zone (Figure 8). Fossil fish (*Atherstonia*) and the captorhinid *Pareiasaurus* have also been recorded. Other fossils that occur are *Procynosuchus, Tetracynodon, Lycaenops, Ictidorhinus, Dicynodon, Youngina,* to name but a few (Rubidge 1995).

Figure 12: Typical Karoo scene during the Upper Permian times (Cluver 1978)

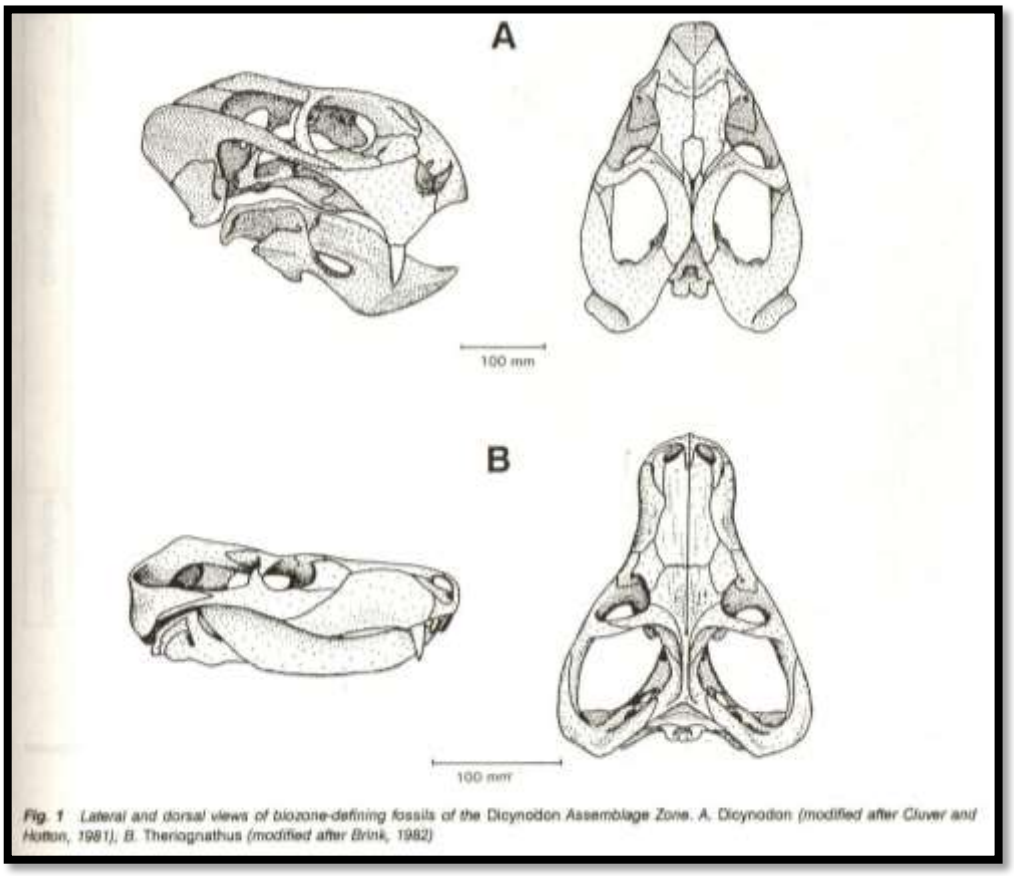

Fig. 1 Lateral and dorsal views of biozone-defining fossils of the Dicynodon Assemblage Zone. A. Dicynodon (modified after Cluver and Hotton, 1981), B. Theriognathus (modified after Brink, 1982)

Figure 13: Examples of the Zone fossils (Rubidge 1995)

The Volksrust Formation consists of a monotonous sequence of grey shale and fossils are significant, but very rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, fish scales, petrified wood, and low-diversity marine to non-marine trace fossil assemblages (Groenewald and Groenewald 2014).

The Ecca Group, Vryheid Formation may contain fossils of diverse non-marine trace, *Glossopteris* flora, mesosaurid reptiles, palaeoniscid fish, marine invertebrates, insects, and crustaceans (Johnson 2009). *Glossopteris* trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal. It is only in the northern part of the Karoo Basin that the glossopterids and cordaitales, ferns, clubmosses and horsetails thrived (McCarthy and Rubidge 2005).

The Glossopteris flora is thought to have been the major contributor to the coal beds of the Ecca. These are found in Karoo-age rocks across Africa, South America, Antarctica, Australia and India. This was one of the early clues to the theory of a former unified Gondwana landmass (Norman and Whitfield 2006).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH, but here locally **MODERATE** for the Volksrust Formation, and **VERY HIGH** for the Adelaide Subgroup and Vryheid Formation.

Adelaide (Pa / Pne)		Deltaic and fluvial sequences of sandstone and green-grey mudstone	Dicynodon and Lystrosaurus assemblage zones. Fish, amphibians, reptiles, therapsids and vertebrate burrows
Normandien (Pn)	Harrismith	Lacustrine environment. Fine-grained brightly coloured siltstone	Lystrosaurus Assemblage zone. Fish, amphibians, reptiles, therapsids and vertebrate burrows
	Schoondraal	Meandering river channel sandstone	Dicynodon Assemblage Zone
	Rooinek	Meandering river channel sandstone	Glossopteris tree fossils and insect wings
Estcourt (Pe / Pes) / Emakwezini (Pem)		Deltaic Coarse-grained sandstone and shale	Trace Fossils, including areas in the Estcourt Area, plant fossils of Glossopteris
Volksrust (Pvo)		Dark Grey Shale	Trace Fossils
Vryheid (Pv)		Light grey coarse- to fine-grained sandstone and siltstone. Dark coloured siltstone due to presence of carbon enrichment and coal beds	Abundant plant fossils of Glossopteris and other plants. Trace fossils. The reptile *Mesosaurus* has been found in the southern part of the Karoo Basin

Table 2: Taken from Paleontological Report (Groenewald 2012)

Rock Unit	Significance/vulnerability	Recommended Action
Adelaide Subgroup	Very High	Field assessment and protocol for finds is required
Volksrust Formation	Moderate	Desktop survey and Phase 1 PIA is recommended
Vryheid Formation	Very High	Field assessment and protocol for finds is required

Table 3: Criteria used (Fossil Heritage Layer Browser/SAHRA)

Databases and collections: Ditsong: National Museum of Natural History. Evolutionary Studies Institute, University of the Witwatersrand (ESI).

Impact: **MODERATE**, **VERY HIGH** for the Volksrust Formation, Adelaide Subgroup and Vryheid Formation, Beaufort Group, Karoo Supergroup. There are significant fossil resources that may be impacted by the development (mudstone, shale) and if destroyed are no longer available for scientific research or other public good (Almond, *et al.* 2009).

9.3 Description of the Methodology

The palaeontological impact assessment desktop study was undertaken in April 2020. A Phase 1: Field Survey of the affected portion will include photographs (in 7.1 mega pixels) taken of the site with a digital camera (Canon PowerShot A470). Additionally, Google.maps will be accessed on a cellular phone for navigation. A Global Positioning System (GPS) (Garmin eTrex 10) is used to record fossiliferous finds and outcrops (bedrock) when the area is not covered with topsoil, subsoil, overburden, vegetation, grassland, trees or waste. The survey did identify the Karoo Supergroup. A literature survey is included and the study relied heavily on geological maps.

SAHRA document 7/6/9/2/1 (SAHRA 2012) requires track records/logs from archaeologists not palaeontologists as palaeontologists concentrate on outcrops which may be recorded with a GPS. Isolated occurrences of rocks usually do not constitute an outcrop. Fossils can occur in dongas, as nodules, in fresh rock exposures, and in

riverbeds. Finding fossils require the experience and technical knowledge of the professional palaeontologist, but that does not mean that an amateur can't find fossils. The geology of the region is used to predict what type of fossil and zone will be found in any particular region. Archaeozoologists concentrate on more recent fossils in the quaternary and tertiary deposits.

Assumptions and Limitations (**1e**):-
The accuracy and reliability of the report may be limited by the following constraints:

1. Most development areas have never been surveyed by a palaeontologist or geophysicist.
2. Variable accuracy of geological maps and associated information.
3. Poor locality information on sheet explanations for geological maps.
4. Lack of published data.
5. Lack of rocky outcrops.
6. Inaccessibility of site.
7. Insufficient data from developer and exact lay-out plan for all structures.

A Phase 2 Palaeontological Impact Assessment: Mitigation will include:

1. Recommendations for the future of the site.
2. Description of work done (including number of people and their responsibilities.
3. A written assessment of the work done, fossils excavated, not removed or collected and observed.
4. Conclusion reached regarding the fossil material.
5. A detailed site plan.
6. Possible declaration as a heritage site or Site Management Plan.

The National Heritage Resources Act No. 25 of 1999 further prescribes.

Act No. 25 of 1999. National Heritage Resources Act, 1999.
National Estate: 3 (2) (f) archaeological and palaeontological sites,
(i)(1) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens,
Heritage assessment criteria and grading: (a) Grade 1: Heritage resources with qualities so exceptional that they are of special national significance;
(b) Grade 2: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and (c) Grade 3: Other heritage resources worthy of conservation.
SAHRA is responsible for the identification and management of Grade 1 heritage resources.
Provincial Heritage Resources Authority (PHRA) identifies and manages Grade 2 heritage resources.
Local authorities identify and manage Grade 3 heritage resources.

No person may damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of a provincially protected place or object without a permit issued by a heritage resources authority or local authority responsible for the provincial protection.
Archaeology, palaeontology and meteorites: Section 35.
(2) Subject to the provisions of subsection (8) (a), all archaeological objects, palaeontological material and meteorites are the property of the State.
(3) 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.

Mitigation involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or excavation, recording and sampling of fossil heritage that might be lost during development,

together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before a Phase 2 may be implemented.

The Mitigation is done in order to rescue representative fossil material from the study area to allow and record the nature of each locality and establish its age before it is destroyed and to make samples accessible for future research. It also interprets the evidence recovered to allow for education of the public and promotion of palaeontological heritage.

Should further fossil material be discovered during the course of the development (*e. g.* during bedrock excavations), this must be safeguarded, where feasible *in situ,* and reported to a palaeontologist or to the Heritage Resources authority. In situations where the area is considered palaeontologically sensitive (*e. g.* Karoo Supergroup Formations, ancient marine deposits in the interior or along the coast) the palaeontologist might need to monitor all newly excavated bedrock. The developer needs to give the palaeontologist sufficient time to assess and document the finds and, if necessary, to rescue a representative sample.

When a Phase 2 palaeontological impact study is recommended, permission for the development to proceed can be given only once the heritage resources authority has received and approved a Phase 2 report and is satisfied that (a) the palaeontological resources under threat have been adequately recorded and sampled, and (b) adequate development on fossil heritage, including, where necessary, *in situ* conservation of heritage of high significance. Careful planning, including early consultation with a palaeontologist and heritage management authorities, can minimise the impact of palaeontological surveys on development projects by selecting options that cause the least amount of inconvenience and delay.

Three types of permits are available; Mitigation, Destruction and Interpretation. The specialist will apply for the permit at the beginning of the process (SAHRA 2012).

7.1 Description of significant fossil occurrences

All Karoo Supergroup geological formations are ranked as **LOW** to **VERY HIGH**, and here the impact is potentially **VERY HIGH** for the Adelaide Subgroup and Vryheid Formation and **MODERATE** for the Volksrust Formation.

Fossil vertebrates are found in the thick mudrock of the Adelaide Subgroup. Fossils of *Diictodon, Ictidosuchops, Gorgonops* and the amphibian *Rhinesuchus* are frequently preserved as articulated skeletons within the mudrock present in the *Daptocephalus* Assemblage Zone (Figure 16). Fossil fish (*Atherstonia*) and the captorhinid *Pareiasaurus* have also been recorded. Other fossils that occur are *Procynosuchus, Tetracynodon, Lycaenops, Ictidorhinus, Dicynodon, Youngina,* to name but a few (Rubidge 1995).

The Volksrust Formation consists of a monotonous sequence of grey shale and fossils are significant, but very rarely recorded. Fossils include rare temnospondyl amphibian remains, invertebrates, minor coals with plant remains, fish scales, petrified wood, and low-diversity marine to non-marine trace fossil assemblages (Groenewald and Groenewald 2014).

Fossils likely to be found are mostly plants (Appendix 1) such as '*Glossopteris* flora' of the Vryheid Formation. The aquatic reptile *Mesosaurus* and fossil fish may also occur with marine invertebrates, arthropods and insects. Trace fossils can also be present. During storms a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these

areas and wherever they are found, they constitute most valuable palaeobotanical records (Plumstead 1963) and can be used in palaeoenvironmental reconstructions.

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to be determined due to thick topsoil, subsoil, overburden and alluvium. Depth of the overburden may vary a lot.

The threats are:- earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, the sealing-in or destruction of fossils by development, vehicle traffic, and human disturbance. See Description of the Geological Setting (F) above.

9.4 Recommendation

a. There is no objection (see Recommendation B) to the development, but it is necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity of the shale is **VERY HIGH and MODERATE**. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation (Karoo Supergroup) and fossils or if fossils are found during construction or mining. Protocol is attached (Appendix 2).
b. This project may benefit the economy, the life expectancy of the community, the growth of the community and social development in general.
c. Preferred choice: No Alternatives are possible.
d. The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. A sample of shale / mudstone should be set aside if mined.

Sampling and collecting **(6m,6k)**:
Wherefore a permit is needed from the South African Heritage Resources Agency (SAHRA / PHRA).

a. Objections: Cautious. See heritage value and recommendation.
b. Conditions of development: See Recommendation.
c. Areas that may need a permit: Yes.
d. Permits for mitigation: **Needed from SAHRA/Amafa Research Institute prior to Mitigation**.

9.5 Conclusions

a. All the land involved in the development was assessed and none of the property is unsuitable for development (see Recommendation B).
b. All information needed for the Phase 1 Palaeontological Impact Assessment and Field scope was provided by the Sub- Consultant. All technical information was provided by Hanslab Environmental Consultants
c. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed.
d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. Especially shallow caves.

e. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment (fossils) and adjacent areas as well as for safety and security reasons.

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APPENDIX 1: PROTOCOL FOR CHANCE FINDS AND MANAGEMENT PLAN

This section covers the recommended protocol for a Phase 2 Mitigation process as well as for reports where the Palaeontological Sensitivity is **LOW**; this process guides the palaeontologist / palaeobotanist on site and should not be attempted by the layman / developer. As part of the Environmental Authorisation conditions, an Environmental Control Officer (ECO) will be appointed to oversee the construction activities in line with the legally binding Environmental Management Programme (EMPr).

- The EMPr already covers the conservation of heritage and palaeontological material that may be exposed during construction activities.
- For a chance find, the protocol is to immediately cease all construction activities, construct a 30 m no-go barrier, and contact SAHRA for further investigation. Construction workers must be informed that this is a no-go area.
- It is recommended that the EMPr be updated to include the involvement of a palaeontologist for pre-construction training of the ECO or during the digging and excavation phase of the development or a site visit once a month during construction after drilling, excavating and blasting.
- The ECO must visit the site weekly and keep a photographic record.

The developer must survey the areas affected by the development and indicate on plan where the construction / development / mining will take place. Trenches have to be dug to ascertain how deep the sediments are above the bedrock (can be a few hundred metres). This will give an indication of the depth of the topsoil, subsoil, and overburden, if need be trenches should be dug deeper to expose the interburden.

Mitigation will involve recording, rescue and judicious sampling of the fossil material present in the layers sandwiched between the geological / coal layers. It must include information on number of taxa, fossil abundance, preservational style, and taphonomy. This can only be done during mining or excavations. In order for this to happen, in case of coal mining operations, the process will have to be closely scrutinised by a professional palaeontologist / palaeobotanist to ensure that only the coal layers are mined and the interlayers (siltstone and mudstone) are surveyed for fossils or representative sampling of fossils are taking place.

The palaeontological impact assessment process presents an opportunity for identification, access and possibly salvage of fossils and add to the few good plant localities. Mitigation can provide valuable onsite research that can benefit both the community and the palaeontological fraternity.

A Phase 2 study is very often the last opportunity we will ever have to record the fossil heritage within the development area. Fossils excavated will be stored at a National Repository.

A Phase 2 Palaeontological Impact Assessment: Mitigation will include (SAHRA) -

1. Recommendations for the future of the site.
2. Description and purpose of work done (including number of people and their responsibilities).
3. A written assessment of the work done, fossils excavated, not removed or collected and observed.
4. Conclusion reached regarding the fossil material.
5. A detailed site plan and map.
6. Possible declaration as a heritage site or Site Management Plan.
7. Stakeholders.
8. Detailed report including the Desktop and Phase 1 study information.
9. Annual interim or progress Phase 2 permit reports as well as the final report.
10. Methodology used.

Mitigation involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or excavation, recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before a Phase 2 may be implemented.

The Mitigation is done in order to rescue representative fossil material from the study area to allow and record the nature of each locality and establish its age before it is destroyed and to make samples accessible for future research. It also interprets the evidence recovered to allow for education of the public and promotion of palaeontological heritage.

Should further fossil material be discovered during the course of the development (*e. g.* during bedrock excavations), this must be safeguarded, where feasible *in situ,* and reported to a palaeontologist or to the Heritage Resources authority. In situations where the area is considered palaeontologically sensitive (*e. g.* Karoo Supergroup Formations, ancient marine deposits in the interior or along the coast) the palaeontologist might need to monitor all newly excavated bedrock. The developer needs to give the palaeontologist sufficient time to assess and document the finds and, if necessary, to rescue a representative sample.

When a Phase 2 palaeontological impact study is recommended, permission for the development to proceed can be given only once the heritage resources authority has received and approved a Phase 2 report and is satisfied that (a) the palaeontological resources under threat have been adequately recorded and sampled, and (b) adequate development on fossil heritage, including, where necessary, *in situ* conservation of heritage of high significance. Careful planning, including early consultation with a palaeontologist and heritage management authorities, can minimise the impact of palaeontological surveys on development projects by selecting options that cause the least amount of inconvenience and delay.

Three types of permits are available; Mitigation, Destruction and Interpretation. The specialist will apply for the permit at the beginning of the process (SAHRA 2012).

The Palaeontological Society of South Africa (PSSA) does not have guidelines on excavating or collecting, but the following is suggested:

1. The developer needs to clearly stake or peg-out (survey) the areas affected by the mining/ construction/ development operations and dig representative trenches and if possible supply geological borehole data. When the route is better defined, it is recommended that a specialist undertake a 'walk through' of the entire road as well as construction areas, including camps and access roads, prior to the start of any construction activities, this may be done in sections.
2. Fossils likely to occur are for example the therapsids from the Middleton Formation, these are present in the mudstone (or any other fossiliferous layer ranked as VERY HIGH or HIGH) or other vertebrates from the Beaufort Group (or any other fossiliferous layer). The palaeontologist needs to survey the overburden, subsoil and topsoil at least once a week.
3. When clearing vegetation, topsoil, subsoil or overburden, hard rock (outcrop) is found, the contractor needs to stop all work.
4. A Palaeobotanist / palaeontologist (contact SAHRIS for list) must then inspect the affected areas and trenches for fossiliferous outcrops / layers. The contractor / developer may be asked to move structures, and put the development on hold.
5. If the palaeontologist / palaeobotanist is satisfied that no fossils will be destroyed or have removed the fossils, development and removing of the topsoil can continue.

6. After this process the same palaeontologist / palaeobotanist will have to inspect and offer advice through the Phase 2 Mitigation Process. Bedrock excavations for footings may expose, damage or destroy previously buried fossil material and must be inspected.
7. When permission for the development is granted, the next layer can be removed, if this is part of a fossiliferous layer, then with the removal of each layer of sediment, the palaeontologist / palaeobotanist must do an investigation (a minimum of once every week).
8. At this stage the palaeontologist / palaeobotanist in consultation with the developer / mining company must ensure that a further working protocol and schedule is in place. Onsite training should take place, followed by an annual visit by the palaeontologist / palaeobotanist.

Fossil excavation if necessary during Phase 2:

1. Photography of fossil / fossil layer and surrounding strata.
2. Once a fossil has been identified as such, the task of extraction begins.
3. It usually entails the taking of a GPS reading and recording lithostratigraphic, biostratigraphic, date, collector and locality information.
4. Using Paraloid (B-72) as an adhesive and protective glue, parts of the fossil can be kept together (not necessarily applicable to plant fossils).
5. Slowly chipping away of matrix surrounding the fossil using a geological pick, brushes and chisels.
6. Once the full extent of the fossil / fossils are visible, it can be covered with a plaster jacket (not necessarily applicable to plant fossils).
7. Chipping away sides to loosen underside.
8. Splitting of the rock containing palaeobotanical material should reveal any fossils sandwiched between the layers.

This document forms part of the Environmental Monitoring Programme. For practical reasons a palaeontologist/palaeobotanist may be required to be on site once a week. If any fossil material is discovered then a Phase 2 rescue operation may be necessary, and a permit will be required.

The South African Heritage Resources Agency has the following documents in place:
Guidelines to Palaeontological Permitting policy.
Minimum Standards: Palaeontological Component of Heritage Impact Assessment reports.
Guidelines for Field Reports.
Palaeotechnical Reports (Eastern Cape, North West, Northern Cape, Mpumalanga, Gauteng, Western Cape, Free State, Kwazulu Natal, and Limpopo).

APPENDIX 2: LISTING POINTS IN APPENDIX 6 OF THE ACT AND POSITION IN REPORT (BOLD IN TEXT).

Section in Report	Point in Act	Heading in Report
B	1(c)	Outline of development project
	1(d)	Summary of findings
	1(g)	Concerns/threats
	1(n)i	Concerns/threats
	1(n)ii	Concerns/threats
	1(o)	Concerns/threats
	1(p)	Concerns/threats
D	1(h)	Figures
	1(a)i	Terms of reference
H	1(e)	Description of Methodology
	1(i)	Assumptions and Limitations
I	1(f)	Heritage value
J	1(j)	Recommendation
	1(l)	Recommendation
	1(m)	Sampling and collecting
	1(k)	Sampling and collecting
Declaration	1(b)	Declaration
Appendix 1	1(k)	Protocol for finds
	1(m)	Protocol for finds
	1(q)	Protocol for finds