HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT AT 40 HEADINGLEY AVENUE, eTHEKWINI METROPOLITAN MUNICIPALITY, DAWNCLIFFE, DURBAN, KWAZULU-NATAL

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Declaration of Consultants independence

I, Gary Trower, am an independent consultant and have no business, financial, personal or other interest in the proposed development project in respect of which I was appointed to do a heritage impact assessment other than fair remuneration for work performed. There are no circumstances whatsoever that compromise the objectivity of this specialist performing such work.

Gary Trower

Introduction

This heritage impact assessment relates to the proposed residential development on a piece of land located at the end of a cul-de-sac, at No. 40 Headingley Road, eThekwini Metropolitan Municipality, Durban (Figure 1-4). The site is located in Dawncliffe, adjacent to the N3 highway on a patch of land comprising of sloping topography dominated by dense trees and vines (woodland) on its top end and a patch of grassland on the lower section. The proposed development is situated within an area where the underlying geology is given a low palaeo-sensitivity rating on the SAHRIS map (www.sahra.org.za/sahris/map/palaeo), and these deposits are unlikely to contain any significant palaeontological material. A heritage impact assessment was carried to evaluate whether any graves, historic buildings/structures, archaeological or fossil material could be located within the boundaries of the proposed development.

In terms of the National Environmental Management Act 107 of 1998 and Section 38 (8) of the National Heritage Resources Act 25 of 1999 (sections 34-36), all aspects of heritage are protected. Proposed developments that are likely to impact on heritage resources (i.e. historical, archaeological, palaeontological & cosmological) require a desktop and/or field assessment to gauge the importance of such resources in order to ensure that such sites are not damaged or destroyed by developments which could negatively impact them. Identified heritage resources should be recorded through detailed documentation, mitigation measures applied if resources are threatened, or collection and/or a rescue excavation carried out if necessary.

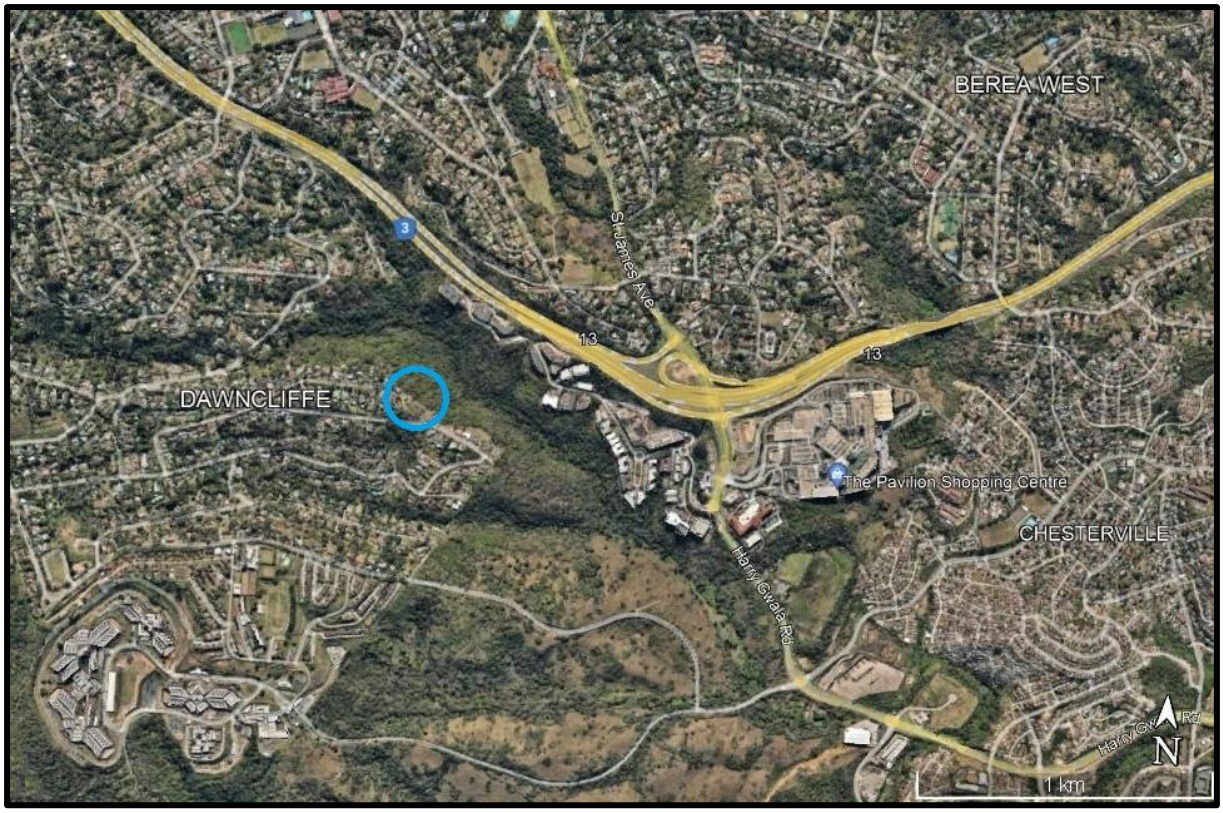


Figure 1: Satellite image showing the location of the site footprint within the regional landscape (indicated by the blue circle), situated in Dawncliffe south of the N3 highway (marked in yellow). Modified from Google Earth, AfriGIS 2021

Figure 2: Satellite image showing a close-up view of the location of the site footprint, viewed from above and marked with a yellow polygon. As can be seen in the image, the area comprises of sloping terrain covered in trees and a small patch of grassland. Modified from Google Earth, AfriGIS 2021

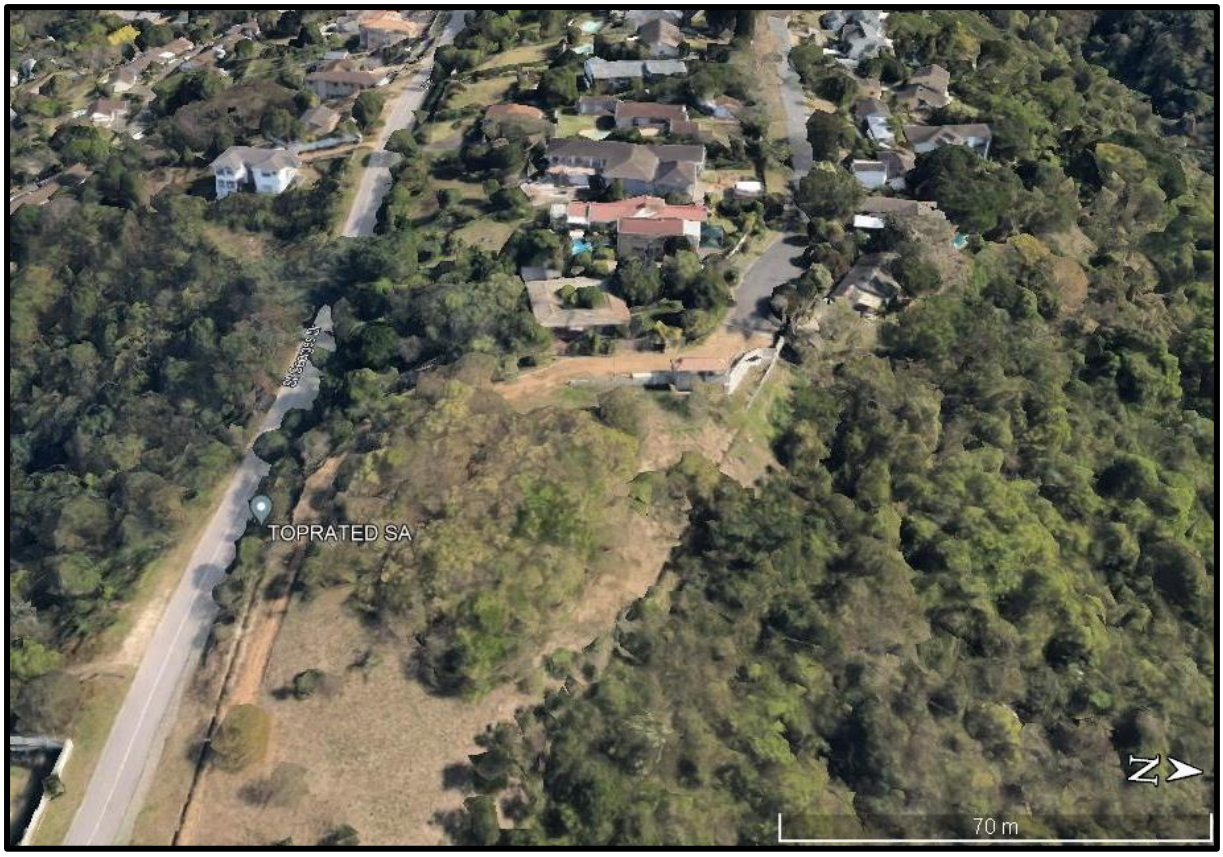


Figure 3: Satellite image of the site footprint as viewed from the east. The site is located between Headingley Avenue and St Georges Drive, on a sloping hill that was already modified from its natural state with previously laid sewerage manholes, lines for cables and stone walling. Modified from Google Earth, AfriGIS 2021

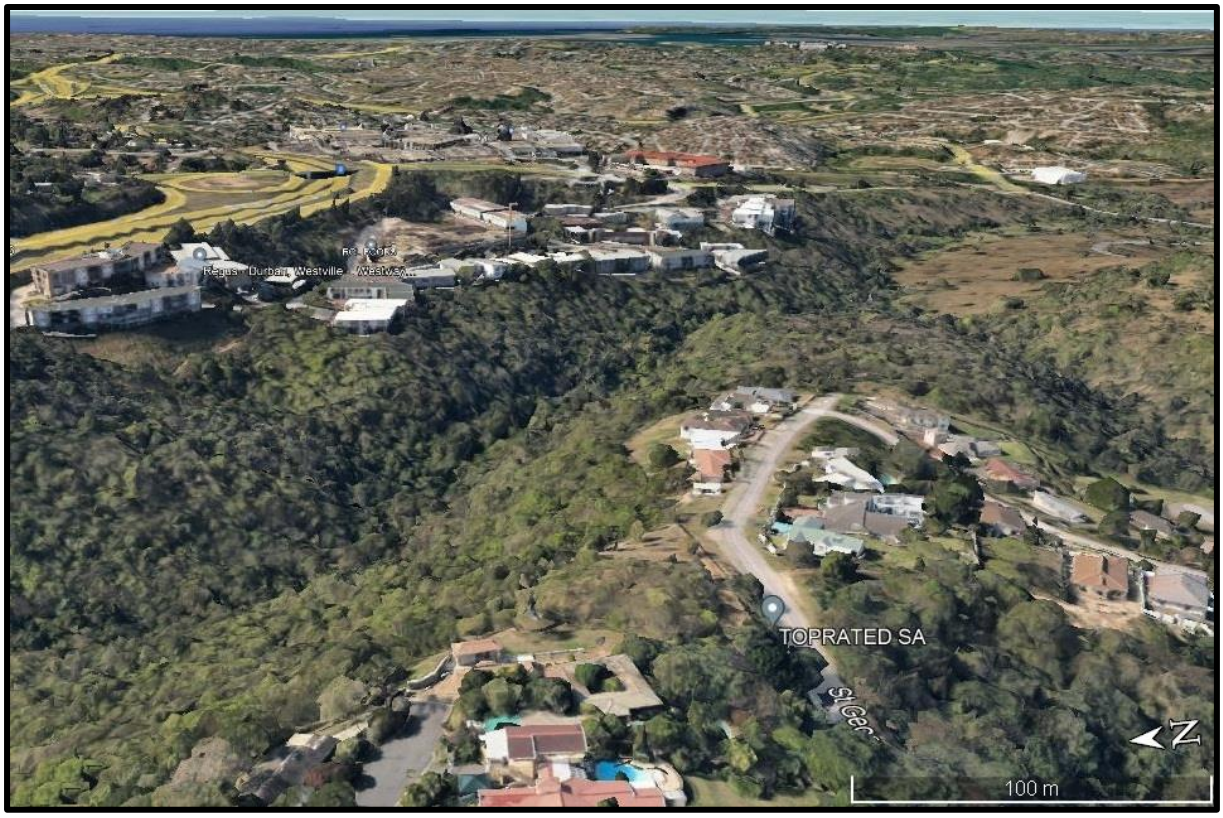


Figure 4: Satellite image of the site footprint, looking east towards the Indian Ocean. A densely forested valley in located to the north of the site, above which runs the N3 highway (marked in yellow). The Durban city centre and harbour is visible to the east of the study area. Modified from Google Earth, AfriGIS 2021

Geology

Many rock outcrops in South Africa originate from the long-term depositional sequence preserved in the Karoo Basin, an ancient giant inland sea fed by a vast network of drainages. These deposits form an important component and subdivision of the stratigraphy of the Karoo Supergroup, an extensive inland basin which preserves a rich array of fossil plants, insects, fish and tetrapod fauna which existed during the Carboniferous, Permian and Triassic of southern Gondwana (Rubidge 2005, Smith *et al*. 1993). These rocks are rich repositories for palaeontological material, necessitating measures to minimize activities which may disturb or destroy fossils preserved in underlying beds.

Karoo rock outcrops are scattered throughout the region but the specific geology in the area of the proposed development comprises of Ordovician-Silurian deposits of the Natal Group. This sequence comprises of subordinate siltstone and mudstone; quartz arenite; small pebble conglomerate; micaceous sandstone; and red-brown coarse-grained arkosic to subarkosic sandstone. This bedrock is rated as blue on the SAHRIS map, meaning that it has a low palaeo-sensitive rating. Carboniferous and early Permian deposits of the Dwyka Group also occur very close to the site and these are rated as moderately-sensitive (green) on the SAHRIS map (Figure 5 & 6). The sedimentary package making up the Dwyka Group accumulated as the basal deposits of the giant inland sea mentioned previously and comprises of diamictite, subordinate varved shale and boulder shale (Figure 5).

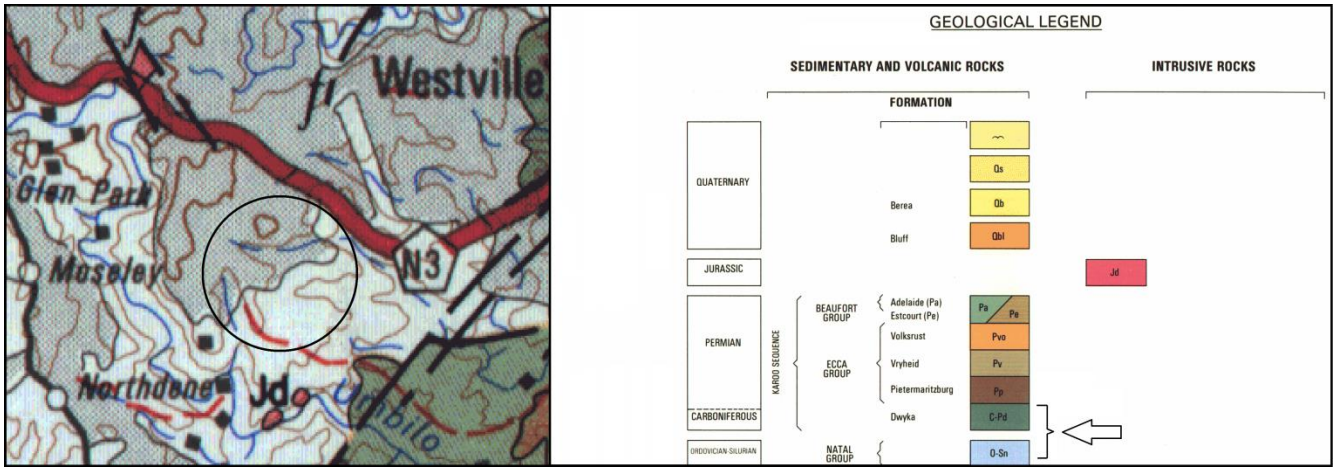
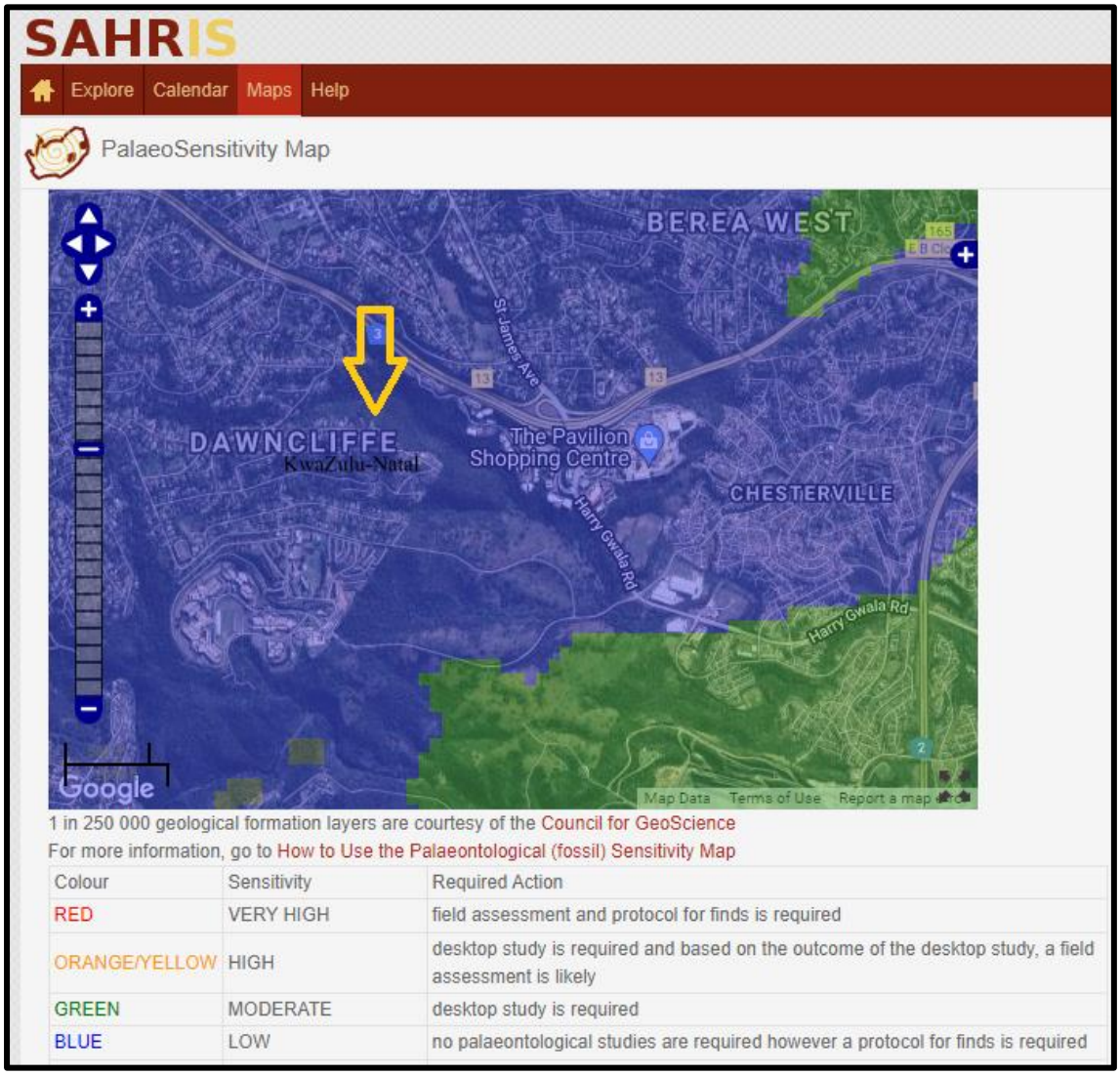


Figure 5: Map showing the geology of the region where the proposed development will take place on top of Ordovician-Silurian aged deposits of the Natal Group (within the black circle). The black arrow in the legend points to the geological units relevant to this study. (Modified from 2930 Durban, 1:250 000 Geological Series, Council for Geoscience, 1988)



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

Figure 6: Map of how the geology in Fig.5 translates into palaeo-sensitivity, with the study site indicated by the yellow arrow. The geological unit which occurs beneath the site footprint has a ranking of blue and corresponds to the Natal Group, a rock type which has a low likelihood of significant fossil occurrences. The green ranking (moderate palaeo-sensitivity) indicates rock outcrops of the Dwyka Group, which are located about 1.5km to the south-east of the site. Modified from the SAHRIS map, www.sahra.org.za/sahris/map/palaeo

Site observations

An aerial survey of the study site was carried out using Google Earth; Google Street Maps; the relevant geology map of the area (2930 Durban); and the SAHRIS palaeo-sensitivity map. These were all used in combination to gain an understanding of the site features, as well as the underlying bedrock beneath the site footprint and how it ranked in terms of possible fossil occurrences.

The site footprint is located in Dawncliffe at No.40 Headingley Avenue, adjacent to the N3 highway at GPS coordinates 29º 50' 55.5" **S**, 30º 55' 15.6" **E** (Figure 1-4, 7 & 8). Plans for the site include two blocks of residential units totalling 15 units as well as parking bays, with an environmental buffer along the northern and eastern edge of the site footprint. The site comprised of sloping terrain which was heavily vegetated with trees, bushes and vines, almost impenetrable without the assistance of a machete (Figure 9, 10, 17, 19 & 20). Amongst the thick vegetation several manhole covers were observed, as well as sewerage piping and thin plastic tubing, probably for running cables and wires (Figure 10 & 13-16). To the north and south of the plot stone walling was also observed, which seemed to mark the edges of the site footprint, as well as a stone drainage channel on the northern edge (Figure 17, 18 & 20). This stone walling did not appear to be historical or archaeological in nature but instead a modern feature. Along the northern edge of the site boundary wall pillars were also noted (Figure 19 & 20). This indicates that the site has been partially developed in preparation for future expansion of housing stands, so portions of it have already been excavated in the past. To the east of the site the ground began to level out and open up as the vegetation changed to a patch of grassland, which provided access to St Georges Drive (Figure 12, 21 & 22).

The bedrock underlying the site comprises of Ordovician-Silurian deposits of the Natal Group. This bedrock is rated as blue on the SAHRIS map, meaning that it has a low palaeo-sensitive rating (Figure 5 & 6). The nearest rock outcrop with potential fossils is only 1.5 km away, comprising a moderately-sensitive strip of the Dwyka Group, a geological unit with a palaeo-sensitivity rating of green on the SAHRIS map. However even within these nearby Dwyka rocks the likelihood of significant fossils being present is very low as it forms the base of the Karoo Basin and these rocks were deposited under very cold, abrasive conditions (e.g. melting glaciers) where the chances of fossilization are greatly reduced.

Quaternary fossils are unlikely to be preserved adjacent to the rivers crossing through the area (in the valleys to the north and south of the site) as the soil chemistry is generally unsuitable for Pleistocene fossil preservation and the slopes are too steep for the deposition of alluvial material. In addition, the difference in elevation between the site footprint and the nearest drainage line is 70 metres (see Fig. 4); far beyond the reaches of the highest water levels and potential alluvial deposits that could be created during rare flood events.

Information available in the KwaZulu-Natal Museum heritage site inventory indicates that several Stone Age sites occur in the greater area (ESA, MSA and LSA) as well as Iron Age sites; however none of these archaeological sites are located close to the site footprint and will not be impacted by this development. Due to the sources of water flowing in the nearby valleys, pottery fragments may be scattered about in the landscape and stone tools may also be present as humans will always be attracted to this important resource but these artefacts will mostly be out of context surface finds. However, no such material was observed during the ground survey of the site.

To better evaluate the site, the table below summarizes the heritage impact significance:

Assessing Impact Significance

Criteria	without mitigation	with mitigation
Extent/spatial scale of impact	local	local
Duration of impact	permanent	permanent
Intensity/severity of impact	low	low
Probability of impact	improbable	improbable
Consequence	low	low
Confidence	high	high
Significance	very low	very low
Reversibility	irreversible	
Loss of resource	low	
Mitigation potential	none	

Identified heritage resources (NHRA status)

Formal protections	
National Heritage site (Section 27)	none
Provincial Heritage site (Section 27)	none
Provisional Protection (Section 29)	none
Place listed in heritage register (Section 30)	none
General protections	
Palaeontological site or material (Section 35)	none

Figure 7-12: Fig.7: Looking east towards the site footprint from Headingley Avenue; looking north at the security guard house (Fig.8, top right); showing the densely overgrown vegetation on the top half of the site (Fig.9 & 10, centre left & right) with the sewerage connection point visible in Fig.10; the top half of the site was covered in both indigenous and exotic trees (Fig.11 & 12, bottom left & right) with the woodland changing over to grassland on the lower half of the site footprint (Fig.12)


Fig.13


Fig.14


Fig.15


Fig.16

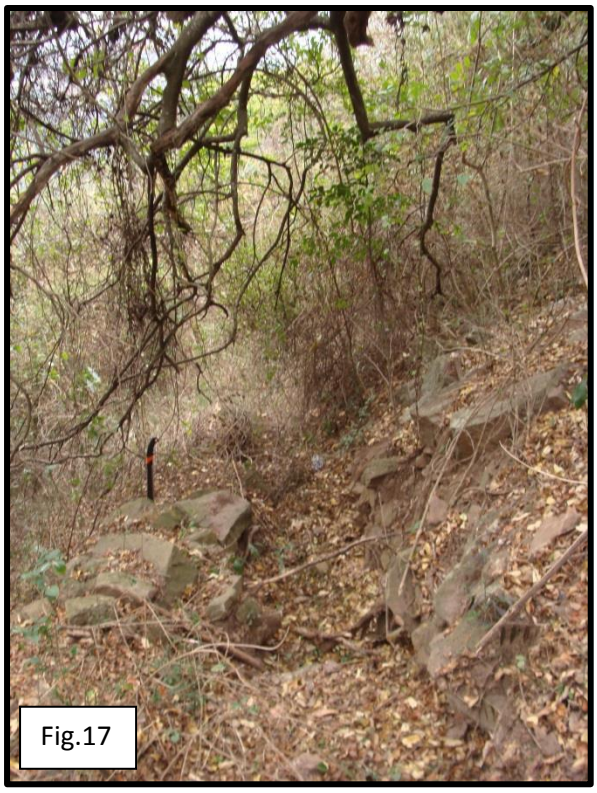


Fig.17

Figure 13-18: In the woodland section on the top half of the site various sewerage manhole covers (Fig.13 & 15), sewerage connection points (Fig.14 & 16), and plastic tubing for running wires (pink tubing, Fig.16) were observed. Stone walling and a stone stormwater channel was noted on the northern border of the site (Fig.17, bottom right) and stone walling was also present along the southern border (Fig.18, bottom left)


Fig.18


Fig.19

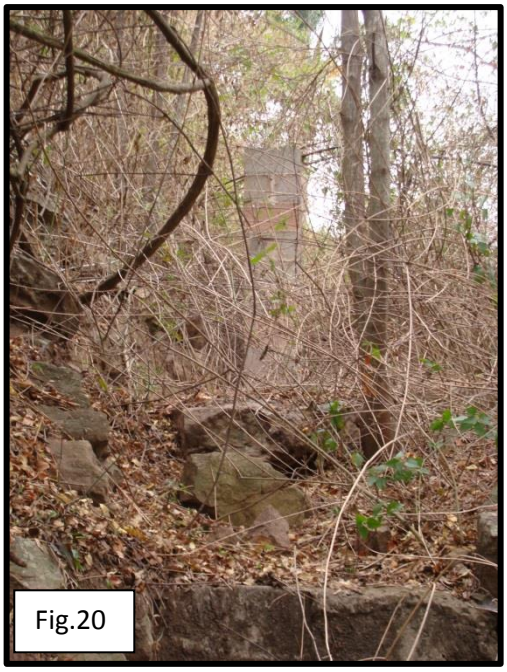


Fig.20


Fig.21


Fig.22

Figure 19-22: In the top left and top right images, the northern boundary wall pillars are visible as well as the stone walling (Fig.20). The bottom two images (Fig.21 & 22) show a view of the site from St Georges Drive, with Fig.22 showing the grassland on the lower section of the stand

Contingency plan for possible palaeontological discoveries:

CHANCE FIND PROTOCOL

Based on the work of Almond *et al*. (2009) and Groenewald *et al*. (2014) and summarised on the SAHRIS website (www.sahra.org.za/sahris/map/palaeo), if a development occurs within a red zone a desktop study is required, as well as a phase 1 Palaeontological Impact Assessment (PIA) comprising a field survey and recording of fossils. A phase 2 PIA is also required, which entails the rescue of fossil material during construction activities, as well as the compulsory application for a collection and destruction permit. If the development occurs in an orange zone, a desktop survey as well as a phase 1 PIA comprising of a field survey and collection of fossils is compulsory. A prior application for a collection permit is therefore recommended and a phase 2 PIA may be necessary during the construction phase of the project. If the development occurs in a green zone, a desktop survey as well as phase 1 PIA comprising a field survey is recommended. Lastly developments which occur in a blue or grey zone may require a desktop survey, based on the known heritage sites in the area as well as the nature of surrounding geological units.

The normal procedure for recovering palaeontological material would be to identify areas which show investigative potential through a concentration of fossils and whose recovery and preparation could address certain scientific questions. The process would then entail obtaining permission from the landowner/s and applying to SAHRA (South African Heritage Resources Agency) or another provincial heritage agency for a collection permit to excavate or remove blocks of bedrock for preparation in the lab. This is a slow and time-consuming process which requires the skills of a field archaeologist/palaeontologist to spot worthy material within geological/stratigraphic exposures, and skilled fossil excavators and/or preparators who can successfully recover fossils from sediment or slabs of bedrock.

But in the case of developments fossils may be exposed which were not being targeted as a part of a formal scientific investigation, which then requires intervention to ensure that such heritage resources are documented and evaluated, and possibly recovered. In this way, construction activities can provide an opportunity for scientists in that sediments or bedrock and other heritage related material will be exposed which otherwise would have gone unnoticed as it was hidden from view and would have been costly to excavate.

Heritage consultants such as palaeontologists are required to evaluate proposed development sites in the hope of recording and/or recovering important objects and artefacts before they are damaged or destroyed, but during the entire timeline of a project a HIA consultant is generally only on site for a few hours. Having a palaeontologist or archaeologist on site to examine every scoop of a back actor/JCB would be very costly and impractical, so additional site visits may be required for certain large-scale projects, or developments in highly sensitive areas. If fossils are unearthed during the rest of the project timeline when no palaeontologist is on site, they may be difficult for the on-site layman to identify as many geological formations superficially resemble palaeontological material. Pseudo-fossils and certain mineral deposits often form into a variety of shapes which may closely resemble plant and animal fossils, making it more difficult for laypersons to positively identify chance finds in the field. With certain projects it is therefore recommended that training be provided to on-site staff on fossil identification in order to increase the chances of observing palaeontological material that may be present within the boundaries of the site footprint.

It is not the responsibility of site workers to keep an eye out for heritage objects neither are they likely to have had the appropriate training on what to look for, but they are on the ground witnessing and observing. This is a helpful tool when there is a flow of information from on-site staff to management and protocol dictates that you convey when something unusual or out of the ordinary is observed during work operations. The probability of on-site

foremen or construction workers operating heavy earth moving equipment and working to a strict time schedule spotting heritage objects amongst tons of bedrock or sediment is unlikely but nonetheless possible, especially after having received basic training on what to look out for. In South Africa and around the world many important archaeological and palaeontological discoveries have been made during construction projects, and companies and individuals can play their part by following the law and making the effort to report heritage resources which have been unearthed during digging operations. In so doing, developers can improve their public image and potentially contribute to a rare fossil or object reaching a museum or tertiary institution where it can studied and eventually displayed to the public as heritage belongs to the entire nation and should be preserved as best as possible.

If by chance fossils or any other heritage-related material were to be discovered which was not anticipated in this report, construction would need to cease immediately and a protocol should be followed whereby the relevant provincial or national heritage custodians in the applicable province would need to be informed. Developers would also need to acquire the services of a suitably qualified palaeontologist or archaeologist to rank the significance of the discoveries. If anything relevant is observed, mitigation measures may be necessary and an application for a collection permit may be required. Additional site visits may be necessary so that scientists can be given the opportunity to record and/or recover fossil or archaeological material if it is ranked as significant and likely to make a positive contribution to the field of science.

Assumptions and limitations

According to the amended 2017 EIA regulations, various assumptions and limitations need to be stated when reporting on proposed developments. A key assumption for this report is that the kml/kmz file sent to the heritage specialist accurately conveys the layout and nature of the

development, which is not always the case as plans are often revised; because the site layout has not been accurately drawn in Google Earth; or lastly because the developers have understated and downplayed the degree, severity, nature or extent of the development so as to make it seem less impactful to the environment. A further assumption is that the geological maps used in this assessment are accurate and up to date, which may not be the case as there is a continuous refinement and revision of the geological model through new scientific research, some of which may still need to become incorporated into available maps.

A limitation with large scale maps (1:250 000) is that smaller outcrops of fossiliferous bedrock may not be indicated within the represented geological model. In addition, several potentially fossiliferous outcrops may have been weathered and eroded over millennia, buried under younger deposits such as alluvial and colluvial sediments, or capped by topsoil. Palaeontologically-sensitive bedrock may have also been metamorphosed through its contact with intrusive lavas, damaging or destroying fossil specimens along the contact zone.

The professional opinion given in the palaeontological section of this report is based on the combined results of a desktop and field study, which were used to gauge the fossiliferous potential of the bedrock likely to be exposed during the proposed development and the impact significance. This process involved careful scrutiny of the best available maps and data sets and all attempts were made to take a holistic, informed decision. Yet in spite of this, there is a very small possibility that fossils may be present within the boundaries of the proposed development but were not observed due to their buried nature or were not regarded as significant enough to warrant further investigation. Moreover, certain predictions about the likelihood of encountering fossils was based on all available evidence and may prove to be less or more likely than anticipated.

As a general rule direct field observations are the best method to gauge the degree to which palaeontological or archaeological material may be present on site, which can only happen once such material starts eroding out from the stratigraphy it was preserved in and becomes visible at the surface. As many developments require a degree of digging down into the soil and/or underlying stratigraphy, other such material would be hidden from view due to its buried nature and will only be exposed by the action of a back-actor.

Lastly, it is assumed that the developers will respect the guidelines set out in the laws of South Africa with regards to good environmental management practices and policies, and will immediately cease all construction activities if any fossiliferous material or any other heritage-related artefacts are discovered. It is also assumed that developers will practice integrity and embrace an unwavering mind-set with regards to respecting and protecting all aspects of heritage, including due consideration for the fact that such objects cannot simply be sacrificed to meet project deadlines.

Conclusion and recommendations

The proposed development is unlikely to have any impact on heritage resources and there is no need for any mitigation. No fossils, archaeological material, graves, historical buildings or structures were observed during the ground survey. No further palaeontological or archaeological investigation is required and the project can proceed as planned. The rock outcrops which occur beneath the site footprint comprise Ordovician-Silurian rocks of the Natal Group, which have a very low possibility of containing highly significant fossil material. The nearest drainage line (to the north) is unlikely to contain any significant degree of alluvial deposition where Quaternary fossils could become trapped and preserved as the slope is too steep, the soils are too shallow, and soil pH too low.

If any palaeontological or heritage-related material were to be unearthed during construction activities developers are reminded that according to the National Heritage Resources Act 1999 (Act No. 25) and KwaZulu-Natal Heritage Act 2008 (Act No. 4), work should immediately cease and the **Chance Find Protocol** outlined above should be followed to ensure that developments comply with the law, and to ensure that a rare object/fossil stands a good chance of being recorded and/or relocated to a museum, university or other relevant tertiary institution before being damaged or destroyed by on-site construction activities.

References

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