PHASE ONE HERITAGE IMPACT ASSESSMENT AND DESKTOP PALAEONTOLOGICAL IMPACT ASSESSMENT

FOR THE PROPOSED LIGHT INDUSTRIAL ESTATE ON REM OF LOT 20 MARBURG SETTLEMENT NO. 5096, RAY NKONYENI LOCAL MUNICIPALITY, KWAZULU-NATAL

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LAND MATTERS
ENVIRONMENTAL CONSULTING

Document Title:	Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment for the proposed establishment of a light industrial estate on Rem of Lot 20 Marburg Settlement No. 5096, Ray Nkonyeni Local Municipality, KwaZulu-Natal.
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Report Prepared For:	Green Door Environmental (Pty) Ltd
Date:	23 September 2022

GENERAL DECLARATION:

I, **Dr Phillipa Harrison**, declare that –

- I act as the independent specialist in this application in terms of Section 12 and 13 of the regulations;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist study relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

REPORTING CONDITIONS:

- The findings, results, observations, conclusions, and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as information available at the time of compilation.
- The author accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.
- No form of this report may be amended without the prior written consent of the author.

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Refer to Appendix A for the CV of the Heritage Consultant

EXECUTIVE SUMMARY

Land Matters Environmental Consulting (Pty) Ltd was appointed by Green Door Environmental (Pty) Ltd on behalf of the Applicant, Ama-Superco 20 CC, to conduct a Phase 1 Heritage Impact Assessment (HIA) and Desktop Palaeontological Impact Assessment (PIA) for the proposed establishment of a light industrial estate on Rem of Lot 20 Marburg Settlement No. 5096 in the Ray Nkonyeni Local Municipality of KwaZulu-Natal. The proposed development site is situated in the Marburg area of Port Shepstone in close proximity to the N2 Highway, with access to the site via Berg Road. The site is surrounded by industrial and commercial areas to the north and east, and undeveloped land to the south and southwest.

Most of the proposed development site is currently undeveloped and comprises dense woody and herbaceous alien invasive vegetation, with a small portion of secondary grassland on the southern tip of the site, and several small watercourses which traverse the central portion of the site. There is a small cluster of derelict buildings in the north-eastern corner of the site which previously comprised residential houses and apartments, and which are in the process of being demolished. The development property is approximately 6.96ha in extent, while the proposed light industrial development footprint will cover an area of approximately 4.49ha. The site also requires rezoning from 'Agriculture' to 'Light Industrial' as part of the development. As such, this Phase 1 HIA is being undertaken in accordance with the requirements of Section 41(1)(c)&(d) of the KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act 5 of 2018). The project site is located within an area that is designated as 'moderately sensitivity' in terms of fossil sensitivity according to the SAHRIS palaeo-sensitivity map. As such a Desktop PIA is also required for the proposed light industrial estate development project.

The Phase 1 HIA and Desktop PIA also forms part of the Environmental Authorisation process under the National Environmental Management Act (NEMA) 1998 (Act 107 of 1998) for the proposed establishment of a light industrial estate in Marburg. The proposed development triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (amended 2017) under NEMA for which a Basic Assessment Process is required.

The Phase 1 HIA included a desktop assessment and review of relevant current and historical aerial imagery of the study site. The SAHRIS website and Provincial Heritage Register were consulted for data on the presence and significance of any heritage sites within the project area and immediate surrounds. In addition, the available heritage literature covering the larger study area was also consulted. The Desktop PIA included the consultation of the relevant geological maps, paleontological databases, records, relevant literature and existing paleontological assessment studies for the larger study area, to determine the likelihood of fossils being present within the project site and immediate surrounds.

According to the 3030 Port Shepstone 1:250 000 Geological map series (Council for Geosciences) the local geology of the study site is characterised by Late Carboniferous to Early Permian age tillite or diamictite sedimentary rock of the Dwyka Formation of the Karoo Supergroup. The likelihood of significant fossils being present on the development footprint is low as the Dwyka Group is associated with glacial deposits from the Late Carboniferous to Early Permian period. The cold glacial environment in which the sedimentary rocks of the Dwyka Group were deposited is not considered

conducive to fossilisation, and to date, no significant fossils have been recorded in KwaZulu-Natal Dwyka deposits (Groenewald, 2012; Bamford, 2020). As such, no well-preserved fossils are expected to be present on the study site. However, in the unlikely event that the project activities expose fossil material, the chance find protocol in Appendix C must be implemented.

A ground survey of the study site was conducted on the 14th September 2022 following standard archaeological survey procedures. The consultant liaised with the current property owner to determine the site history, particularly in relation to the buildings present on the site, as well as on the possible presence of graves, stone walling, or other heritage features on the study site. None of the persons interviewed were aware of the presence of any graves or other heritage features on the development footprint.

No heritage resources were identified on the proposed development site during the Phase 1 HIA and Desktop PIA, and the site does not form part of any known cultural or heritage landscape. The oldest built structures present on the property are less than 60 years old having been established in the 1970s. As the study site is wholly underlain by sedimentary rock of the Dwyka Formation, which was deposited under extreme glacial conditions, no well-preserved fossils are expected to be present on the study site.

The heritage consultant is of the opinion that the proposed light industrial estate development may proceed on the proposed site, subject to the implementation of the recommendations as outlined in Section 11 of this Report. The proposed development must also adhere to the requirements of the National Heritage Resources Act (NHRA), 1999 (Act 25 of 1999) and the KwaZulu-Natal Amafa and Research Institute Act which states that all operations that expose graves, fossils or heritage features must cease immediately, pending an investigation by the provincial heritage resource agency.

CROSS REFERENCE TABLE TO APPENDIX 6 OF THE EIA REGULATIONS

Minimum Report Content Requirements as per Appendix 6 of the EIA Regulations	Cross Reference in this Report
1. (1) A specialist report prepared in terms of these Regulations must contain - (a) details of (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Declaration of Independence by Specialist (pg. ii). Specialist CV in Appendix A.
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Declaration of Independence by Specialist (pg. ii).
(c) an indication of the scope of, and the purpose for which, the report was prepared; (cA) an indication of the quality and age of base data used for the specialist report; (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 2: Scope of the Assessment. Section 5: Study Methodology. Section 10: Impact Assessment.
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5: Study Methodology.
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5: Study Methodology.
(f) 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 9: Assessment Results.
(g) an identification of any areas to be avoided, including buffers;	N/A
(h) 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;	N/A
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3: Assumptions and Limitations.
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 9: Assessment Results. Section 10: Impact Assessment.
(k) any mitigation measures for inclusion in the EMPr;	Section 11: Conclusion and Recommendations.
(l) any conditions for inclusion in the environmental authorisation;	Section 11: Conclusion and Recommendations.
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 11: Conclusion and Recommendations.
(n) a reasoned opinion - (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) 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 11: Conclusion and Recommendations.
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 5: Study Methodology.
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A

Minimum Report Content Requirements as per Appendix 6 of the EIA Regulations	**Cross Reference in this Report**
(q) any other information requested by the competent authority.	N/A
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

CONTENTS

APPENDICES

LIST OF ABBREVIATIONS

EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
HIA	Heritage Impact Assessment
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAPS	South African Police Services

MARBURG LIGHT INDUSTRIAL ESTATE: PHASE 1 HERITAGE IMPACT ASSESSMENT AND DESKTOP PALAEONTOLOGICAL IMPACT ASSESSMENT

1 INTRODUCTION AND DEVELOPMENT BACKGROUND

Land Matters Environmental Consulting (Pty) Ltd was appointed by Green Door Environmental (Pty) Ltd on behalf of the Applicant, Ama-Superco 20 CC to conduct a Phase 1 Heritage Impact Assessment (HIA) and Desktop Palaeontological Impact Assessment (PIA) for the proposed establishment of a light industrial estate on the property Rem of Lot 20 Marburg Settlement No. 5096 in the Marburg Area of Port Shepstone, in the Ray Nkonyeni Local and Ugu District Municipality of KwaZulu-Natal. The development site is located to the immediate south of the N2 Highway at GPS coordinates S30°45'17.76" and E30°25'26.80", with access to the site via Berg Road.

The development property is approximately 6.96ha in extent, while the proposed light industrial estate development footprint will cover an area of approximately 4.49ha. The site also requires rezoning from 'Agriculture' to 'Light Industrial' as part of the development. As such, this Phase 1 HIA is being undertaken in accordance with the requirements of Section 41(1)(c)&(d) of the KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act 5 of 2018). The project site is located within an area that is designated as 'moderately sensitivity' in terms of fossil sensitivity according to the SAHRIS palaeo-sensitivity map. As such a Desktop PIA is also required for the proposed light industrial estate development project. The Phase 1 HIA and Desktop PIA also form part of the Environmental Authorisation process under the National Environmental Management Act (NEMA) 1998 (Act 107 of 1998) for the proposed establishment of the light industrial estate in Marburg. The proposed development triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (amended 2017) under NEMA 1998 (Act 107 of 1998) for which a Basic Assessment Process is required.

2 SCOPE OF THE ASSESSMENT

The Phase 1 HIA aims to locate, identify and assess the significance of any heritage resources that may be found on the development footprint, including archaeological and palaeontological deposits/sites, built structures older than 60 years, burial grounds and graves, graves of victims of conflict and basic cultural landscapes and viewscapes, as defined and protected by the National Heritage Resources Act (NHRA), 1999 (Act 25 of 1999) and the KwaZulu-Natal Amafa and Research Institute Act.

As per the requirements set out in Section 41(3) of the KwaZulu-Natal Amafa and Research Institute Act, the key terms of reference for the Phase 1 HIA were as follows:

- The identification and mapping of all heritage resources in the study area.
- Undertaking an assessment of the significance of such resources in terms of the heritage assessment criteria set out in Section 6(2) and/or Section 7 of the NHRA.
- Undertaking an assessment of the impact of the proposed development on the identified heritage resources.
- An evaluation of the impact of the proposed development on such identified heritage resources relative to the sustainable social and economic benefits to be derived from the development.

- Reporting on the results of the consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources.
- The consideration of alternatives should any heritage resources potentially be adversely affected by the proposed development.
- The compilation of plans for mitigating of any adverse effects during and after the completion of the proposed development.

In addition to the above, the primary aim of the Desktop PIA was to undertake a review of all relevant palaeontological and geological literature including maps and previous palaeontological impact reposts for the general study area, to predict the potential for the occurrence of buried fossil heritage within the development footprint.

3 ASSUMPTIONS AND LIMITATIONS

It is difficult to apply pure scientific methods within a natural environment without limitations or assumptions. The following apply to this study:

- Areas of very dense vegetation cover most of the study site which may have compromised heritage site visibility.
- Heritage/palaeontological resources may be present below the surface. No subsurface investigations were undertaken as part of the Phase 1 HIA and Desktop PIA.
- The findings, results, observations, conclusions and recommendations provided in this report are based on the authors' best scientific and professional knowledge as well as available information regarding the perceived impacts on heritage/palaeontological resources.
- The study results are based on a single day field investigation. Once-off assessments such as this may potentially miss certain heritage information, thus limiting accuracy, detail and confidence.
- Any additional information used to inform the assessment was limited to data and GIS data sets which were available for the area at the time of assessment.

4 LEGISLATIVE REQUIREMENTS

4.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) 1998 (ACT 107 OF 1998)

This Phase 1 HIA and Desktop PIA has been undertaken in compliance with the requirements for specialist studies as contained in the EIA Regulations 2014 (amended 2017) under NEMA, as outlined in Appendix 6 of GNR 326 which provides the requirements for specialist reports, and Section 13 of GNR 326 which provides the general requirements for Environmental Assessment Practitioners (EAPs) and specialists.

4.2 NATIONAL HERITAGE RESOURCES ACT (NHRA) 1999 (ACT 25 OF 1999)

The NHRA makes provisions for the management and protection of heritage resources on a national level in South Africa. Section 3(1-3) of the NHRA defines those heritage resources in South Africa which form part of the national estate due to their cultural significance or other special value for the present community and future generations. Such resources include places, buildings, structures,

equipment, oral traditions, historical settlements, townscapes, landscapes, geological sites, archaeological and palaeontological sites, graves and burial grounds and movable objects. Section 4 of the NHRA establishes both the national and provincial systems for the management of heritage resources within the country.

Section 7(1) of the NHRA provides for a three-tier management system which operates at a national, provincial and local level and distinguishes between three categories for the grading of places and objects which form part of the national estate, as follows:

- National (Grade I) heritage resources, which are resources that are regarded as being of national significance, and are managed at a national level by SAHRA;
- Provincial (Grade II) heritage resources, which have provincial or regional significance and are managed by provincial heritage resources authorities; and
- Local (Grade III) heritage resources which are the responsibility of local authorities.

Sections 34, 35 and 36 of the NHRA provides for the protection of heritage resources from damage, destruction or alteration, and Section 38 of the NHRA sets out the requirements for heritage resources management.

4.3 KwaZulu-Natal Amafa and Research Institute Act 2018 (Act 5 of 2018)

The KwaZulu-Natal Amafa and Research Institute Act provides for the recognition of the establishment of the KwaZulu-Natal Amafa and Research Institute as the provincial heritage resources authority for the Province of KwaZulu-Natal, to identify, conserve, protect, manage and administer heritage resources in the Province of KwaZulu-Natal.

Chapter 7 of the Act provides for the establishment of the Amafa and Research Forum, whose objectives include the compilation of a consolidated register of all heritage resources in the Province of KwaZulu-Natal. Chapter 8 of the Act provides for the general protection of heritage resources, specifically the general protection of structures older than 60 years, graves of victims of conflict, informal and private burial grounds, battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite and meteorite impact sites. Section 41(1 – 10) of Chapter 8 of the Act sets out the requirements for heritage resources management specifically in terms of the undertaking of developments, and the need and requirements for impact assessment studies and report requirements.

Chapter 9 of the Act provides for the special protection of heritage resources including the designation of protected area, heritage landmark and provincial landmark status, and special protection of graves of members of the Royal Family, battlefields, public monuments and memorials, and heritage objects. Chapter 9 of the Act also makes provision for the establishment of a consolidated register of heritage sites and heritage objects in the Province of KwaZulu-Natal. Chapter 10 of the Act provides for the determination of criteria for best practice, standards, norms and conditions for the management of heritage resources in the Province of KwaZulu-Natal. Lastly, Chapter 11 outlines the general provisions of the Act and includes allowances for the drafting of Regulations to enable the provincial heritage resources authority to regulate heritage matters in the Province of KwaZulu-Natal.

4.4 MINIMUM STANDARDS FOR HERITAGE SPECIALIST STUDIES

The South African Heritage Resources Agency (SAHRA) Minimum Standards for Heritage Specialist Studies (2007, 2016) in terms of Section 38(1) and 38(8) of the NHRA outlines the requirements for Phase 1 HIA studies, including the requirements for Phase 1 HIA Reports and provides a standardised site significance and field rating methodology.

4.5 KWAZULU-NATAL AMAFA AND RESEARCH INSTITUTE REGULATIONS, 2021 (DRAFT REGULATIONS)

The draft KwaZulu-Natal Amafa and Research Institute Regulations, 2021 in terms of Section 58 of the KwaZulu-Natal Amafa and Research Institute Act, provides for the regulation of heritage matters in the KwaZulu-Natal Province. The Regulations specifically outline the requirements for permit applications and the application procedures to be followed. Section 7 of the Regulations outlines the requirements in terms of the discovery of archaeological or palaeontological material or a meteorite. Section 12 of the Regulations outlines the heritage resources management requirements in terms of undertaking developments, and procedures to be followed to ensure compliance with the requirements of the KwaZulu-Natal Amafa and Research Institute Act and NHRA.

Table 1 below outlines the legislative requirements as applicable to the Phase 1 HIA and Desktop PIA study for the proposed light industrial estate development in Marburg.

Table 1: Applicable Legislative Requirements

Legislation	Relevant Section	Description
KwaZulu-Natal Amafa and Research Institute Act 2018 (Act 5 of 2018)	Section 41(1)	*"Any person who intends to undertake a development categorized as –* *(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;* *(b) the construction of a bridge or similar structure exceeding 50 m in length;* *(c) any development or other activity which will change the character of a site - (i) exceeding 5 000 m² in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations;* *(d) the re-zoning of a site exceeding 10 000 m² in extent; or* *(e) any other category of development provided for in regulations, must, at the very earliest stages of initiating such a development, notify the Institute and furnish it with details regarding the location, nature and extent of the proposed development."*
EIA Regulations 2014 (amended 2017) under NEMA 1998 (Act 107 of 1998)	GNR 327 Part 12	*"The development of: (ii) infrastructure or structures with a physical footprint of 100 square metres or more, where such development occurs (a) within a watercourse…."*
	GNR 327 Part 19	*"The infilling or depositing of any material of more than 10 cubic meters into; or the grudging excavation, removal of soil, sand, shells, grit, pebbles, or rock of more than 10 cubic meters from a watercourse…."*
	GNR 327 Part 27	*"The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation"*
	GNR 324 Part 12	*"The clearance of an area of 300 square meters or more on indigenous vegetation… within a critically endangered ecosystem listed in terms of Section 52 of the NEMBA"*

5 Study Methodology

5.1 Desktop Assessment

An initial desktop assessment and review of relevant current and historical aerial imagery of the study site was undertaken at the start of the project. Historical imagery was obtained from the Department of Rural Development and Land Reform and the National Geospatial Information website (http://cdngiportal.co.za/cdngiportal/) in order to identify historical land uses associated with the study site and surrounds. The SAHRIS website and Provincial Heritage Register were consulted for data on the presence and significance of any heritage sites within the Ray Nkonyeni Local Municipal area and in particular Port Shepstone and Marburg. In addition, the available heritage literature covering the larger study area was also consulted.

The methods employed for the Desktop PIA included the consultation of the relevant geological maps, paleontological databases, records, relevant literature and existing paleontological

assessment studies for the larger study area, to determine the likelihood of fossils being present within the development site and immediate surrounds.

5.2 GROUND SURVEY

A ground survey of the study site was conducted on the 14th September 2022 which comprised a walkover and visual survey of the development footprint, where vegetation density and terrain allowed. The assessment was done by foot and limited to a Phase 1 visual survey. Geographic coordinates were taken using a handheld Garmin Etrek GPS unit (Datum: WGS84). All readings were taken using the GPS unit, and accuracy was to a level of 5m. Photographic documentation of the site was undertaken using a Huawei P20 Smartphone camera. Ground visibility was good in the north-eastern corner of the site where the remains of the houses and residential units are located, as well as in the grassland area in the southern end of the site. Ground visibility was compromised on the remining areas of the site, due to the dense cover of alien invasive vegetation on the property. Archaeological and cultural heritage site recording, significance assignation and associated mitigation recommendations were done according to the field rating system prescribed by SAHRA (2007, 2016).

The study site is largely inaccessible to the public, and there are currently no persons residing on the development footprint. As such, no local community members were encountered on the study site during the ground survey. The consultant liaised with the property owner, Mr. Derrick Classen prior to the site visit in order to gain an understanding of the site history and determine the possibility of the presence of any graves, stone walling or other heritage features on the study site. The property owner was not aware of the presence of any graves or other heritage features on the development footprint.

The relevant site photographs are included in Appendix B.

6 PROJECT DESCRIPTION AND LOCALITY

The project site is located in the Marburg area in the southern end of Port Shepstone, on the property Rem of Lot 20 Marburg Settlement No. 5096. The N2 Highway is located to the north and east of the project site. The site is surrounded by industrial and commercial areas to the north and east, and mix of undeveloped land and agricultural areas to the south and southwest.

Most of the development site is currently undeveloped and comprises dense woody and herbaceous alien invasive vegetation, with a small portion of secondary grassland on the southern tip of the site, and several small watercourses which traverse the central portion of the site. There is a small cluster of derelict buildings in the north-eastern corner of the site which previously comprised residential houses and apartments, and which are in the process of being demolished. The earliest built structure was established on the property during the 1970s.

Table 2 below provides the details of the general project area and the specifics of the development, while Figures 1 - 3 below provide locality and layout maps.

Table 2: Details of the General Project Area and Development Specifics

Property description	Rem of Lot 20 Marburg Settlement No. 5096
Magisterial District	Ray Nkonyeni Local Municipality and Ugu District Municipality
1: 50 000 map sheet number	3030CD
Central co-ordinate of the development	S30°45'17.76" and E30°25'26.80"
Type of development	Light Industrial Estate
Property zoning	Site is currently zoned for 'Agriculture'. To be rezoned to 'Light Industrial'.

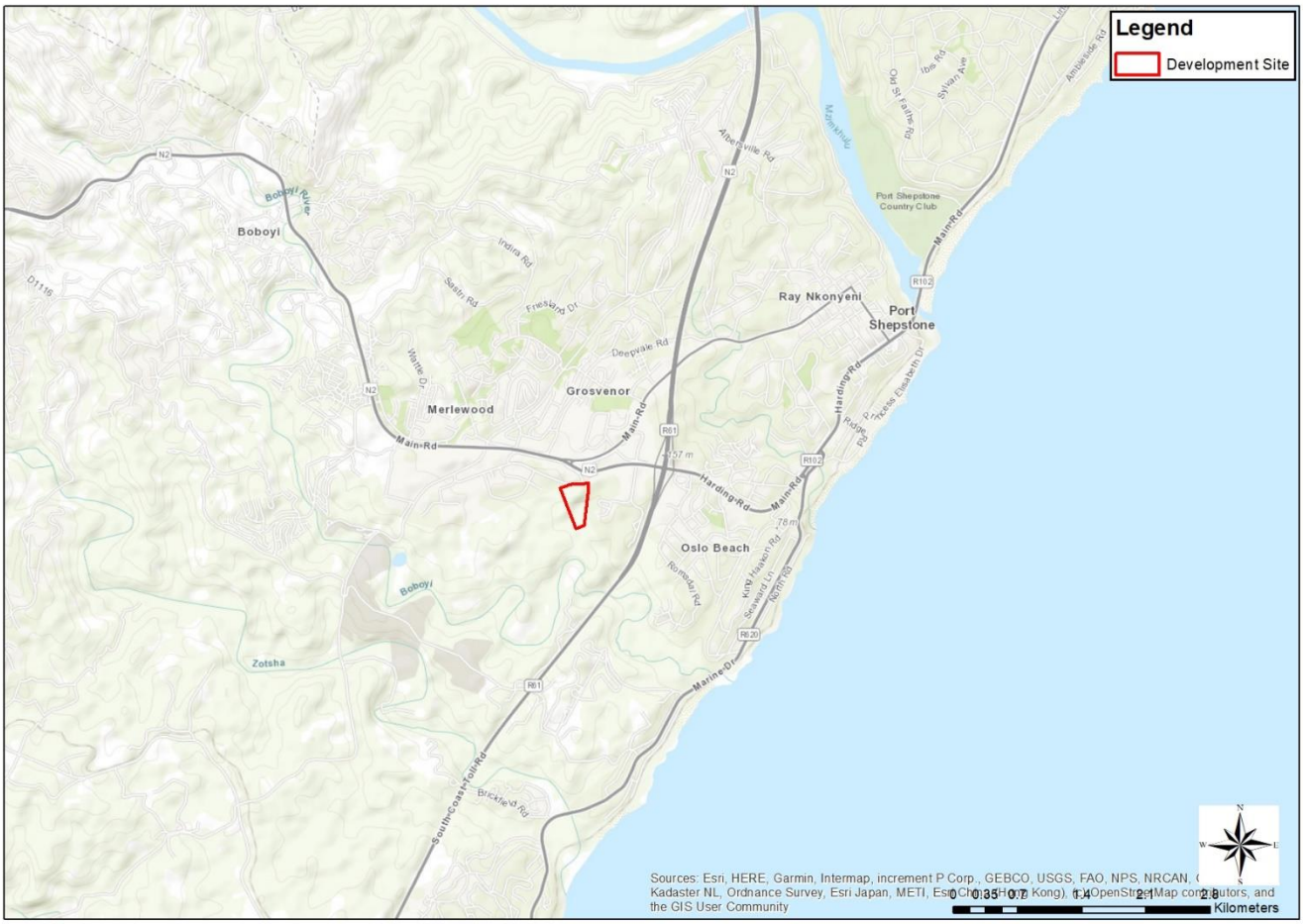


Figure 1: Topographical map of the light industrial estate development site in Marburg.

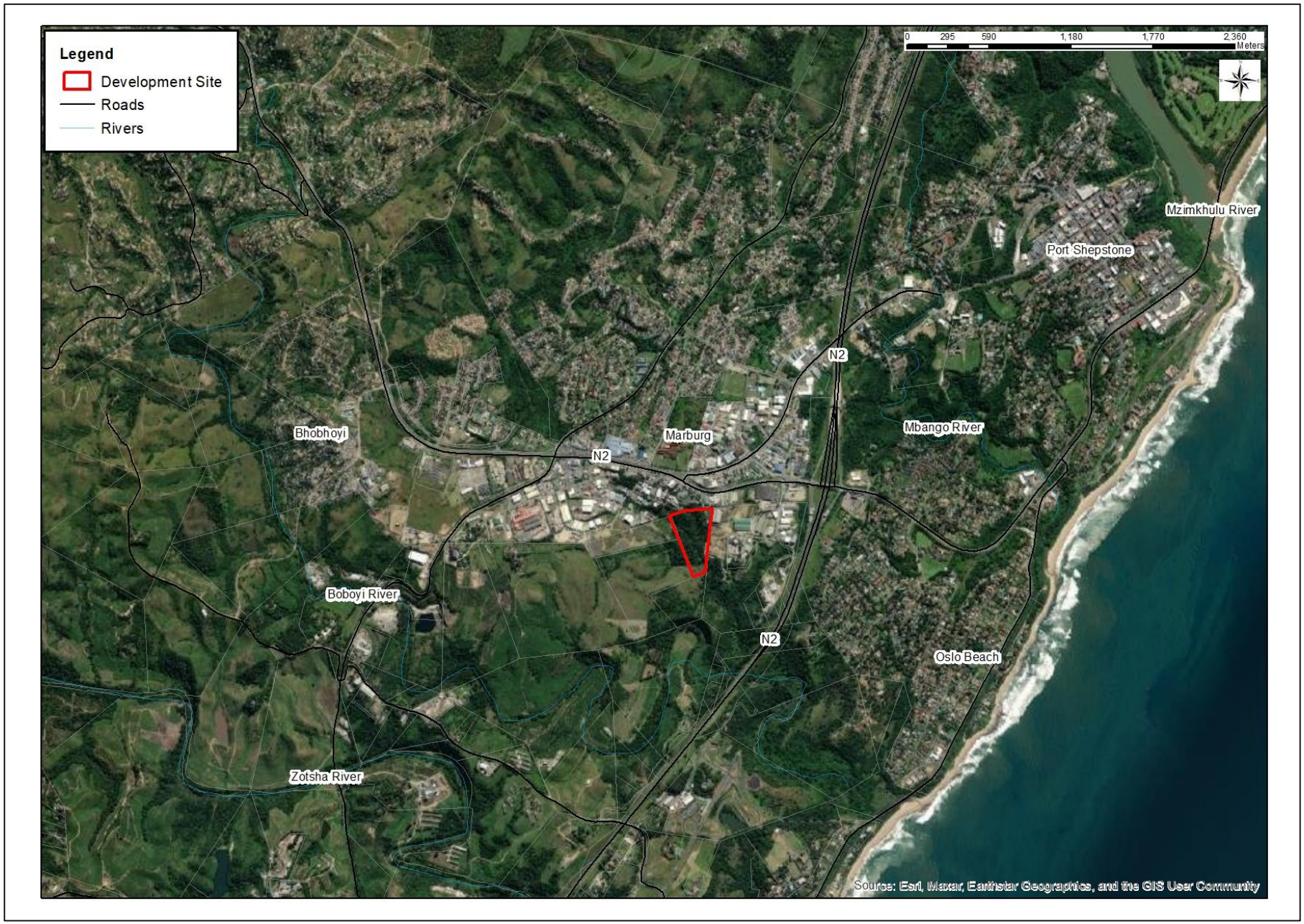


Figure 2: Locality map of the study site and surrounding area.

Figure 3: Development site map.

7 CULTURAL OVERVIEW OF THE STUDY AREA

The township of Port Shepstone was founded in the 1880s at the mouth of the Mzimkhulu River after the discovery of marble in the area in 1867. The town was named after the Secretary of Native Affairs, Sir Theophilus Shepstone. A harbour was established in Port Shepstone at the Mzimkhulu River mouth in 1880 which facilitated the movement of marble, limestone and sugar up the coastline to Durban. The town grew with the arrival of Norwegian settlers in 1882 and by 1893 Port Shepstone was functioning as an important harbour town, and source of marble and limestone. However, with the completion of the narrow-gauge railway line from Durban to Port Shepstone, the harbour fell into disuse and eventually silted up making the harbour impossible to use. Today the larger Port Shepstone area is the main administrative, commercial, distribution and transportation centre for the KwaZulu-Natal South Coast region.

The greater Hibberdene and Port Shepstone areas have been relatively well surveyed by archaeologists from the Natal Museum in the 1970s and 1980s (Prins, 2019). A number of more recent heritage surveys have also been undertaken in the Port Shepstone area by private heritage consultants over the past few years. Oribi Gorge which is situated approximately 15km to the northwest of the project site has been extensively surveyed for archaeological sites by the Natal Parks Board in the 1970s and later by archaeologists from the Natal Museum in the 1980s and the KwaZulu-Natal Museum during the 2000s (Prins, 2019).

The KwaZulu-Natal Museum and SAHRIS Databases contain records of a wide range of archaeological and heritage sites for the greater Port Shepstone area. These include Early, Middle and Late Stone Age sites, Early and Late Iron Age sites, and more recent historical sites dating back to the Victorian and Edwardian periods.

A relatively large number of stone age sites have been identified in the Oribi Gorge and adjacent areas, including Later Stone Age rock art sites, which form part of the eastern seaboard coastal rock art zone (Prins, 2019). Furthermore, a relatively large number of Early and Middle Stone Age sites are located within the coastal dunes of the Berea Formation within 1-2km of the coastline within KwaZulu-Natal. Berea Formation dunes are however not present on the study site or within the immediate surrounds. Most Stone Age sites comprise the presence of stone flakes or individual stone tools in open air contexts, exposed by erosion. As these Stone Age sites comprise open air surface scatter finds which do not occur in archaeological context, they generally have limited value.

The first Iron Age sites in KwaZulu-Natal date back to approximately 1500 years ago and are situated close to sources of iron ore and within 15km of the coast due to climatic conditions at that time (eThembeni, 2013). From 650AD onwards climatic conditions improved and Iron Age agriculturalists expanded into the valleys of KwaZulu-Natal where they settled close to rivers in savannah or bushveld environments (eThembeni, 2013). Very few Iron Age sites are found on steep slopes or hilltops in the KwaZulu-Natal coastal areas (eThembeni, 2013). A relatively large number of Late Iron Age sites have been identified in the greater Port Shepstone area within a distance of 2-3km from the shore (eThembeni, 2013). Typical artefacts associated with these sites include ceramic sherds, marine shell, and grindstones as well as metal artefacts including furnace remains, slag, and bloom (eThembeni, 2013).

A number of colonial-era buildings and sites associated with the Victorian and Edwardian periods are also present within the larger Port Shepstone area. All of these sites are over 60 years old and are protected by heritage legislation. Notable sites include:

- Old Police Fort, Port Shepstone (Provincial Landmark);
- Port Shepstone Lighthouse (Provincial Landmark);
- Izotsha River Railway Bridge (Provincial Landmark);
- Kneisel's Castle, 24 Reynolds Street, Port Shepstone (Heritage Landmark); and
- Royston Hall, 10 Royston Lane, Port Shepstone (Heritage Landmark).

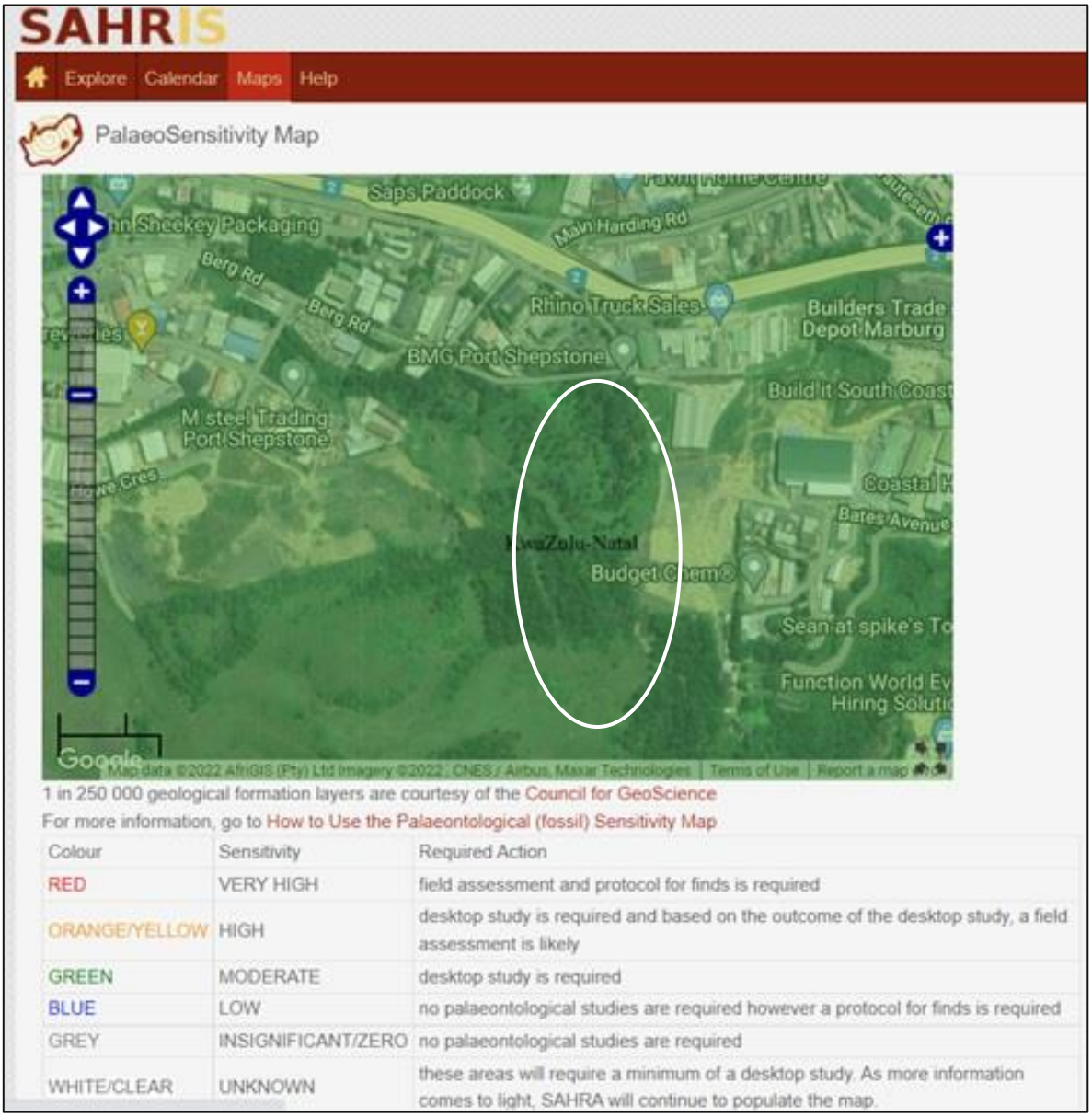
None of the above-mentioned archaeological or historical sites are known to occur on the development footprint or immediate surrounds.

8 GEOLOGY AND PALAEONTOLOGY

South Africa has a very rich fossil record, dating back over some 3.5 billion years. Fossil heritage is found in all provinces of South Africa. The palaeontological sensitivity of the study site as per the SAHRIS palaeo-sensitivity map is shown in Figure 4 below. The SAHRIS paleo-sensitivity map shows the area as "moderately sensitive" in terms of fossil sensitivity.

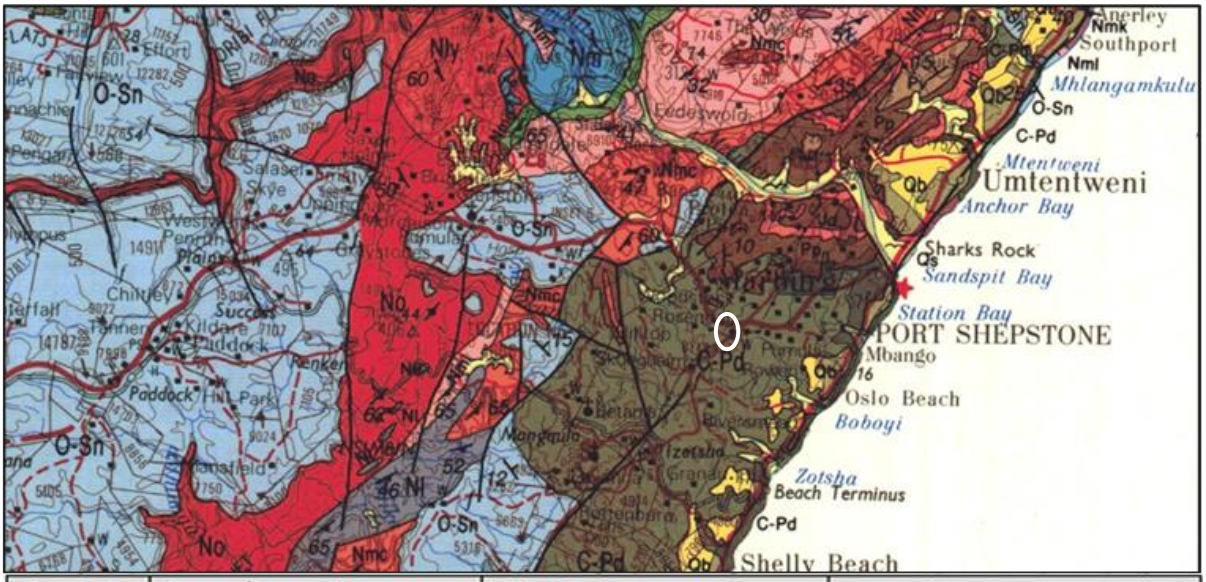
The 3030 Port Shepstone 1:250 000 Geological map series (Council for Geosciences) was used to identify the general geology of the study area, as shown in Figure 5 below. The study site is underlain by Late Carboniferous to Early Permian age tillite or diamictite sedimentary rock of the Dwyka Formation of the Karoo Supergroup. The geological formations of the Dwyka Group are largely restricted to the edges of the Karoo Basin, with the study site forming part of the eastern exposures, and comprising glacial deposits (tillite or diamictite) from retreating ice sheet about 300 million years ago during the Late Carboniferous to Early Permian period. The Dwyka Group is the earliest and lowermost deposit in the Karoo Supergroup Basin. Approximately 300 to 290 million years ago, southern Africa was part of the supercontinent Godwana and was located in the Antarctic region with much of the land surface covered by ice sheets. As Gondwana drifted northwards and the ice sheets melted they dropped moraine trapped in the ice, together with some plant matter from the vegetation that was gradually colonising the land surface, forming a thick unit of tillite (Bamford, 2020). Deposited flora from this period (Late Carboniferous) comprises *Glossopteris* leaves, wood, as well as other plants such as lycopods, sphenophytes and ferns (Bamford, 2020). Terrestrial vertebrates had not yet evolved during this period (Bamford, 2020).

The Dwyka Group is made up of a number of differing lithological facies which were deposited in the marine environment of the Karoo Basin as a result of the differing environmental processes associated with glacial formation and retreat. These facies are further subdivided into two main geological formations, namely the Elandsvlei Formation in the southern deposits and the Mbizane Formation in the northern deposits. Of the various facies that make up the Dwyka Group, fossil plant fragments and trace fossils have only been recorded from the mudrock facies in the Douglas area of the Northern Cape, and in the Free State (Bamford, 2020). No fossils associated with the Dwyka Group have been recorded from KwaZulu-Natal (Bamford, 2020).



Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 4: SAHRIS palaeo-sensitivity map for the study site (SAHRIS).



Symbol	Group/Formation	Lithology	Approximate Age
Qs	Quaternary sands	Young sands and alluvium	Recent
Qb	(Berea Formation) now Umkwelane Fm, Maputalnd Group	Alluvium, sand, calcrete	Neogene, ca 2.5 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pvo	Volksrust Fm, Ecca Group, Karoo SG	Shales, mudstones	Early middle Permian
Pp	Pietermaritzburg Fm, Ecca Group, Karoo SG	Dark, fine-grained shale	Early Permian
C-Pd	Dwyka Group, Karoo SG	Diamictites, subordinate varved shale	Late Carboniferous to early Permian
O-Sn	Natal Group	Arkose, quartz arenite, sandstone, grit conglomerate	Ordovician-Silurian
No	Oribi Gorge Granite	Porphyritic granite	>1000 Ma
Nmc	Margate granite	Medium-grained charnockite	>1000 Ma

Figure 5: Regional geology of the study area (Council for Geosciences).

9 ASSESSMENT RESULTS

9.1 DESKTOP STUDY

An investigation into historical aerial imagery of the development site was undertaken as part of the Phase 1 HIA. Aerial imagery from 1943 and 1976 (Figures 6–7) was used to identify past activity on the site.

Aerial imagery from 1943 shows the site and much of the surrounding areas as completely undeveloped, comprising natural grassland (Figure 6). There are no built structures present on the development site in the aerial imagery. Two watercourses and associated riparian vegetation can be seen traversing the central portion of the site.

Aerial imagery from 1976 shows the site as still undeveloped with the exception of the north-eastern corner, where a building is now evident (Figure 7). A significant change to the vegetation composition on the site is evident in the 1976 aerial imagery, with the large-scale encroachment of woody species onto the site, resulting from disturbance associated with development and the clearing of natural vegetation in the larger Marburg area surrounding the site.

The results of the desktop assessment show that no heritage resources are evident on the site surface in the historic aerial imagery for the area. The earliest built structure on the site was established in the 1970s, making it less than 60 years old.

Figure 6: Historic aerial imagery of the development site from 1943 shows the site as undeveloped, comprising grassland. There are no built structures present on the study site in 1943.

Figure 7: Historic aerial imagery of the development site from 1976 shows a built structure in the north-eastern corner of the site. The development and growth of the Marburg area around the site is evident in the aerial imagery, as well as an associated change in vegetation composition on the site resulting from anthropogenic disturbance associated with this development.

9.2 GROUND SURVEY

No development activities associated with the establishment of the proposed light industrial estate in Marburg had begun at the time of the ground survey. No heritage resources were identified on or directly adjacent to the development footprint as outlined in Table 3 below. The built structures present in the north-eastern corner of the study site are all younger than 60 years. These structures are in the process of being demolished and will not be retained as part of the light industrial estate development.

Table 3: List of Possible Heritage Resources and Assessment Findings

Heritage Resource Type	Finding
Places, buildings, structures and equipment of cultural significance	None
Places to which oral traditions are attached or which are associated with living heritage	None
Historical settlements and townscapes	None
Landscapes and natural features	None
Geological sites of scientific or cultural importance	None
Archaeological and palaeontological sites	None
Graves and burial grounds	None
Public monuments and memorials	None
Sites of significance relating to the history of slavery in South Africa	None
Movable objects	None

An assessment in terms of the significance criteria outlined in Section 3(3) of the NHRA was also undertaken for the study site as part of the Phase 1 HIA, as shown in Table 4 below.

Table 4: Evaluation of Heritage Sites or Objects in terms of Section 3(3) of the NHRA

Significance criteria for heritage sites or objects in terms of Section 3(3) of the NHRA 1999 (Act 25 of 1999)	Rating
Importance in the community, or pattern of South Africa's history.	None
In possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.	None
Has potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.	None
Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects.	None
Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;	None
Importance in demonstrating a high degree of creative or technical achievement at a particular period.	None
Has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.	None
Has a strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.	None
Sites of significance relating to the history of slavery in South Africa.	None

9.3 Site Significance and Field Rating

The field rating system (Table 5) as developed by SAHRA (2007, 2016) does not apply to the proposed light industrial estate development in Marburg as no heritage sites occur on, or directly adjacent to the development footprint.

Table 5: Site Significance and Field Rating (SAHRA 2007, 2016)

Level	Description	Action
Grade I National Resource	This site is considered to be of National significance.	Nominated to be declared by SAHRA and maintained in situ.
Grade II Provincial Resource	This site is considered to be of Provincial significance.	Nominated to be declared by Provincial Heritage Authority and maintained in situ.
Grade IIIA Local Resource	This site is considered to be of a High significance locally.	The site must be retained as a heritage register site.
Grade IIIB Local Resource	This site is considered to be of a High/Medium significance locally.	The site must be mitigated and part retained as a heritage register site.
Grade IIIC Local Resource	This site is considered to be of a Low significance locally.	The site needs to be recorded but may be granted destruction authorisation at the discretion of the relevant heritage authority.
Generally Protected A	High to medium significance	Mitigation necessary before destruction.
Generally Protected B	Medium significance	Site to be recorded before destruction.
Generally Protected C	Low significance	Site has been sufficiently recorded (in the Phase 1). It requires no further recording before destruction.

9.4 PALAEONTOLOGY

The results of the Desktop PIA show that the "moderate sensitivity" in terms of the SAHRIS palaeo-sensitivity is applicable to the entire study site. The excavations for the light industrial estate development will expose sediments of the Dwyka Formation. Based on the study findings, the Dwyka Group rock underlying the site comprises tillite or diamictite sedimentary rock deposited in a cold, glacial environment, which is not conducive to fossilization. As such, no well-preserved fossils are expected to be present on the study site. However, in the unlikely event that the light industrial estate development exposes fossil material, the chance find protocol in Appendix C must be implemented.

10 IMPACT ASSESSMENT

Any development or anthropogenic activity in a natural system will have an impact on the surrounding environment, usually in a negative way. The assessment criteria as outlined in Table 6 below have been used to identify, predict and assess the significance of any potential heritage and palaeontological related impacts associated with the Marburg light industrial estate development.

As no heritage sites or resources have been identified on the development footprint; the area is not part of any known cultural landscape; and it is highly unlikely that fossils are present within the development site footprint; the proposed activity poses a minimal risk to heritage and palaeontological resources, as shown in Table 7 below.

Table 6: Summary of Aspects used for Assessing Heritage / Palaeontological Impacts

Aspect	Rating	Description
Nature	Positive	The impact on the resource will be positive.
	Negative	The impact on the resource will be negative.
Probability (with mitigation)	Definitely	The impact will definitely occur even with mitigation (100%).
	Likely	It is likely that the impact will occur (60%-99%).
	Fair	There is a fair chance that the impact will occur (30% -59%).
	Unlikely	It is unlikely that the impact will occur (0% - 29%).
Reversibility (with mitigation)	Possible	It is possible to reverse the impact.
	Partly	It is partly possible to reverse the impact.
	Not possible	It is not possible to reverse the impact.
Extent	Site	The impact will be limited to the site.
	Local	The impact will affect the local area (within a radius of 40km).
	Provincial	The impact will affect areas beyond the site but within the boundaries of KwaZulu-Natal.
	National	The impact will affect areas beyond the Province but within the boundaries of South Africa.
Duration	Short-term	0-5 years (construction phase).
	Medium-term	5-40 years (construction and operation).
	Long-term	(>40 years).
	Permanent	Permanent damage to the resource.
Significance of Impact without Mitigation	Low	Small impact / disturbance.
	Medium	Moderate impact / disturbance expected.
	High	Significant impact / disturbance expected.
Significance of Impact Post-Mitigation	Low	Small impact / disturbance.
	Medium	Moderate impact / disturbance expected.
	High	Significant impact / disturbance expected.

Table 7: Impact Assessment Results for the Marburg Light Industrial Estate Development Project

Aspect	Rating	Description
Nature	Positive	-
	Negative	While it is highly unlikely that impacts to fossils or heritage resources will occur, any impacts resulting from the project will be negative.
Probability (with mitigation)	Definitely	-
	Likely	-
	Fair	-
	Unlikely	It is unlikely that the impact will occur (0% - 29%).
Reversibility (with mitigation)	Possible	-
	Partly	-
	Not possible	It is not possible to reverse the impact.
Extent	Site	The impact will be limited to the site.
	Local	-
	Provincial	-
	National	-
Duration	Short-term	-
	Medium-term	-
	Long-term	-
	Permanent	Permanent damage to the heritage resource.
Significance of Impact without Mitigation	Low	Small impact / disturbance.
	Medium	-
	High	-
Significance of Impact Post-Mitigation	Low	Small impact / disturbance.
	Medium	-
	High	-

11 CONCLUSION AND RECOMMENDATIONS

The Phase 1 HIA and Desktop PIA for the proposed establishment of a light industrial estate on Rem of Lot 20 Marburg Settlement No. 5096 identified no heritage sites or features on the development footprint. The area also does not form part of any known cultural landscape. It is also highly unlikely that fossils are present within the development footprint due to the nature of the bedrock (Dwyka Group glacial tillite or diamictite) and geological conditions present at the site and surrounding area. The proposed development may therefore proceed as no heritage or paleontological features are threatened by the light industrial estate development.

In the unlikely event that the proposed development exposes any graves, fossils or other heritage features on the development footprint, all activities must cease and the Environmental Control Officer (ECO) appointed for the development project must be contacted. The ECO must in turn notify the provincial heritage resource authority, the KwaZulu-Natal Amafa and Research Institute and/or the heritage consultant, and the chance find protocol in Appendix C must be implemented.

The proposed development must adhere to the requirements of the NHRA and the KwaZulu-Natal Amafa and Research Institute Act, and Draft Regulations, which requires that a person that discovers any archaeological or palaeontological material or a meteorite must immediately cease all operations or activity within a 25m radius of the discovery, and must notify the KwaZulu-Natal Amafa and Research Institute. In addition, no structures older than sixty years or parts thereof are allowed to be demolished, altered or extended without a permit from the KwaZulu-Natal Amafa and Research Institute. Under no circumstances may any heritage material be destroyed or removed from site unless under direction of the KwaZulu-Natal Amafa and Research Institute and appointed heritage consultant.

12 REFERENCES

Bamford, M. 2020. Phase 1 Palaeontological Impact Assessment for the Proposed D59 Bridge near Richmond, KwaZulu-Natal Province. Internal Palaeontological Reports, SAHRA.

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eThembeni Cultural Heritage. 2013. Ugu District Municipality Environmental Management Framework. Heritage Resource Management Report. Unpublished Report, SAHRA.

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http://cdngiportal.co.za/cdngiportal/

APPENDICES

APPENDIX A: SHORT CV OF THE HERITAGE CONSULTANT

CURRICULUM VITAE

Dr. Phillipa Harrison – Heritage Consultant / Archaeologist
Land Matters Environmental Consulting (Pty) Ltd

CONTACT DETAILS

Telephone	082 408 6545
E-mail	phillipa@lmenvironmental.co.za

QUALIFICATIONS

- 2015 – 2021: Bachelor of Arts Honours (Archaeology), University of South Africa (UNISA)
- 2003 – 2006: Doctor of Philosophy (PhD), University of KwaZulu-Natal
- 2001 – 2002: Master of Arts (MA), University of KwaZulu-Natal
- 2000: Bachelor of Arts Honours (Geography), University of KwaZulu-Natal
- 1997 – 1999: Bachelor of Arts (Geography, English, Geology), University of KwaZulu-Natal

PROFESSIONAL REGISTRATIONS

Association of Southern African Professional Archaeologists (ASAPA) (No. ASAPA545)

AREAS OF EXPERTISE

- Heritage Impact Assessment and Desktop Palaeontological Impact Assessment Studies;
- EIA and Basic Assessment Processes;
- Environmental Management Programmes;
- Water Use License Applications; and
- Waste Management License Applications.

WORK EXPERIENCE

Dr Phillipa Harrison holds a Bachelor of Arts Honours Degree in Archaeology from the University of South Africa (UNISA) and a Doctor of Philosophy in Geography from the University of KwaZulu-Natal. She is professionally affiliated to the Association of Southern African Professional Archaeologists (ASAPA) and has ten years consulting experience in the Environmental Assessment field with experience in conducting Heritage Impact Assessments and Palaeontological Impact Assessments, as well as Basic Assessment and Scoping and EIA processes, compiling Environmental Management Programmes, and undertaking Water Use and Waste Management License Applications.

EXAMPLES OF RELEVANT PROJECT EXPERIENCE

PROJECT	DATE
Phase 1 Heritage Impact Assessment: for the proposed establishment of a Cattle Feedlot on Westlands Farm in the Kokstad Area, Greater Kokstad Local Municipality and Harry Gwala District Municipality, KZN.	July 2022
Phase 1 Heritage Impact Assessment: for the proposed establishment of a Mixed-Use Development on Rem of the Farm Usherwood West No. 303 in Kokstad, Greater Kokstad Local Municipality and Harry Gwala District Municipality, KZN.	July 2022
Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment: for the proposed establishment of the Ulundi Crossings Shopping Centre and Service Station on Erf 402 of Ulundi B, Ulundi Local and Zululand District Municipality, KZN.	April 2022
Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment: for the proposed establishment of a 67 900m^3 dam and the cultivation of approximately 45ha of macadamia nut trees on Hopewell Farm, KwaDukuza Local and iLembe District Municipality, KZN.	April 2022
Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment: for the proposed establishment of the Umlaas Junction Private Light Industrial estate located on Rem of the Farm Crookes No. 15732, Camperdown, Mkhambathini Local Municipality and uMgungundlovu District Municipality, KwaZulu-Natal.	March 2022
Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment: for the proposed establishment of a 20ha cemetery located on Portion 43 of the Farm Honig Krantz No. 945 in the Cato Ridge Area of the Mkhambathini Local Municipality and uMgungundlovu District Municipality, KwaZulu-Natal.	January 2022
Phase 1 Heritage Impact Assessment: for the proposed establishment of a second residential development at Beacon Hill Country Estate on Portion 5 of Erf 1280 and a game park on Portion 9 of Erf 1280 in Bishopstowe, Pietermaritzburg, Msunduzi Local and uMgungundlovu District Municipality, KwaZulu-Natal.	December 2021
Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment: for the proposed establishment of the Richmond Cemetery in Richmond, Richmond Local Municipality and uMgungundlovu District Municipality, KwaZulu-Natal.	November 2021

APPENDIX B: SITE PHOTOGRAPHS

Plate 1: Photograph facing southwards showing the grassland area on the southern end of the site.

Plate 2: Photograph showing the central portion of the site with a high density of alien invasive vegetation.

Plate 3: Remains of buildings on the north-eastern portion of the site.

Plate 4: Remains of buildings on the site.

Plate 5: Remains of the buildings on the site which are in the process of being demolished.

Plate 6: Remains of buildings on the site.

APPENDIX C: CHANCE FIND PROCEDURES FOR HERITAGE / PALAEONTOLOGICAL RESOURCES

1. INTRODUCTION

The following procedures must be considered in the event that previously unknown heritage resources, including fossils, burial grounds or graves, are exposed or found during the life of the project. The procedures below are based on the National Heritage Resources Act, 1999 Regulations (Reg No. 6820, GNR 548) and the KwaZulu-Natal Amafa and Research Institute Draft Regulations, 2021.

The term 'heritage resource' here includes burial grounds and graves, structures, archaeology, palaeontology, meteors and public monuments. If any sign of the above are uncovered during excavation of the site, the following protocol must be observed:

- All work in the vicinity of the find must immediately cease, with a radius of at least 25 meters of the site or discovery, and further disturbance of the heritage resource must be avoided.
- The ECO and project manager/developer must be notified of the discovery.
- The ECO must arrange for a suitably qualified specialist to consider the heritage resource, either via communicating with the ECO via telephone or email, or based on a site visit.
- The ECO and specialist must advise on the appropriate mitigation measures to be implemented.
- Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) and the KwaZulu-Natal Amafa and Research Institute Act (2018), a written report must be submitted to the KwaZulu-Natal Amafa and Research Institute within a period of 30 days from the date of making such a discovery.
- The report must include – the names of the person reporting; the object discovered; the time and date of such discovery; the location of such discovery; and the municipal area within which the discovery was made.
- The Provincial Heritage Resource Authority (PHRA) may require that a full Heritage Impact Assessment (HIA) to be conducted and may require rescue excavations to take place.

2. BURIAL GROUND AND GRAVE FIND PROCEDURE

In the event that human remains are accidently exposed, the project manager and / or ECO must immediately be notified of the discovery in order to take the required further steps:

- The local SAPS will be notified on behalf of the Applicant;
- A suitably qualified specialist must be arranged to inspect the exposed burial and determine in consultation with the SAPS:

a) The temporal context of the remains, i.e.:
   - forensic
   - authentic burial grave (informal or older than 60 years); or
   - archaeological (older than 100 years).

b) If any additional graves or burial sites may exist in the vicinity.

- Should the specialist conclude that the find is a heritage resource protected in terms of the NHRA (1999) and the KwaZulu-Natal Amafa and Research Institute Act (2018), a written report must be submitted to the KwaZulu-Natal Amafa and Research Institute within a period of 30 days from the date of making such a discovery.
- The SAHRA / PHRA may require that interested parties be identified and that consultation and /or grave relocation take place.
- If consultation and / or grave relocation are required, consultation and grave relocation must take place in terms of the NHRA (1999) and the KwaZulu-Natal Amafa and Research Institute Act (2018).

3. FOSSIL FIND PROCEDURES

3.1 Introduction

In the context of this application, it is unlikely that any fossil finds will require the declaration of permanent "no go" areas and it is likely that if any fossil finds are made, a temporary pause in activity within a particular area will be required. In the event that fossil material is uncovered during excavation, the strategy to be employed will be to rescue the material as quickly as possible.

The procedures outlined below are in general terms and will require adaptation depending on the specifics of type of fossil find. The procedures outlined below are detailed in terms of fossil bone finds, which usually occur sparsely. However, they do serve as a guideline for other fossil material finds, which may occur on the site.

3.2 Isolated and Cluster Bone Finds

There are two types of fossil bone finds – 'isolated bone finds' and 'cluster bone finds'. During the excavation process, isolated bones may be found within the walls or base of the excavation, or as they appear on the stockpile or spoil heap. When bones appear singly, in different parts of the excavation site, they are considered 'isolated bone finds', however, when six or more isolated bones / pieces are found, the finds are considered a 'cluster bone find'. A 'cluster bone find' is when several bones are uncovered in the same spot or grouped together within the excavation site. These bones may or may not resemble an intact or partially intact skeleton.

3.2.1 Response by Personnel in the Event of an Isolated Bone Find

The following responses should be undertaken by personnel in the event of isolated bone finds:

1. An isolated bone exposed in an excavation or spoil heap must be retrieved before it is covered by further spoil from the excavation and set aside;
2. The site foreman and ECO must be informed;
3. The responsible field person (site foreman or ECO) must take custody of the fossil. The following information is to be recorded:
    - Position (excavation position);
    - Depth of find in hole;
    - Digital image of hole showing vertical section (side); and
    - Digital image of fossil.
4. The fossil should be placed in a bag (e.g. a Ziploc bag), along with any detached fragments. A label must be included with the date of the find, position information, and depth; and
5. The ECO is to inform the Applicant who must then contact the heritage consultant. The ECO is to describe the occurrence and provide images via email.

3.2.2 Response by Palaeontologist in the Event of Isolated Bone Finds

The palaeontologist will assess the information and liaise with the Applicant and the ECO and a suitable response procedure will be established.

3.3 Response by Personnel in the Event of a Cluster Bone Find

The following responses should be undertaken by personnel in the event of bone cluster finds:

1. Immediately stop excavation in the vicinity of the potential material. Mark or flag the position as well as the spoil heap that may contain fossils;
2. Inform the site foreman and the ECO; and
3. The ECO is to inform the developer who must then contact the heritage consultant. The ECO must then describe the occurrence and provide images via email.

3.3.2 Response by Palaeontologist in the Event of a Bone Cluster Find

A palaeontologist must assess the information and liaise with the Applicant and the ECO and a suitable response procedure must be established. It is likely that a Field Assessment by the palaeontologist will be required. The response time / scheduling of the Field Assessment will be decided in consultation with the Applicant and the ECO. The Field Assessment could have the following outcomes:

- If a human burial, the appropriate authority is to be contacted. The find must be evaluated by a human burial specialist to decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are of an archaeological context, an archaeologist must be contacted to evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are of a palaeontological context, the palaeontologist must evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.

3.4 Rescue Excavation

Rescue Excavation refers to the removal of the material from the site excavation. This is applicable if the volume or significance of the exposed material appears to be relatively confined and it is feasible to remove it without compromising the contextual data. The time span for Rescue Excavation should be relatively rapid to avoid any undue delays (e.g. less than one week).

In principle, the strategy during the mitigation is to “rescue” the fossil material as quickly as possible. The strategy to be adopted depends on the nature of the occurrence, particularly the density of the fossils. The methods of collection would depend on the preservation or fragility of the fossil and whether in loose or in lithified sediment.

These could include:

- On-site selection and sieving in the case of robust material in sand; and
- Fragile material in loose sediment would be encased in blocks using Plaster-of-Paris or reinforced mortar.

If the fossil occurrence is dense and is assessed to be a “Major Find”, a carefully controlled excavation is required.

3.5 Major Finds

A Major Find is when the occurrence of material that, by virtue of quantity, importance and time constraints, cannot be feasibly rescued without compromising the detailed material recovery and contextual data / observations.

3.5.1 Management Options for Major Finds

In consultation with the Applicant and the ECO, the following options should be considered when deciding on how to proceed in the event of a Major Find.

Option 1: Avoidance
Avoidance of the Major Find through project redesign or relocation. This ensures minimal impact to the site and is the preferred option from a heritage resource management perspective. When feasible, it can also be the least expensive option from a construction perspective. The find site will require site protection measures, such as erecting fencing or barricades. Alternatively, if excavation of the find will be delayed substantially or indefinitely, the exposed finds can be stabilised and the site refilled or capped. Appropriate protection measures should be identified on a site-specific basis and in wider consultation with the heritage and scientific communities. This option is preferred as it will allow the later excavation of the finds with due scientific care and diligence.

Option 2: Emergency Excavation
Emergency excavation refers to the "no other option" situation where avoidance is not feasible due to design, financial and time constraints. It can delay construction and emergency excavation itself will take place under tight time constraints, with the potential for irrevocable compromise of scientific quality. It could involve the removal of a large, disturbed sample by an excavator and conveying this by truck from the immediate site to a suitable place for "stockpiling". This material could then be processed later. Emergency excavation is not the preferred option for a Major Find due to the loss of contextual data and the loss of sample integrity.

3.6 Exposure of Other Fossil Types (e.g. Plants, Fossil Shell Beds)

3.6.1 Response for Personnel in the Event of Other Fossil Finds

The following responses should be undertaken by personnel in the event of any type of fossil finds:

1. The site foreman and ECO must be informed;
2. The responsible field person (site foreman or ECO) must record the following information:
    - Position (excavation position);
    - Depth of find in hole;
    - Digital image of the hole showing the vertical section (side); and
    - Digital images of the fossiliferous material.
3. A generous quantity of the excavated material containing the fossils should be stockpiled near the site, for later examination and sampling;
4. The ECO is to inform the developer who must then contact the heritage consultant. The ECO is to describe the occurrence and provide images via email.

3.6.2 Response by the Palaeontologist in the Event of Other Fossil Finds

The palaeontologist will assess the information and liaise with the developer and the ECO and a suitable response will be established. This will most likely be a site visit to document and sample the exposure in detail, before it is covered up.

4. MONITORING FOR FOSSILS

A regular monitoring presence over the period during which excavations are made, by either an archaeologist or palaeontologist, is generally not practical.

The field supervisor or foreman and workers involved in digging excavations must be encouraged and informed of the need to watch for potential fossil and buried archaeological material. Workers seeing potential objects are to report to the field supervisor who, in turn, will report to the ECO. The ECO will inform the heritage consultant in the case of fossil finds.

To this end, responsible persons must be designated. This will include hierarchically:

- The field supervisor or foreman who is going to be most often in the field;
- The ECO for the project; and
- The Project Manager.

Should the monitoring of excavations be stipulated in the Archaeological Impact Assessment and / or the Heritage Impact Assessment, the contracted Monitoring Archaeologist (MA) can also monitor for the presence of fossils and a make field assessment of any material brought to attention. The MA is usually sufficiently informed to identify fossil material and this avoids additional monitoring by a palaeontologist.

The MA then becomes the responsible field person and fulfils the role of liaison with the palaeontologist and coordinates with the Applicant and the ECO. If fossils are exposed in non-archaeological contexts, the palaeontologist should be summoned to document and sample / collect them.