



PHASE 1 HERITAGE IMPACT ASSESSMENT AND DESKTOP PALAEOLOGICAL IMPACT ASSESSMENT:

**PROPOSED ESTABLISHMENT OF A 67 900M³ DAM AND THE
CULTIVATION OF APPROXIMATELY 45HA OF MACADAMIA NUT
TREES ON HOPEWELL FARM, KWADUKUZA LOCAL AND ILEMBE
DISTRICT MUNICIPALITY, KZN.**

PREPARED FOR: LINNEAR SUGAR FARMING (PTY) LTD

DATE: 01 APRIL 2022

FINAL REPORT

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Date:	01 April 2022
Document Title:	Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment for the proposed establishment of a 67 900m ³ dam and cultivation of approximately 45ha of macadamia nut trees on Hopewell Farm, KwaDukuza Local Municipality, KwaZulu-Natal.
Author:	Dr Phillipa Harrison – Green Door Environmental
Peer Review:	Jean Beater – JLB Consulting
Report Prepared For:	Linnear Sugar Farming (Pty) Ltd

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

General declaration:

- 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 report 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.



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Refer to Appendix A for the CV of the Heritage Consultant

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EXECUTIVE SUMMARY

Green Door Environmental was appointed on behalf of Linnear Sugar Farming (Pty) Ltd to conduct a Phase 1 Heritage Impact Assessment (HIA) and Desktop Palaeontological Impact Assessment (PIA) for the proposed establishment of a 67 900m³ dam and the cultivation of macadamia nut trees on Hopewell Farm, KwaDukuza Local and iLembe District Municipality, KwaZulu-Natal. Hopewell Farm is located on Portions 98 and 116 of the Farm Drie Fontein No. 1127, approximately 8km to the north west of Ballito, in the Compensation area.

The proposed dam will cover an area of approximately 2.3ha once fully developed, and approximately 3km of associated pipeline will also be installed on Hopewell Farm for irrigation from the dam. The proposed macadamia cultivation will be undertaken on four areas of the Farm, covering approximately 45ha of land in total. While the majority of the study site has previously been cultivated and currently comprises sugar cane, some uncultivated land will be cleared and converted from natural vegetation as part of the project. As such, this Phase 1 HIA is being undertaken in accordance with the requirements of Section 41(1)(a)&(c) of the KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act 5 of 2018). The project site is located within an area that is predominantly designated as having a 'low sensitivity' in terms of fossil sensitivity according to the SAHRIS palaeo-sensitivity map. However a small portion of the site also falls within a 'moderately sensitive' palaeontological area. As such, a Desktop PIA and a protocol of finds is required for the proposed 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 dam and macadamia cultivation on Hopewell Farm. The proposed development triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (amended 2017) under NEMA for which a Scoping and EIA 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. A ground survey of the study site was conducted on the 28th March 2022 following standard archaeological survey procedures.

Hopewell Farm is a commercial agricultural operation currently comprising sugar cane cultivation. It is situated within the vicinity of the Isinembe Community and is surrounded by commercial sugar cane and other farming enterprises. The site is bounded by Esenembi Road to the south. A tributary of the Mhlali River, and other riparian channels, traverse the site and there is an existing farmhouse located on the property which was established in 2010.

According to the Durban 1:250 000 Geological map series (Council for Geosciences) the local geology of the study site is characterised by Natal Group sandstone. A localised occurrence of Dwyka tillite of the Karoo Supergroup is present on the south eastern portion of the site. Dolerite dykes and sills are also known to occur in the wider project area. Dolerite is an intrusive igneous rock which has

an insignificant/zero sensitivity rating according to the SAHRIS palaeo-sensitivity map, and comprises a non-fossiliferous rock type. Natal Group deposits have a low palaeo-sensitivity rating and no fossils have been recorded for the Natal Group deposits to date (Groenewald, 2012). It can therefore also be considered a non-fossiliferous rock type. The likelihood of significant fossils being present in the Dwyka Group deposit is low as the cold glacial environment in which the sedimentary rocks of the Dwyka Group were deposited is not considered conducive to fossilization, 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.

No heritage resources were identified on the project site during the Phase 1 HIA, and the site does not form part of any known cultural or heritage landscape. The oldest built structure present on the property is approximately 12 years old and comprises the farmhouse. As such, the proposed dam and cultivation project may proceed on the identified site subject to the recommendations as contained in Section 11 of this Report.

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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

HOPEWELL FARM DAM AND MACADAMIA CULTIVATION: PHASE 1 HERITAGE IMPACT ASSESSMENT AND DESKTOP PALAEOLOGICAL IMPACT ASSESSMENT

1 INTRODUCTION AND DEVELOPMENT BACKGROUND

Green Door Environmental was appointed on behalf of Linnear Sugar Farming (Pty) Ltd to conduct a Phase 1 Heritage Impact Assessment (HIA) and Desktop Palaeontological Impact Assessment (PIA) for the proposed establishment of a 67 900m³ dam and the cultivation of macadamia nut trees on Hopewell Farm in the Compensation area of the KwaDukuza Local and iLembe District Municipality, KwaZulu-Natal. Hopewell Farm is located on Portions 98 and 116 of the Farm Drie Fonteynen No. 1127. The farm is accessed off the Esenembi Road via the R102 Road and is located at GPS coordinates S29°28'3.91" and E31°7'35.04", approximately 8km to the north west of Ballito.

The proposed dam will cover an area of approximately 2.3ha once fully developed, and approximately 3km of associated pipeline will also be installed on Hopewell Farm for irrigation of the macadamia trees from the dam. The proposed macadamia cultivation will be undertaken on four areas of the farm, covering approximately 45ha of land in total. While the majority of the study site has previously been cultivated and currently comprises sugar cane, some uncultivated land will be cleared and converted from natural vegetation as part of the project.

This Phase 1 HIA is being undertaken in accordance with the requirements of Section 41(1)(a)&(c) of the KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act 5 of 2018). The project site is located within an area that is predominantly designated as having a 'low sensitivity' in terms of fossil sensitivity according to the SAHRIS palaeo-sensitivity map. However, a small portion of the site also falls within a 'moderately sensitive' palaeontological area. As such, a Desktop PIA and a protocol of finds is required for the proposed dam and macadamia cultivation 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 a dam and macadamia cultivation on Hopewell Farm. The proposed development triggers Listed Activities in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (amended 2017) under NEMA for which a Scoping and EIA Process is required.

2 SCOPE OF THE ASSESSMENT

The Phase 1 HIA aims to locate, identify and assess the significance of any heritage resources, 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 views, 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 reports 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:

- Hopewell Farm has a long history of agricultural use and is largely disturbed, and currently comprises sugar cane cultivation. Heritage site visibility may have been compromised by the presence of the sugar cane cultivation which covers much of the study site.
- Areas of dense vegetation are also present along the riparian channels on the study site which compromised heritage site visibility as well as site accessibility.
- Heritage resources may be present below the surface. No subsurface investigations were undertaken as part of the Phase 1 HIA.
- 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 resources.
- The study results are based on a single day field investigation conducted during the late summer/early autumn months when vegetation cover is denser. 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 establishment of a dam and macadamia cultivation on Hopewell Farm.

Table 1: Applicable Legislative Requirements

Legislation	Relevant Section	Description
EIA Regulations 2014 (amended 2017) under NEMA 1998 (Act 107 of 1998)	GNR 327 Part 12	<i>"The development of – (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; where such development occurs – (a) within a watercourse."</i>
	GNR 327 Part 19	<i>"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse."</i>
	GNR 327 Part 27	<i>"The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for - (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan."</i>
	GNR 325 Part 16	<i>"The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more."</i>
KwaZulu-Natal Amafa and Research Institute Act 2018 (Act 5 of 2018)	Section 41(1)	<i>"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."</i>

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 KwaDukuza Local Municipal area and in particular the Umhlali and Compensation area. 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. The study also made use of the site specific specialist Geotechnical Report (MonoBlock Laboratories, 2017) and Preliminary Yield and Groundwater Alternatives Report (GCS Water and Environmental Consultants, November 2021) to determine the geology and soil characteristics of the study site.

5.2 GROUND SURVEY

A ground survey of the study site was conducted on the 28th March 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 some areas, particularly along the contours and other uncultivated portions of the site. Ground visibility and accessibility was compromised along the riparian channels due to dense vegetation cover as well as on the areas currently under sugar cane cultivation. 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 Consultant also liaised with the Hopewell Farm property owner both telephonically prior to the site visit, and in person during the ground survey, in order to gain an understanding of the site history, age of the buildings present on the site, and determine the possibility of the presence of any graves, stone walling or other heritage features on the study site. The landowner was not aware of the presence of any graves, stone walling 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 Umhlali / Compensation area of the North Coast of KwaZulu-Natal in the KwaDukuza Local and iLembe District Municipality. The proposed dam site is located on Portion 116 of the Farm Drie Fonteinen No. 1127, on a tributary of the Mhlali River. The proposed dam will have a storage capacity of 67 900m³, a surface area of 2.3ha, a wall height of 9.5m and a wall length of 105m.

The proposed 45ha of macadamia cultivation will be undertaken on four areas of the farm, located on both Portions 98 and 116 of the Farm Drie Fonteinen No. 1127. The majority of this land has previously been cultivated however some uncultivated land will be cleared and converted from natural vegetation as part of the project.

Water from the proposed dam will be pumped via 200mm pipelines to the macadamia lands for irrigation purposes. The proposed dam will serve as a storage reservoir to be used for supplementary irrigation to support the critical flowering phase of the macadamia nut tree growth cycle. Approximately 3km of pipeline will be installed as part of the project. Due to the encroachment of the proposed project into indigenous vegetation and within 32m of watercourses, there may be a potential need for the implementation of both wetland and biodiversity offsets respectively.

Hopewell Farm is a commercial agricultural operation situated within the vicinity of the Isinembe Community and is surrounded by commercial sugar cane and other farming enterprises. The site is bounded by Esenembi Road to the south. A tributary of the Mhlali River and other riparian channels traverse the site, and there is an existing farmhouse located on the property which was established in 2010. Most of the study site is currently under sugar cane cultivation and can be considered transformed. Strips of indigenous vegetation with a high density of alien invasive species are however still present along the riparian channels on the site.

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

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

Property description	Portions 98 and 116 of the Farm Drie Fonteinen No. 1127
Magisterial District	KwaDukuza Local Municipality and iLembe District Municipality
1: 50 000 map sheet number	2931AC
Central co-ordinate of the development	S29°28'3.91" and E31°7'35.04"
Type of development	Agriculture
Property zoning	Unzoned / Agriculture.

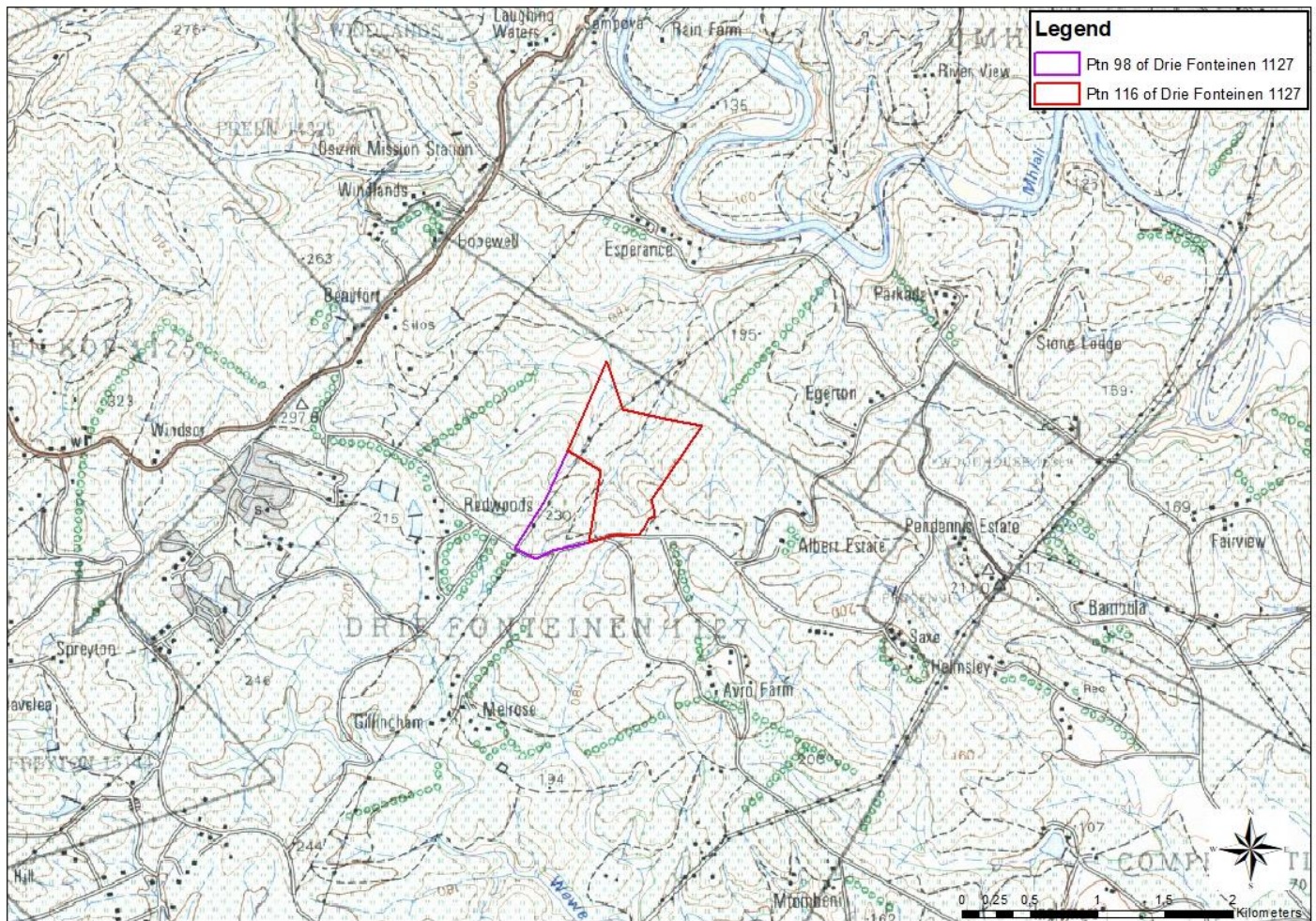


Figure 1: Topographical map of the Hopewell Farm study site in Compensation.



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

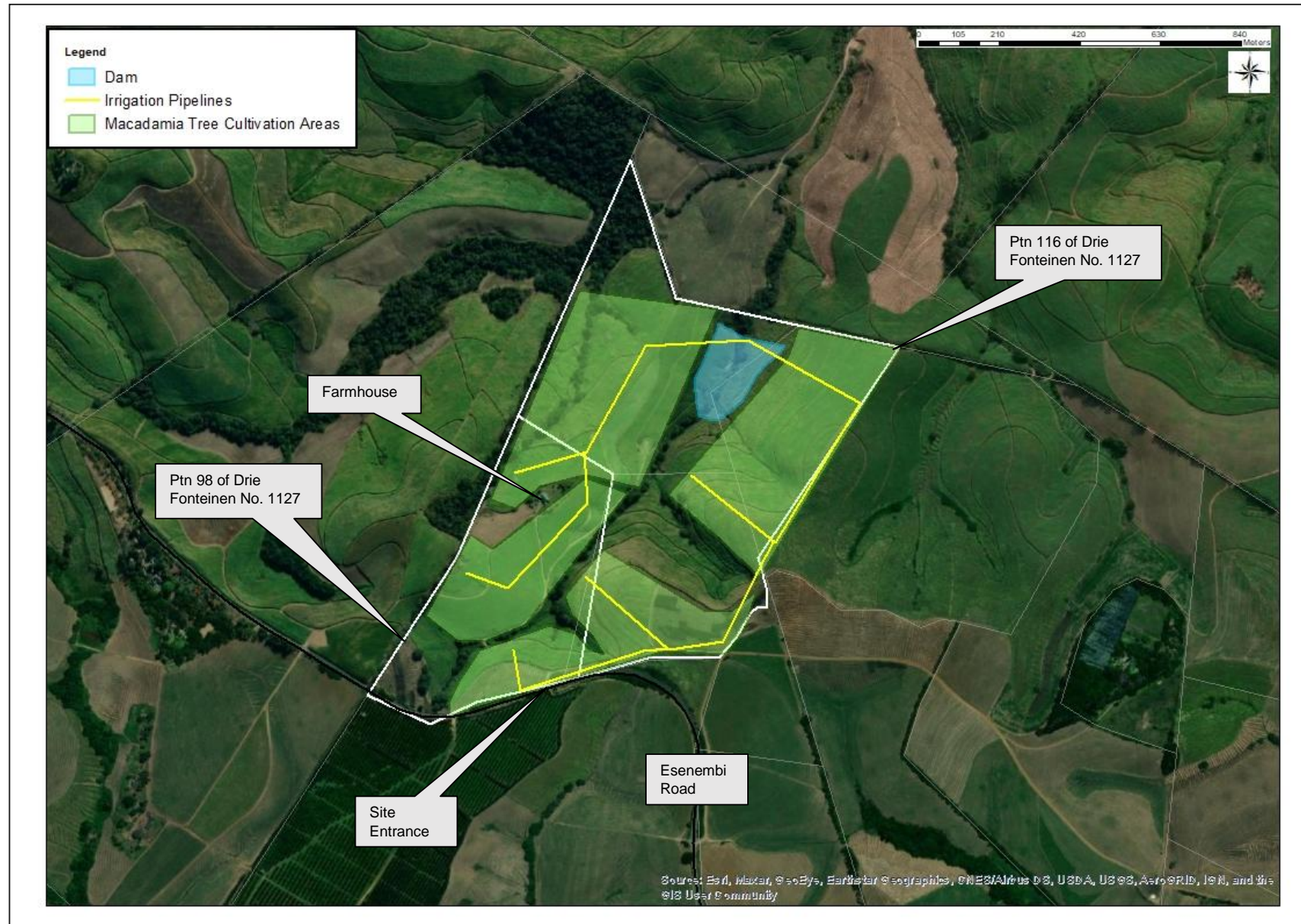


Figure 3: Layout plan showing the proposed dam, pipelines and macadamia cultivation on Hopewell Farm.

7 CULTURAL OVERVIEW OF THE STUDY AREA

The general KwaDukuza / Stanger area has been relatively well surveyed for archaeological and heritage sites by the KwaZulu-Natal Museum. Archaeological work has also been undertaken in the larger project area by the Universities of Cape Town and Witwatersrand due to the presence of the Sibudu Rock Shelter in the area. A number of heritage surveys have also been undertaken in the KwaDukuza area by private heritage consultants over the past few years.

A range of archaeological sites are recorded in the KwaZulu-Natal Museum and Amafa heritage site inventories for the larger study area. These include Early, Middle and Late Stone Age sites; Middle and Late Iron Age sites; and more recent sites from the historical period relating to the Zulu Kingdom and the colonial era (Prins, 2017; 2020).

Sibudu Rock Shelter is located approximately 6km to the south west of the project site and is one of the most important Middle Stone Age sites identified in KwaZulu-Natal. Extensive excavations have been carried out at the site over the past two decades and evidence of some of the earliest examples of modern human technology have been unearthed including some of the earliest known bedding material and evidence for the use of medicinal plants (Mitchell, 2002; Wadley, 2004; Prins, 2020). Sibudu Shelter was occupied from approximately 77 000 to 38 000 years ago during the Middle Stone Age which is associated with early behavioural innovations and the expansion of modern humans within and out of Africa (Wadley, 2004). Sibudu Shelter has been declared a National Heritage Site in terms of the NHRA as it has made a significant contribution to our understanding of the evolution of modern human behaviour (Prins, 2020).

In addition to the Sibudu Shelter, two other archaeological sites are located approximately 6km from the project area, as recorded in the KwaZulu-Natal Museum inventory. These comprise Middle and Late Stone Age sites. Lastly, a HIA study previously undertaken for a proposed Eco Estate development in the area identified a number of Late Iron Age sites approximately 2.5km to the north east of Hopewell Farm (Anderson, 2014). Figure 4 below shows the location of the identified archaeological sites within the vicinity of the project area.

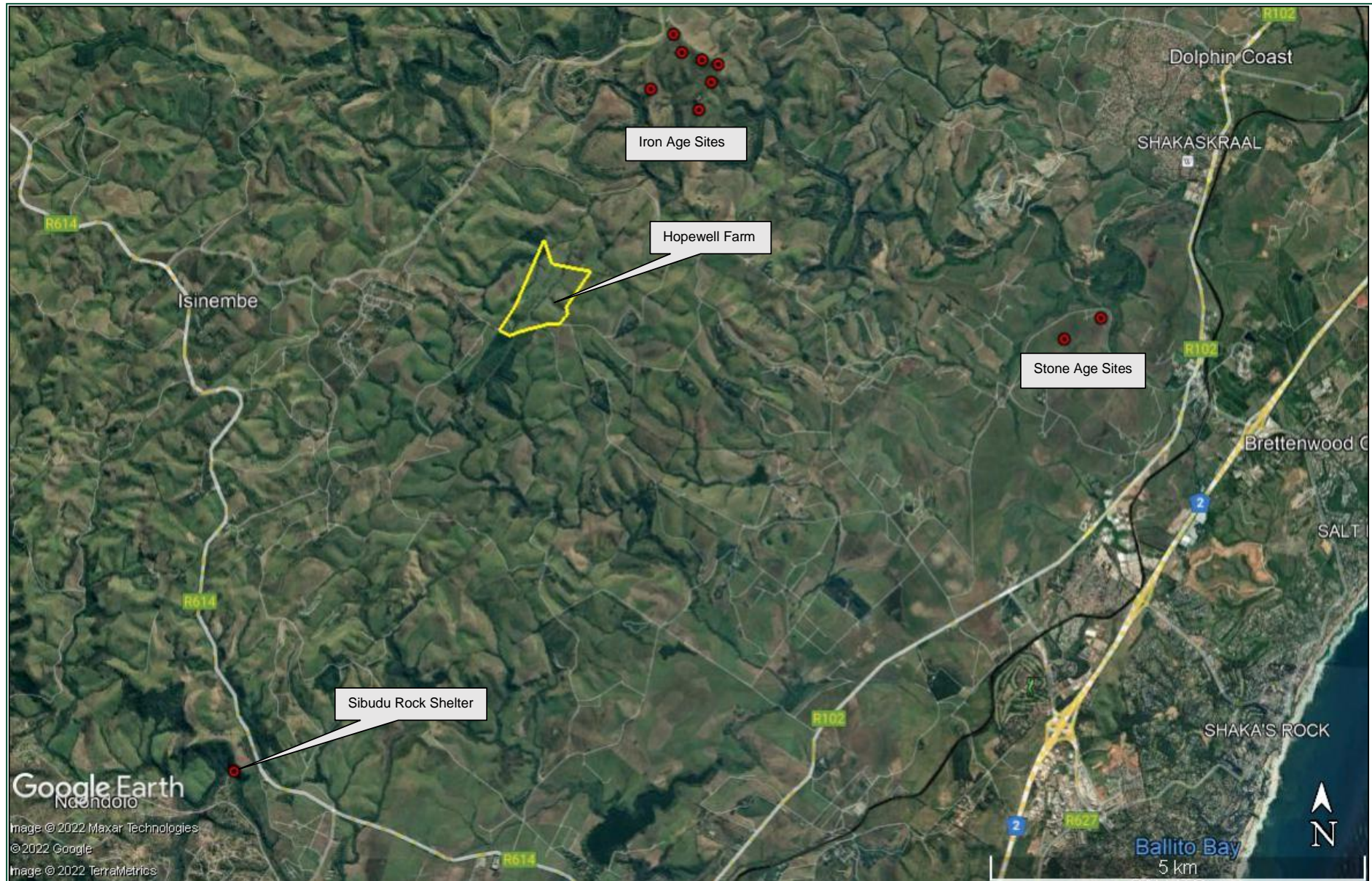


Figure 4: Location of identified Heritage Sites within the vicinity of the project area.

8 GEOLOGY AND PALAEOLOGY

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 5 below. The SAHRIS paleo-sensitivity map shows the area as having a predominantly “low sensitivity” in terms of fossil sensitivity. A very small portion of the site however falls within a “moderately sensitive” area, in the south eastern portion of the site.

The 2930 Durban 1:250 000 Geological map series (Council for Geosciences) was used to identify the general geology of the study site, as shown in Figure 6 below. The majority of the site is underlain by Cambrian to Ordovician age sandstone of the Natal Group. A small portion in the south eastern section of the site comprises Late Carboniferous to Early Permian age tillite sedimentary rock of the Dwyka Formation of the Karoo Supergroup. Localised Jurassic age dolerite intrusions do also occur in the larger study area however none are present on the project site. Jurassic age dolerite comprises a non-fossiliferous rock type which, by its nature as an intrusive volcanic rock, has the potential to damage or destroy fossils preserved in adjacent fossiliferous deposits (Trower, 2021).

The sedimentary sequence that makes up the Natal Group was deposited some 490 million years ago during the Cambrian to Ordovician period and comprises coarse grained arkosic to subarkosic sandstone, quartz arenite, pebble conglomerate and siltstone and mudstone (Council for Geosciences; Groenewald, 2012). The sediments of the Natal Group were transported and deposited by rivers that drained highlands to the north east. In northern KwaZulu-Natal, close to their source, the Natal Group deposits include thick accumulations of boulders and pebbles where deep valleys were in-filled, while further south, the sediments are finer grained and form resistant sandstone cliffs as seen in the Valley of a Thousand Hills and Oribi Gorge near Port Shepstone (Groenewald, 2012). Figure 7 below shows the location of the Natal Group sandstones in KwaZulu-Natal. Natal Group deposits have a low palaeo-sensitivity rating and no fossils have been recorded for the Natal Group deposits to date (Groenewald, 2012). It can therefore be considered a non-fossiliferous rock type.

The geological formations of the Dwyka Group are largely restricted to the edges of the Karoo Basin, and overlie the Natal Group deposits, with the study site forming part of the eastern exposures, and comprising glacial deposits (tillite) 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 Gondwana 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).

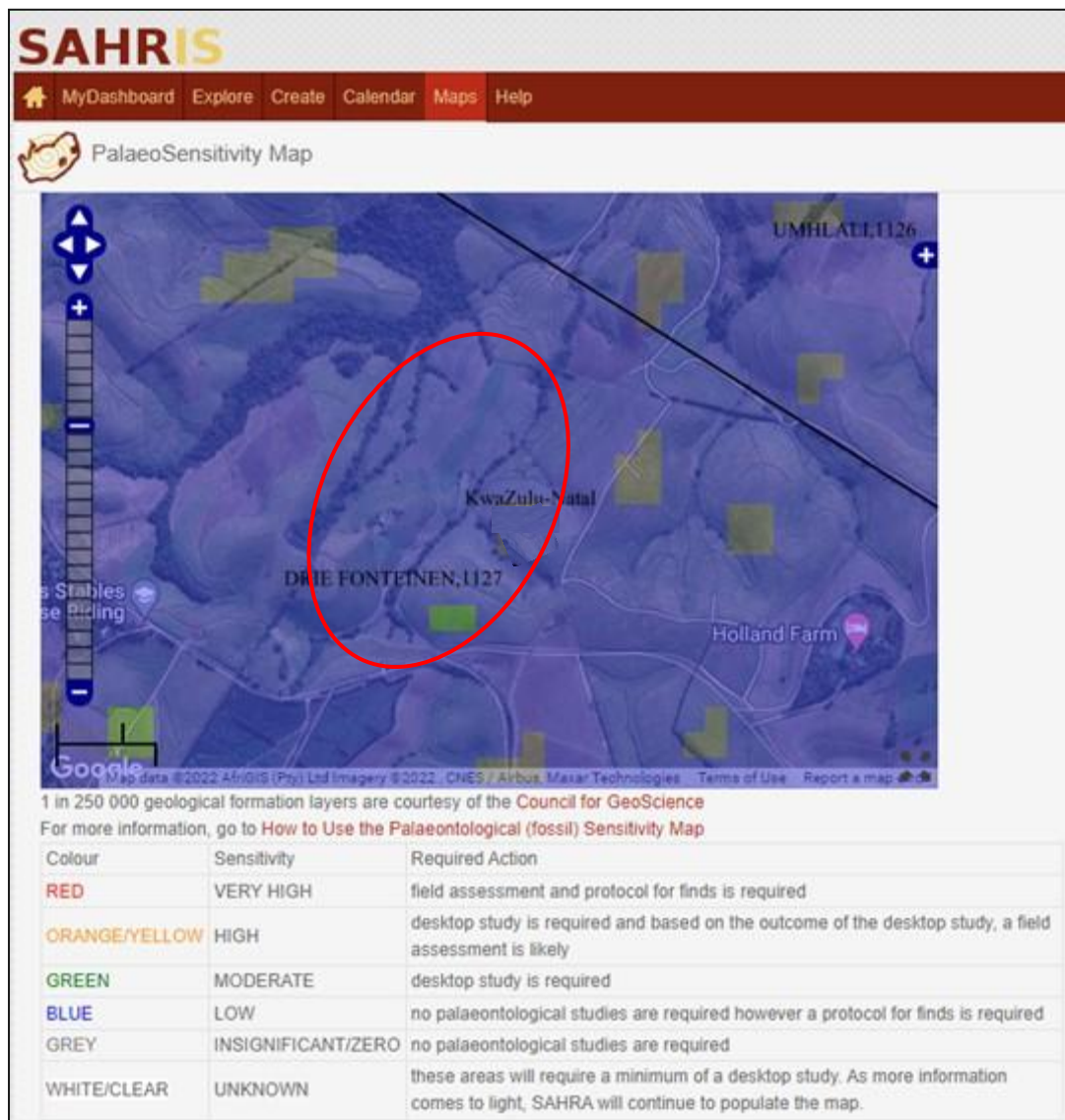


Figure 5: SAHRIS palaeo-sensitivity map for the study site (SAHRIS).

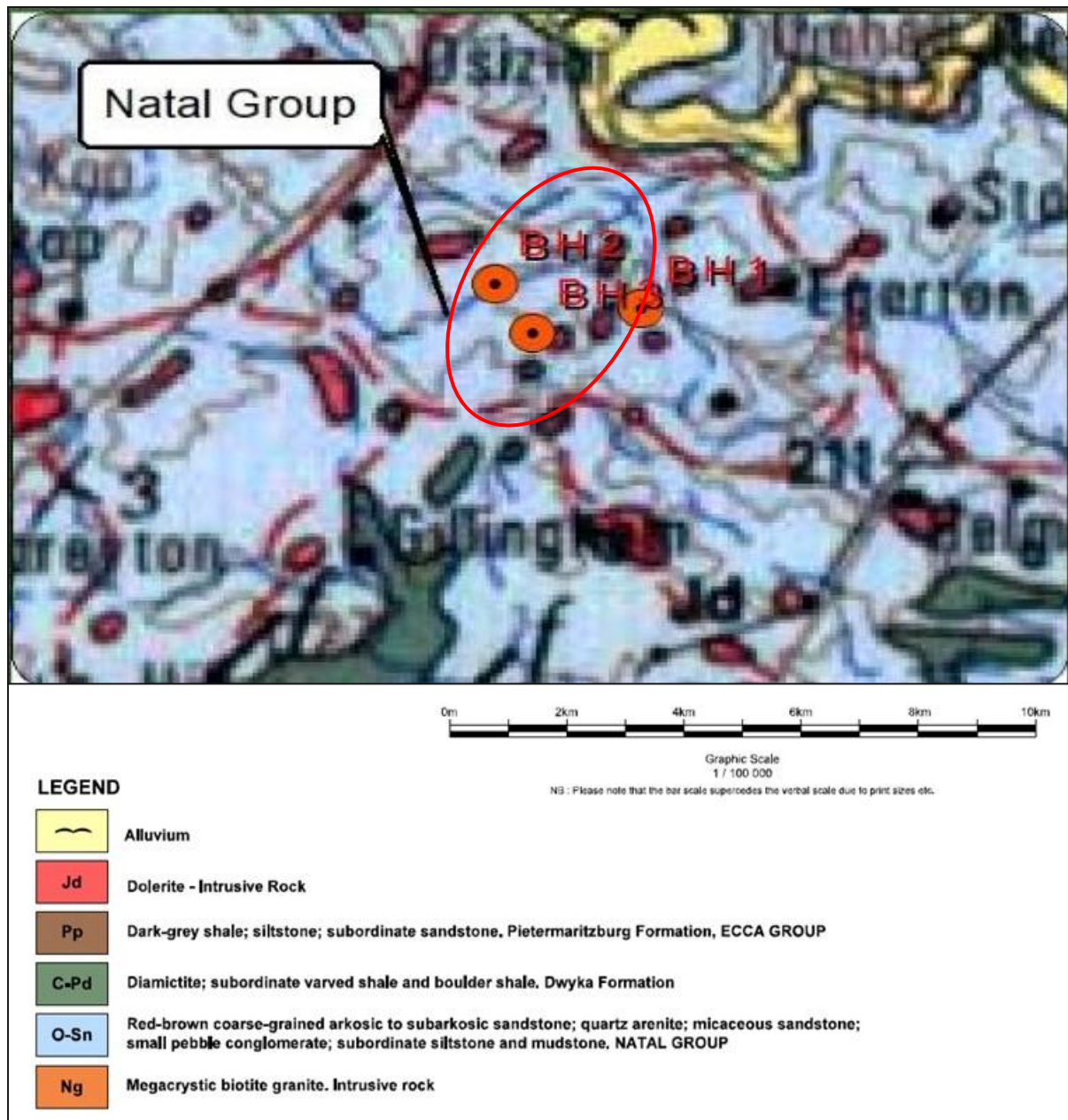


Figure 6: Regional geology of the study area (Council for Geosciences; GCS).

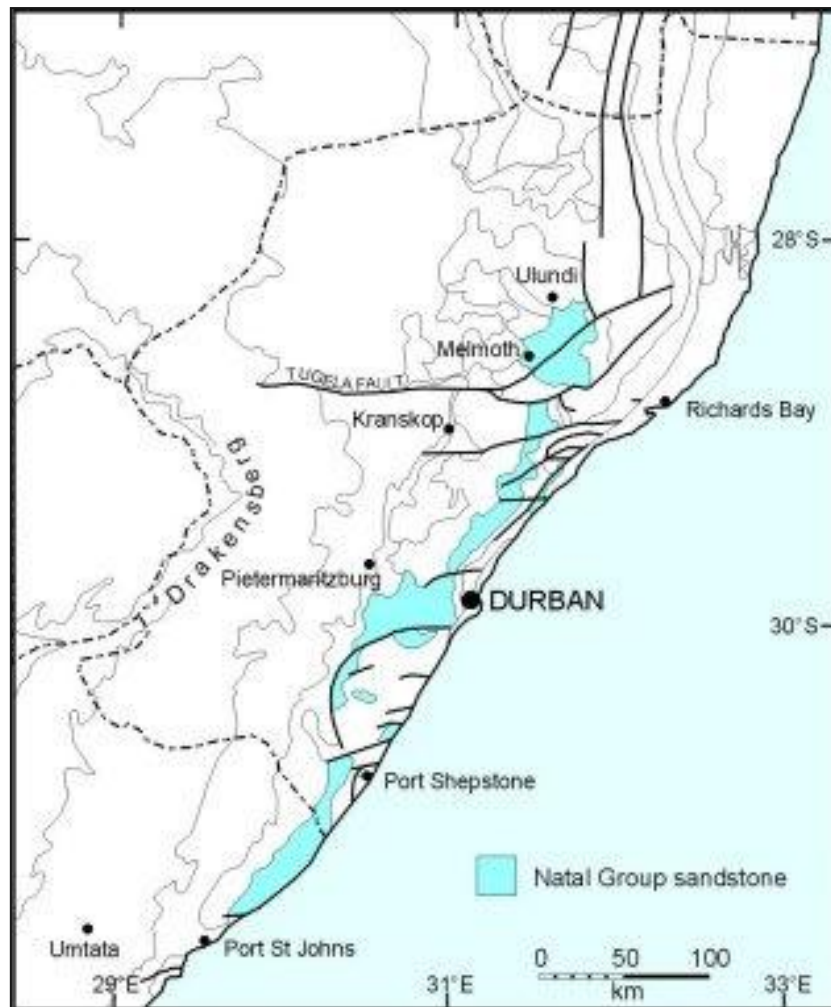


Figure 7: Map showing the outcrops of Natal Group Sandstones in KwaZulu-Natal (Groenewald, 2012).

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 1973, 2004 and 2010 (Figures 8 – 10) was used to identify past activity on the site. The aerial imagery shows that the project site has a long history of agricultural use and associated anthropogenic disturbance, with almost the entire site under sugar cane cultivation by the early 1970s.

Aerial imagery from 1973 shows that the large-scale transformation of the site from indigenous vegetation to sugar cane cultivation had taken place by the 1970s (Figure 8). There are no built structures present on the site in the 1973 aerial imagery. The areas surrounding the site had also been transformed to cultivated land by 1973.



Figure 8: Historic aerial imagery of the development site from 1973 shows the large-scale transformation of the site and surrounding areas to sugar cane cultivation.

Aerial imagery from 2004 shows little change on the site since 1973, with the site still under sugar cane cultivation, and no built structures present on the site (Figure 9).

More recent Google Earth imagery of the site is available from 2006 to the present day. Imagery from 2010 shows the presence of the farmhouse on the western portion of the property (Figure 10). No other land use changes are evident on the remainder of the site.

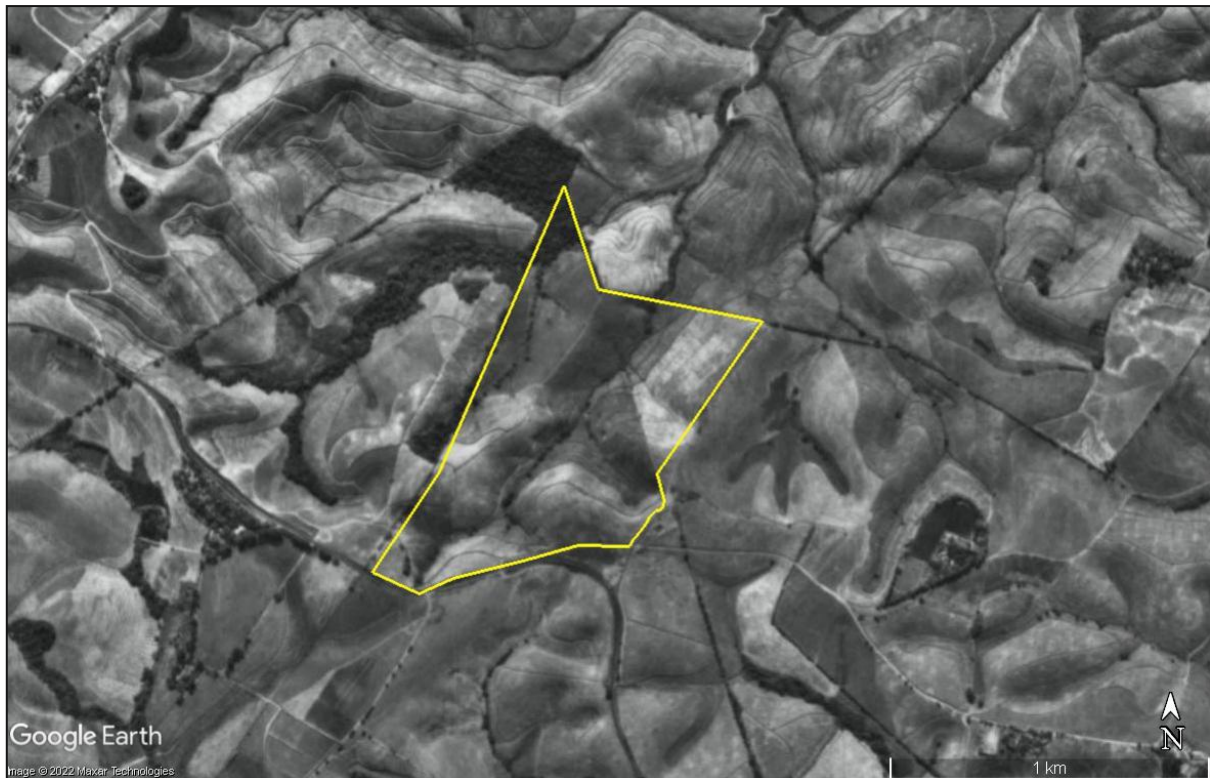


Figure 9: Historic aerial imagery of the development site from 2004 shows no significant land use changes on the site since the 1970s.

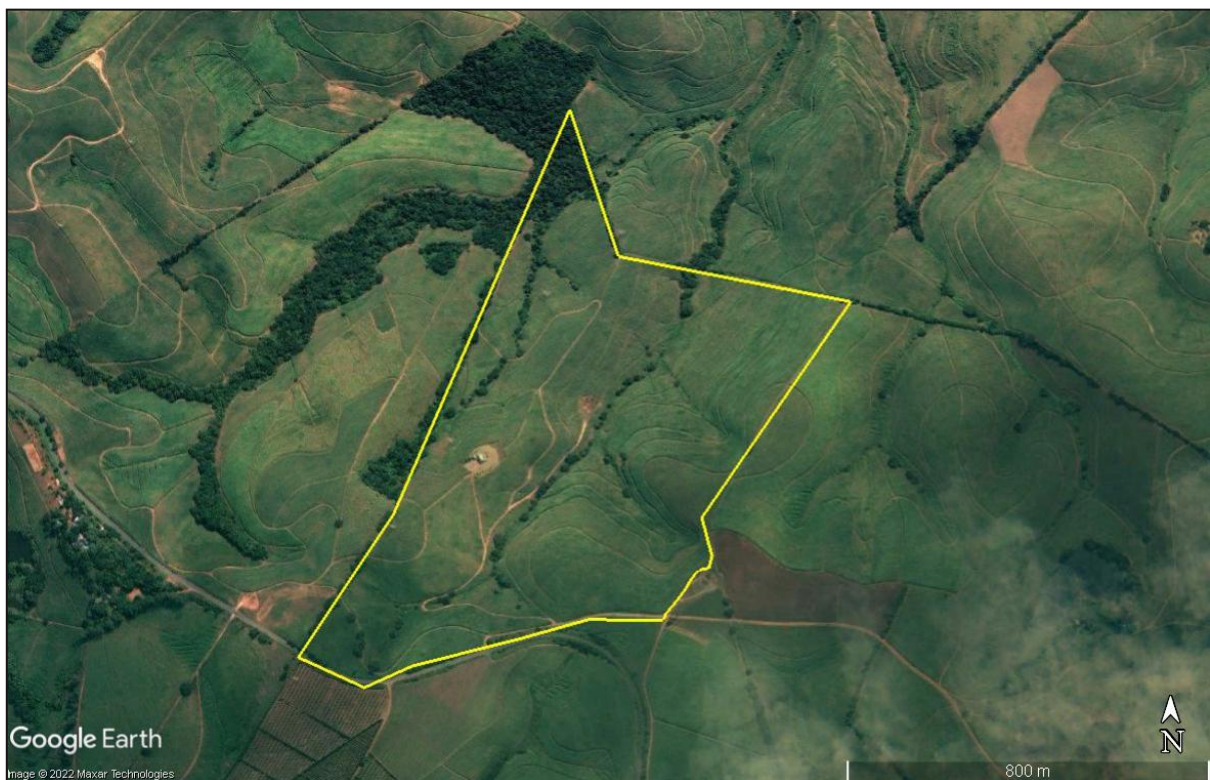


Figure 10: Google Earth imagery from 2010 shows the newly established farmhouse in the western portion of the property.

The results of the desktop assessment show that the transformation of the larger project area began long before the 1970s, with almost the entire site and surrounding areas cultivated by 1973. The earliest built structure on the site was established in 2010 and comprises a farmhouse. No heritage resources are evident on the site surface in the historic aerial imagery of the area. In addition, as the study site has been extensively cultivated, it is likely that any subsurface heritage resources that may have been present on the site have been disturbed and/or destroyed.

9.2 GROUND SURVEY

No development activities associated with the proposed dam establishment and macadamia cultivation had begun at the time of the ground survey. No heritage resources were identified on or directly adjacent to the Hopewell Farm footprint as outlined in Table 3 below. The built structures (farmhouse) present on the site are younger than 60 years.

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.	Negligible
In possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.	Negligible
Has potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.	Negligible
Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects.	Negligible
Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;	Negligible
Importance in demonstrating a high degree of creative or technical achievement at a particular period.	Negligible
Has a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.	Negligible
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 dam and macadamia cultivation project on Hopewell Farm 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 PALAEOLOGY

The results of the Desktop PIA show that the most of the site has a 'low sensitivity' rating and comprises Natal Group sandstone, while a small portion of the site comprises Dwyka tillite which has a 'moderate sensitivity' rating, in terms of the SAHRIS palaeo-sensitivity map. The excavations for the dam construction will expose some sediments of the Natal Group, while a portion of the macadamia cultivation will take place on the 'moderate sensitivity' Dwyka Formation tillite sediments.

Natal Group sandstone comprises a non-fossiliferous rock type and no fossils have been recorded for the Natal Group deposits to date (Groenewald, 2012). The chances of fossils being present in the Natal Group deposits on the study site are therefore minimal to zero. Dwyka Formation tillite comprises glacial sediment deposited in an extremely cold and harsh glacial environment, which is not conducive to fossilization. As such, no well-preserved fossils are expected to be present in the Dwyka Formation sediments on the study site. In addition, due to the nature of the activities in this area of the site (macadamia cultivation), it is unlikely that bedrock will be exposed or disturbed by the proposed activities. However, in the unlikely event that any activities on the site expose 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 proposed dam and macadamia cultivation project on Hopewell Farm.

As no heritage sites or resources have been identified on the development footprint or immediate surrounds; the area is not part of any known cultural landscape; and it is highly unlikely that fossils are present within the project 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 Dam and Macadamia Cultivation Project on Hopewell Farm

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 67 900m³ dam and 45ha of macadamia cultivation on Hopewell Farm identified no heritage sites or features on the project footprint or immediate surrounds. The area also does not form part of any known cultural landscape. It is also highly unlikely that fossils are present within the project site due to the nature of the bedrock (Natal Group sandstone and glacial Dwyka tillite) 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 proposed project.

In the unlikely event that the project activities expose any graves, fossils or other heritage features on the development footprint, all activities must cease and the Environmental Control Officer (ECO) appointed for the construction phase of the 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 project 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.

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APPENDICES

APPENDIX A: SHORT CV OF THE HERITAGE CONSULTANT

CURRICULUM VITAE

Dr. Phillipa Harrison

Environmental Assessment Practitioner (EAP) and Heritage Consultant

Green Door Environmental

PhD. Geog Sci (UKZN), BA Hons Archaeology (UNISA)

CONTACT DETAILS

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QUALIFICATIONS

2015 – 2021	Bachelor of Arts Honours (Archaeology), University of South Africa (UNISA)
2003 – 2006	Doctor of Philosophy (PhD), University of KwaZulu-Natal, Pietermaritzburg, South Africa
Project	The Role of Tourism in Natural Resource Management in the Okavango Delta, Botswana.
Supervisors	Profs. B. Maharaj and T. Hill, Department of Geography, University of KwaZulu-Natal
2001 – 2002	Master of Arts (MA), University of KwaZulu-Natal, Pietermaritzburg, South Africa
Project	The Impact of Tourism on Agriculture in the Okavango Delta, Botswana.
Supervisors	Prof. B. Maharaj, Department of Geography, University of KwaZulu-Natal
2000	Bachelor of Arts Honours (Geography), University of KwaZulu-Natal, Pietermaritzburg
1997 – 1999	Bachelor of Arts (Geography, English, Geology), University of KwaZulu-Natal, Pietermaritzburg

PROFESSIONAL REGISTRATIONS

Association of Southern African Professional Archaeologists (ASAPA)

CAREER PROFILE WITHIN THE ENVIRONMENTAL AND HERITAGE IMPACT ASSESSMENT FIELDS

Dr Phillipa Harrison has nine years' experience in the Environmental Assessment field with experience in conducting Basic Assessment and Scoping and EIA processes, compiling Environmental Management Programmes, undertaking Water Use and Waste Management License Applications, and undertaking Heritage

Impact Assessment and Desktop Palaeontological Impact Assessments. Project experience has been in the industrial, agricultural, commercial, linear and waste management sectors.

Areas of Expertise

- Heritage Impact Assessment and Desktop Palaeontological Impact Assessment Studies;
- EIA and Basic Assessment Processes (including the Public Participation Process);
- Environmental Management Programmes (EMPr);
- Water Use License Applications;
- Waste Management License Applications;
- Internal review of other EAP's EIA work; and
- Section 24G applications and compilation of reports for unlawful activities.

CURRENT EMPLOYMENT RECORD

Green Door Environmental, Hilton, South Africa

June 2015 to Present - Environmental Assessment Practitioner and Heritage Consultant

Responsible for undertaking Heritage Assessment studies and Environmental Authorisation processes for new developments within all sectors. Compiling and implementing construction and operational EMPrs. Project Management, Permit Applications, Compilation of Reports and Environmental Reviews.

EXAMPLES OF PROJECT EXPERIENCE

PROJECT NAME	CLIENT	AUTHORISATION PROCESS
<ul style="list-style-type: none"> • 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). 	Umlaas Junction (Pty) Ltd	Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment
<ul style="list-style-type: none"> • 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). 	Timbali Memorial Park (Pty) Ltd	Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment
<ul style="list-style-type: none"> • 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). 	Beacon Hill Farming (Pty) Ltd	Phase 1 Heritage Impact Assessment
<ul style="list-style-type: none"> • 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). 	Richmond Local Municipality	Phase 1 Heritage Impact Assessment and Desktop Palaeontological Impact Assessment
<ul style="list-style-type: none"> • Cultural Heritage Resource Identification, Mapping and Assessment: for the larger Environmental Management Framework (EMF) for the Msunduzi Local Municipality, KwaZulu-Natal. 	Msunduzi Local Municipality	Heritage Identification and GIS Mapping
<ul style="list-style-type: none"> • Basic Assessment Process and Environmental Auditing: for the KwaZulu-Natal Arts and Culture Trust for the establishment of the Isandlwana Affirmation Village and Garden of Remembrance tourism facility adjacent to the Isandlwana Battlefield near Nquthu, in the Umzinyathi District Municipality of KwaZulu-Natal. 	KwaZulu-Natal Arts and Culture Trust	Basic Assessment Process and Environmental Auditing

APPENDIX B: SITE PHOTOGRAPHS



Plate 1: Photograph facing north eastwards with the proposed dam site in the background.



Plate 2: Photograph showing the proposed dam site which currently comprises sugar cane and riparian vegetation.



Plate 3: Riparian channel which bisects Hopewell Farm.



Plate 4: Current land use on the site comprises sugar cane cultivation.



Plate 5: Sugar cane cultivation which will be converted to macadamia plantations.



Plate 6: Area of sugar cane which will be converted to macadamia.

APPENDIX C: CHANCE FIND PROCEDURES FOR HERITAGE / PALAEOLOGICAL 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 accidentally 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 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.