DESKTOP HIA SURVEY FOR THE UPGRADE OF THE P608-D604

FOR TERRATEST PTY (LTD)

DATE: 15 FEBRUARY 2023

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Abbreviations

EIA	Early Iron Age
ESA	Early Stone Age
HIA	Heritage Impact Assessment
HP	Historical Period
IIA	Indeterminate Iron Age
ISA	Indeterminate Stone Age
KZNARI	KwaZulu-Natal Amafa & Research Institute
LIA	Late Iron Age
LSA	Late Stone Age
MSA	Middle Stone Age
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency

INTRODUCTION

The KwaZulu-Natal Department of Transport (DoT) proposes to re-align sections of the P608 and D604 gravel roads within the Greater Kokstad Municipality, Harry Gwala District Municipality. The current intersection of the D604 with the N2 will need to be relocated due to poor sight distances, as a result of a crest curve, that have resulted in numerous vehicle collisions. While the intersection of the P608 with the N2 is safer than that of the D604, the former will need to be realigned to safely meet with the new D604 intersection.

The new intersection on the N2 is proposed approximately 15km north-east of the Kokstad CBD towards Port Shepstone at approximate centre coordinates of 30°31'48.62"S; 29°32'10.06"E. The new intersection will be about 200m north of Pink Church. The N2 is proposed for widening to allow for turning lanes and transition tapers and in turn safe movements in and out of the proposed access points.

The current access points of the P608 and D604to the N2 will be permanently closed and access will be limited to the proposed N2 intersection. The new section of the P608 from the N2 will be a gravel road of approximately 480m before joining the current road. The re-alignment of the D604 from the N2 will a distance of approximately 2.10km before joining the current route. At a distance of 1.5km form the N2 intersection, the D604 will branch in a north-easterly direction to allow for access to some areas of the farm on which the road is proposed. The proposed D604 will include infrastructure such as culverts and other infrastructure to cater for watercourse crossings and stormwater management as well as road signs.

Umlando was requested to undertake an HIA of the proposed road upgrade. Figures 1 – 4 show the location of the road upgrades.

FIG. 1 GENERAL LOCATION OF THE PROPOSED DEVELOPMENT

FIG. 2: AERIAL OVERVIEW OF THE PROPOSED DEVELOPMENT

FIG. 3: TOPOGRAPHICAL MAP OF THE PROPOSED DEVELOPMENT (2000)

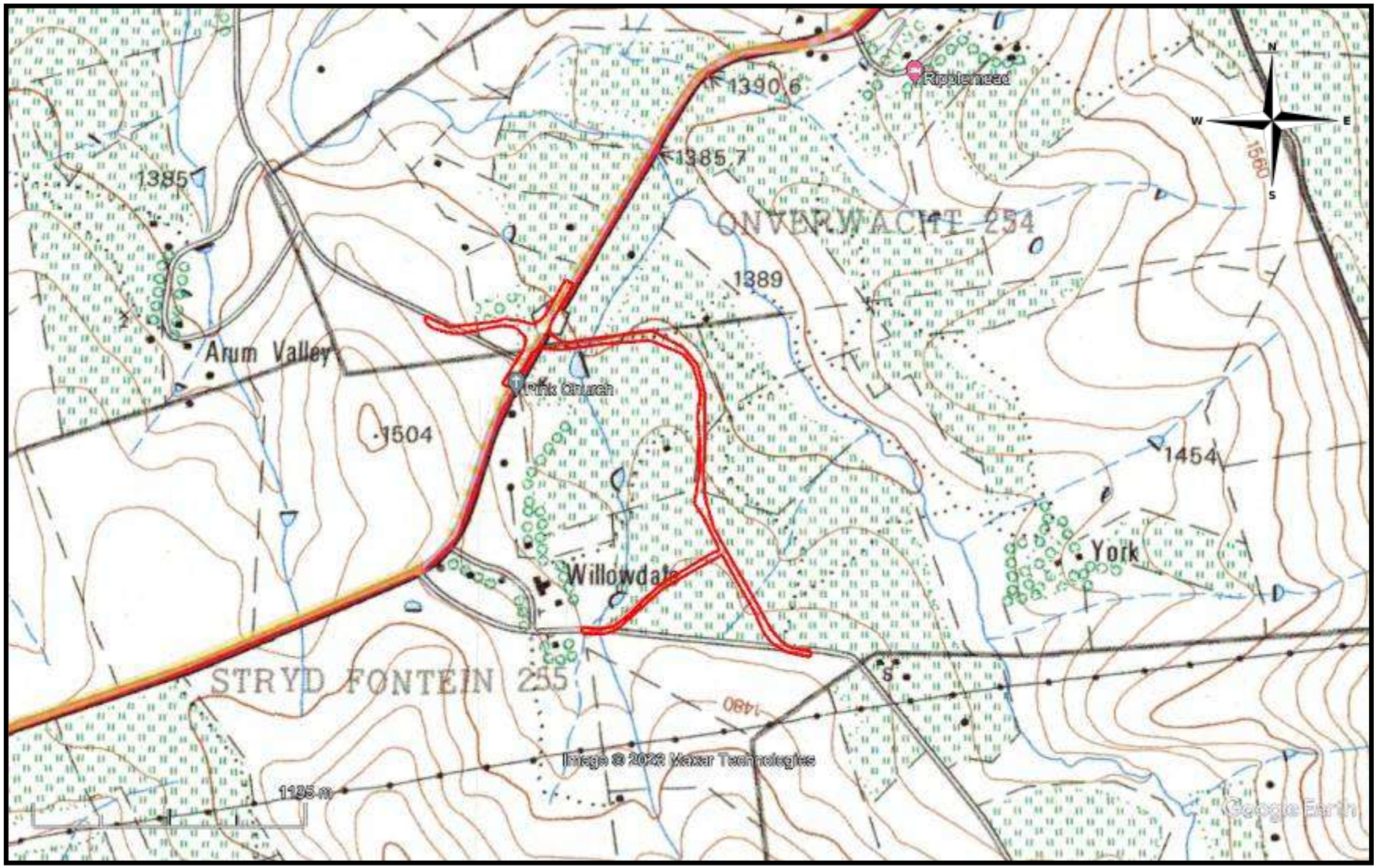


FIG. 4: SCENIC VIEWS OF THE STUDY AREA

KWAZULU NATAL AMAFA AND RESEARCH INSTITUTE, ACT 05, 2018,

The KwaZulu Natal Amafa And Research Institute, Act 05, 2018, Chapter 8 (pp 29 – 32) defines heritage resources.

"General protection: Structures.

37.(1)(a)No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Institute having been obtained on written application to the Council.

(b)Where the Institute does not grant approval, the Institute must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.

The Institute may, by notice in the *Gazette*, exempt—

(a) A defined geographical area; or

(b) defined categories of sites within a defined geographical area, from the provisions of subsection where the Institute is satisfied that heritage resources falling in the defined geographical area or category have been identified and are adequately protected in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.

(3) A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.

General protection: Graves of victims of conflict.

38. No person may damage, alter, exhume, or remove from its original position

(a) the grave of a victim of conflict;

(b) a cemetery made up of such graves; or

(c) any part of a cemetery containing such graves, without the prior written approval of the Institute having been obtained on written application to the Council.

General protection: Informal and private burial grounds

39.(1) or burial ground older than 60 years, or deemed to be of heritage significance by a heritage authority -

(a) not otherwise protected by this Act; and

(b) not located in a formal cemetery managed or administered by a local authority, may be damaged, altered, exhumed, removed from its original position, or otherwise disturbed without the prior written approval of the Institute having been obtained on written application to the Council.

The Institute may only issue written approval once the Institute is satisfied that—

(a) the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and

(b) the applicant and the relevant communities or individuals have reached agreement regarding the grave.

General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

40 (1) No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Institute having been obtained on written application to the Council.

(2) Upon discovery of archaeological or palaeontological material or a meteorite by any person, all activity or operations in the general vicinity of such material or meteorite must cease forthwith and a person who made the discovery must submit a written report to the Institute without delay.

(3) The Institute may, after consultation with an owner or controlling authority, by way of written notice served on the owner or controlling authority, prohibit any activity considered by the Institute to be inappropriate within 50 metres of a rock art site.

(4) No person may exhume, remove from its original position or otherwise disturb, damage, destroy, own or collect any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Institute having been obtained on written application to the Council.

(5) No person may bring any equipment which assists in the detection of metals and archaeological and palaeontological objects and material, or excavation equipment onto any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, or meteorite impact site, or use similar detection or excavation equipment for the recovery of meteorites, without the prior written approval of the Institute having been obtained on written application to the Council.

(6)(a) The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vests in the Provincial Government and the Institute is regarded as the custodian on behalf of the Provincial Government.

(b) The Institute may establish and maintain a provincial repository or repositories for the safekeeping or display of —

(i) archaeological objects;

(ii} palaeontological material;

(iii) ecofacts;

(iv) objects related to battlefield sites;

(v) material cultural artefacts; or

(vi) meteorites,

(7) The Institute may, subject to such conditions as the Institute may determine, loan any object or material referred to in subsection (6) to a national or provincial museum or institution.

(8) No person may, without the prior written approval of the Institute having been obtained on written application to the Institute, trade in, export or attempt to export from the Province ~

(a} any category of archaeological object;

{b) any palaeontological material;

(c) any ecofact;

{d) any object which may reasonably be regarded as having been recovered from a battlefield site;

(e) any material cultural artefact; or

{f) any meteorite.

(9){a) A person or institution in possession of an object or material, referred to in paragraphs (a) ~(f) of subsection (8), must submit full particulars of such object or material, including such information as may be prescribed, to the Institute.

(b} An object or material referred to in paragraph (a) must, subject to paragraph (c) and the directives of the Institute, remain under the control of the person or institution submitting the particulars thereof.

(c) The ownership of any object or material referred to in paragraph (a) vests in the Provincial Government and the Institute is regarded as the custodian on behalf of the Provincial Government."

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. This databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (http://www.vuvuzela.com/googleearth/monuments.html) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern

Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

1.1. Organic remains:

1.1.1. Faunal

1.1.2. Botanical

1.2. Rock art

1.3. Walling

1.4. Presence of a cultural deposit

1.5. Features:

1.5.1. Ash Features

1.5.2. Graves

1.5.3. Middens

1.5.4. Cattle byres

1.5.5. Bedding and ash complexes

2. Spatial arrangements:

2.1. Internal housing arrangements

2.2. Intra-site settlement patterns

2.3. Inter-site settlement patterns

3. Features of the site:

3.1. Are there any unusual, unique or rare artefacts or images at the site?

3.2. Is it a type site?

3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

4.1. Providing information on current research projects

4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?

5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts. Table 1 lists the grading system.

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	
High / Medium Significance	Generally Protected A		Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B		Site conservation or mitigation / test excavation / systematic sampling

		/ monitoring prior to or during development / destruction
Low Significance	Generally Protected C	On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The general area has had very few systematic surveys and/or research (fig. 5). No surveys have occurred near the study area The sites that have been recorded are mostly open Stone Age scatters.

The 1953 aerial photograph indicates that all of the affected land has been extensively ploughed for agricultural purposes. Some of the land has gone back to grasslands (fig. 6).

The 1968 topographical map reiterates the 1953 aerial photograph (fig. 7). The “Pink Church” is on this map and thus it dates between 1953 and 1968. The building is probably older than 60 years in age and is thus protected by the KNZHA.

The likelihood of *in situ* archaeological sites occurring within the study area is very low to nonexistent. A few isolated stone tools may occur but these would have no significance.

FIG. 5: LOCATION OF KNOWN HERITAGE SITES IN THE GENERAL AREA

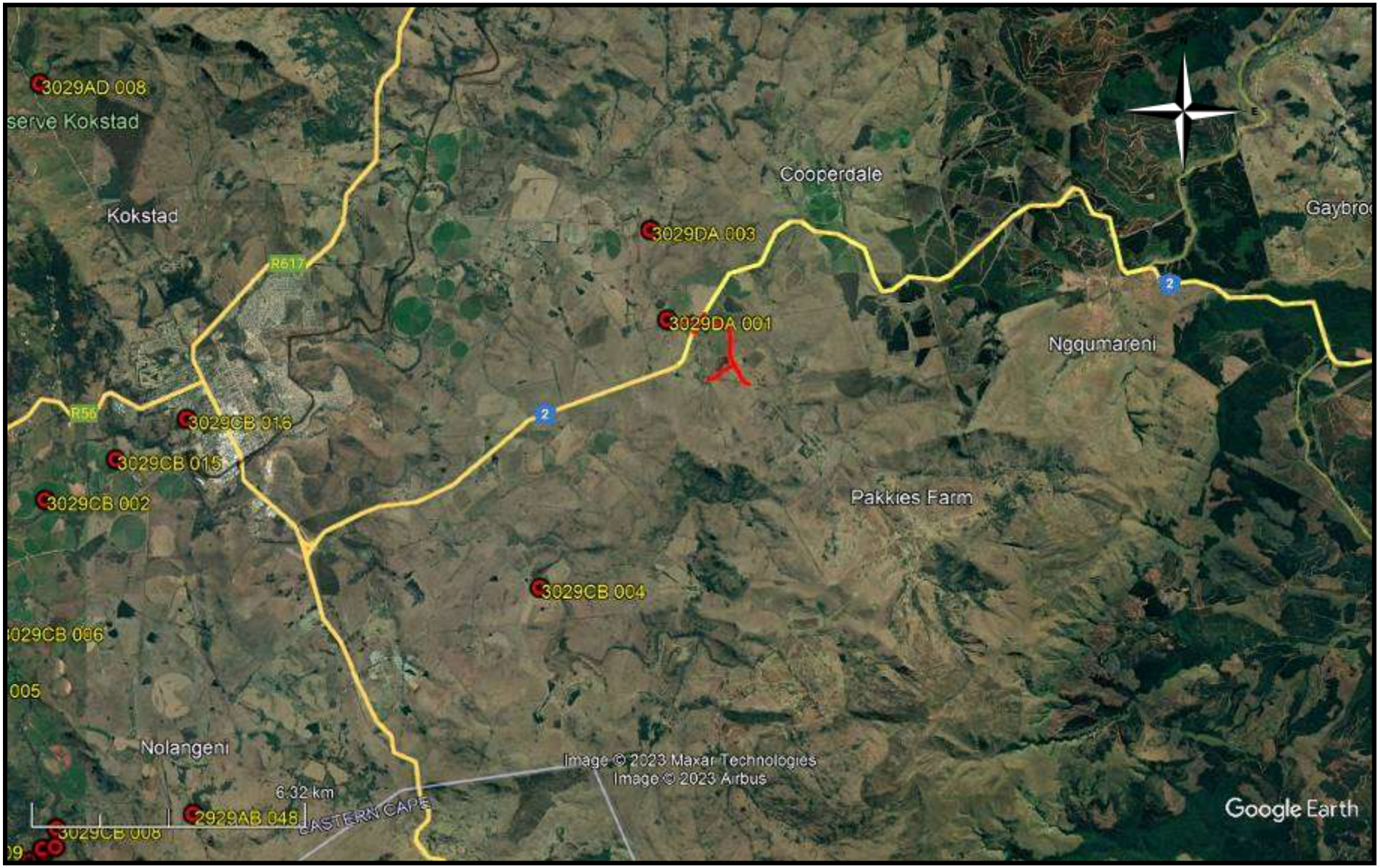
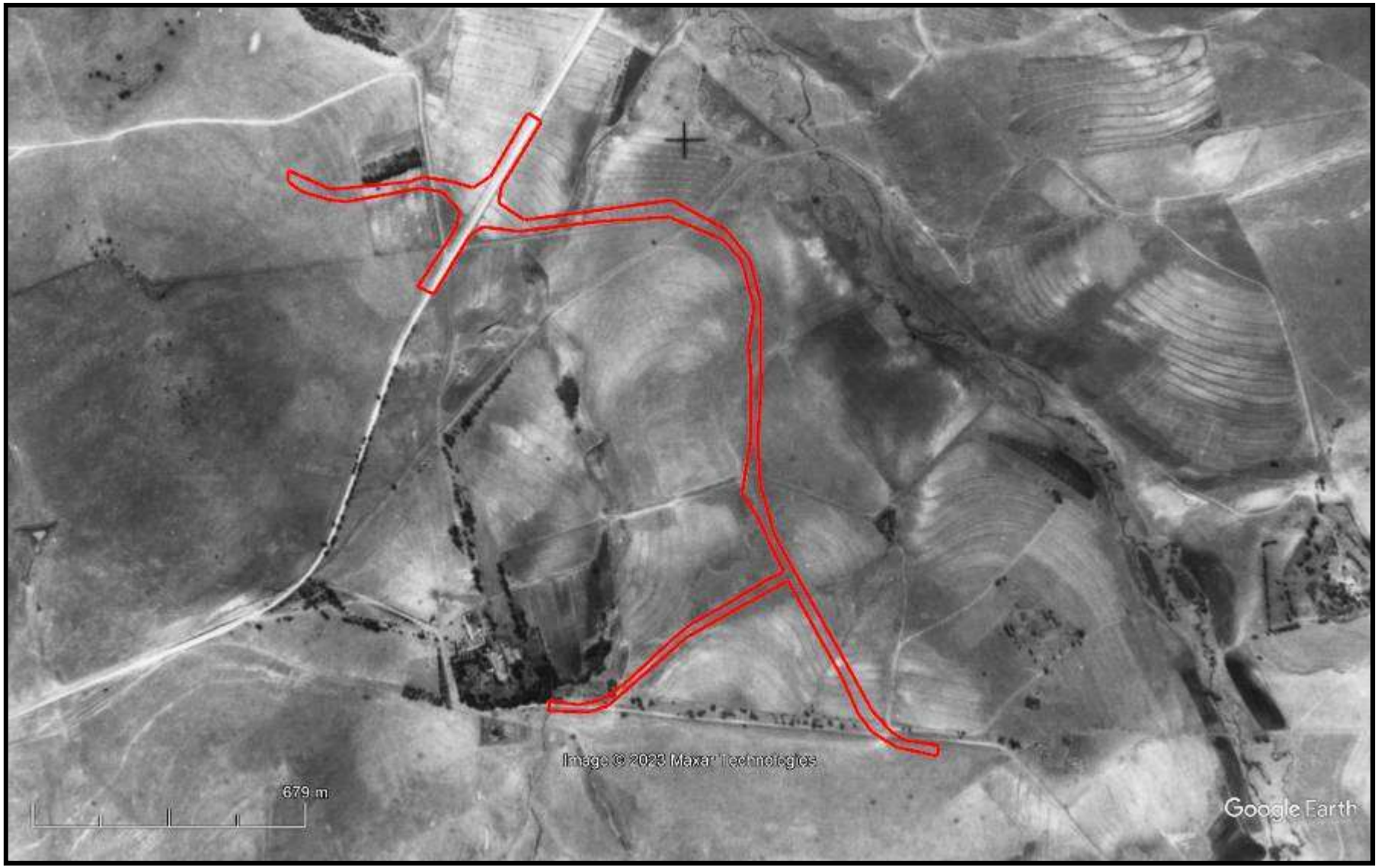
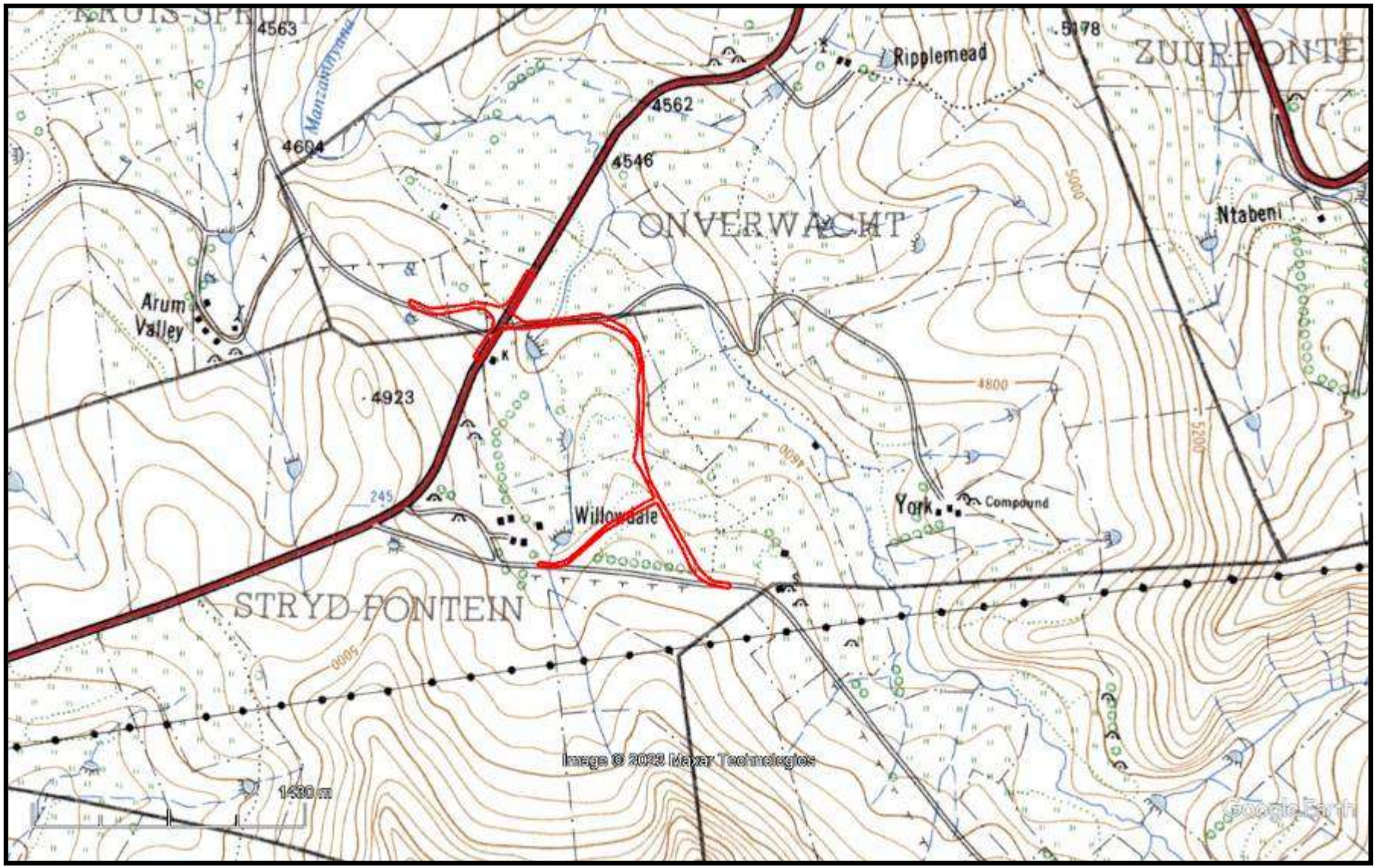


FIG. 6: LOCATION OF THE STUDY AREA IN 1953[1]



[1] 220_019_38527

FIG. 7: LOCATION OF THE STUDY AREA IN 1968[2]

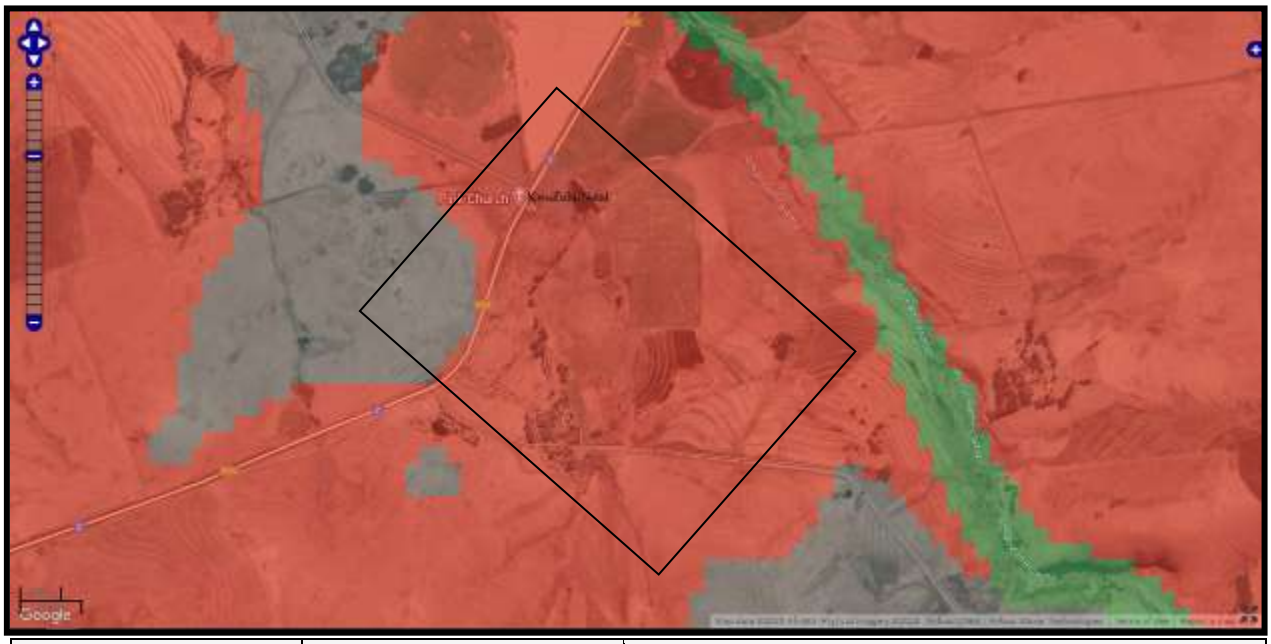


[2] 2930DA Weza

PALAEONTOLOGICAL SENSITIVITY

The area is in an area of very high palaeontological sensitivity (fig. 8). The chances of encountering fossils are potentially **High**. However it is unlikely that fossils will be uncovered during a pre-construction visit. It is recommended that a suitably qualified palaeontologist visit the road-cuttings post-construction, but prior to any "cladding" of the exposed rock. A ***"Chance Find Protocol"*** has been included in case fossils are noted during construction, and in which case a suitably qualified paleontologist should be called in.

FIG. 8: PALAEONTOLOGICAL SENSITIVITY MAP



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

RECOMMENDATIONS

The likelihood of any in situ archaeological and historical remains occurring within the study area is very low. No further mitigation is required in this respect.

Only a small section of the Pink Church yard will be affected by the road upgrade. The “Pink Church” needs a 30m buffer between the building and the road footprint.

The palaeontology of the area is of very high sensitivity. While the upper 2m will be very weathered, fossils may be found in the unweathered Adelaide deposits. A site visit to inspect the excavated material will be required. This needs to be undertaken before and cladding or backfilling occurs.

The results of the geological survey and drilling needs to be given to the palaeontologist before construction begins. This will allow for areas of concern to be more precisely located.

CONCLUSION

A desktop heritage survey was undertaken for the proposed P608 and D604 road upgrades. The area has been disturbed by agricultural activity for over 70 years and it is unlikely to have *in situ* heritage sites. The “Pink Church” is older than 60 years in age but will not be affected.

The area has very high palaeontological sensitivity. The geotechnical survey report needs to be given to the palaeontologist who will then determine which exact areas are sensitive and will be exposed during construction activity. These areas will require on site inspection before they are covered.

REFERENCES

Maps:

2930DA Weza 1968, 1983

220_019_38527

Database

KZN Museum

SAHRA

Umlando

EXPERIENCE OF THE HERITAGE CONSULTANT

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeologist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

DECLARATION OF INDEPENDENCE

I, Gavin Anderson, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Gavin Anderson
Archaeologist/Heritage Impact Assessor

Appendix a

Pia desktop

DESKTOP PALEONTOLOGICAL ASSESSMENT FOR THE PINK CHURCH AREA ROAD UPGRADES, WEST OF KOKSTAD, KWA-ZULU NATAL

FOR

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11 February, 2023

Declaration of Independence

This report has been compiled by Dr Alan Smith (Pr. Sc. Nat.) of Alan Smith Consulting, Durban. The views expressed in this report are entirely those of the author, if not then the source has been duly acknowledged. No other interest was displayed during the decision making process for the Project.

Specialist: Dr Alan Smith

Signature: 

EXECUTIVE SUMMARY

Alan Smith Consulting was appointed by **UMLANDO: Archaeological Surveys & Heritage Management** to conduct a Desk-Top field assessment of the potential impacts to **Palaeontology Resources** that might occur through the activities associated with the proposed Pink Church road upgrades, west of Kokstad, KwaZulu-Natal

Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), requires a Palaeontological Impact Assessment (PIA) to assess any potential impacts to palaeontological heritage.

The chances of encountering fossils are potentially **High**. However it is unlikely that fossils will be uncovered during a pre-construction visit. It is recommended that a suitably qualified palaeontologist visit the road-cuttings post-construction, but prior to any "cladding" of the exposed rock. A ***"Chance Find Protocol"*** has been included in case fossils are noted during construction, and in which case a suitably qualified paleontologist should be called in.

ACRONYMS

BA:	Basic Assessment
EDTEA:	(Department of) Economic Development, Tourism and Environmental Affairs
HIA:	Heritage Impact Assessment
PIA;	Palaeontological Impact Assessment
SAHRA:	South African Heritage Resource Agency
SAHRIS:	South African Heritage Resources Information System

1. TERMS OF REFERENCE

Alan Smith Consulting was requested by **UMLANDO: Archaeological Surveys & Heritage Management** to provide a Desk-Top Palaeo Impact Assessment for the proposed Pink Church Road Upgrades (Figure 1, 2). This report is to meet the requirements of the National Environmental Management Act (Act 107 of 1998) [as amended] Environmental Impact Assessment (EIA) regulations, Appendix 6.

Figure 1: Regional context of proposed Pink Church Road Upgrades.

Figure 2: Location of the Pink Church Road upgrade.

2. SCOPE AND PURPOSE OF REPORT

A Palaeontological Impact Assessment (PIA) is a means of identifying any significant palaeontological material that may be present and exposed on this site, so that this can be managed in such a way as to allow the development to proceed (if appropriate) without

undue impacts to the fragile heritage of South Africa. This Desk-Top investigation, and its recommendations, will fulfill the requirements of the heritage authorities (SAHRA), such that a comment can be issued by them for consideration by the competent authority (EDTEA), who will review the Basic Assessment (BA) and grant or refuse authorisation. The PIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation, should this be granted.

3. METHODOLOGY

Geological maps, a literature review and personal experience (see Section 9) were used in this research.

4. GEOLOGY

The geology of this proposed Pink Church Road development site comprises rocks of the basal Beaufort Group and possibly Karoo Dolerite (Figure 3). In this area this is represented by the Adelaide Subgroup which marks the lower part of the Beaufort Group. The Adelaide Subgroup is Permian in age. It terminates at 242 Ma (million years ago).). The time 242 Ma is significant as it marks the boundary between the Permian and Triassic Eras. This time is marked by the “Great Dying”, the greatest extinction in the last 600 Ma (Green, 1997). This event has not been recognized within southern Africa. This is probably due to non-depostion or erosion.

The Adelaide Subgroup is a sequence of fluvio-lacustrine sedimentary rocks that accumulated in a landlocked, intra-cratonic foreland basin in SW Gondwana during the Middle Permian to Middle Triassic (Neveling et al., 2005).

Figure 3: Extract from the Kokstad 3038 1: 250 000 Geological Map. Grey (Pa) is the Estcourt Formation and red is Karoo Dolerite. Aproximate area boxed.

The Adelaide Subgroup is usually very weathered (Figure 4) but may be fresher at depth (>2m deep).

***Figure 4: An example of the Adelaide Subgroup as it might occur in the proposed development area. However this lithology is expected to be deeply* weathered on this site, but there could be fresh rock at depth (>2m).**

Karoo dolerite intrusions (these are 184 million years (Ma) old) and reputedly represent the onset of the break-up of the Gondwana Supercontinent (Hastie et al (2014).

According to Watkeys (2006), Gondwana rifting commenced between 155 and 135 Ma (Figure 5).

Figure 5: An example of dolerite as it could occur at the proposed site.
Karoo Dolerite

Karoo Dolerite may be present as dykes or sills. This is an intrusive igneous rock emplaced in 184 Ma continental flood basalt eruption (Hastie et al. 2014). This was part of the Karoo volcanism event which was the prelude to the break- up of the Gondwana Supercontinent into the southern hemisphere continents we know today (Watkeys, 2005.

5. PALAEONTOLOGY

The Adelaide Subgroup is flagged red in the Sahris Palaeontological sensitivity map (Table 1).

Table 1: Summary of SAHRIS categories

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

Trace fossils

Evidence of bioturbation is ubiquitous within the Adelaide Subgroup. However the various trace fossil (ichnofossil) types are usually not identifiable. In general, trace fossils are very common within the Beaufort Group. These can be used in paleo-environmental reconstruction but are useless for dating, consequently they are of limited scientific use. They are extremely common and not important.

Body fossils

The Beaufort Group is known internationally for its vertebrate palaeontological content (Cisneros et al., 2008). The Adelaide Subgroup contains plant- and body- fossils. The latter include the mammal-like reptiles such as the Upper Permian- Dicynodon (Neveling et al., 2005) and trace fossils (Green, 1997) (Figure 6).

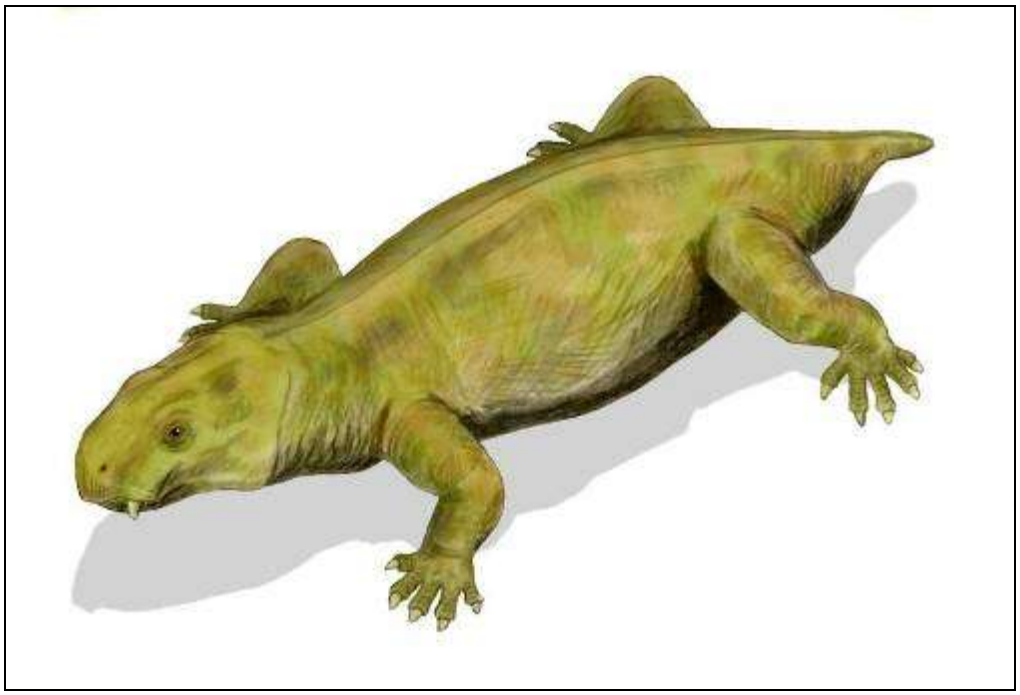

Figure 6: Example of the Upper Permian- Dicynodon, a mammal-like reptile (source: Wikipedia).

Karoo Dolerite

Karoo Dolerite may be present but this is an intrusive igneous rock and, by definition, not fossiliferous.

6. CHANCE FIND PROTOCOL

This Chance Find Protocol must be included in the site EMPr. This will be triggered by findings during excavation.

If any fossils are found, a Palaeontologist must be notified immediately by the ECO and/or EAP and a site visit must be arranged at the earliest possible time with the Palaeontologist.

In the case of the ECO or the Site Manager becoming aware of suspicious looking palaeo-material:

- The construction must be halted in that specific area and the Palaeontologist must be given enough time to reach the site and remove the material before excavation continues.

- Mitigation will involve the attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labeled, and boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer

1. At full cost to the project, and guided by the appointed Palaeontological Specialist, ensure that a representative archive of palaeontological samples and other records is assembled to characterize the palaeontological occurrences affected by the excavation operation.

2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas.

3. Facilitate systematic recording of the stratigraphic and palaeo-environmental features in exposures in the fossil-bearing excavations, by described and measured geological sections, and by providing aid in the surveying of positions where significant fossils are found.

4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.

5. Provide covered, dry storage for samples and facilities for a work area for sorting, labeling and boxing/bagging samples.

6. Costs of basic curation and storage until collected. Documentary record of palaeontological occurrences must be done.

7. The contractor will, in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which appropriate information regarding plans for excavations and work schedules must be indicated on the plan of the excavation sites. This must be done in conjunction with the appointed specialist.

8. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

9. Locations of samples and measured sections are to be pegged, and routinely and accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any “significant fossils” are recorded during the time of excavation.

7. SUMMARY

The chance of fossils being found on this site is potentially **High. However, these fossils are rare and d**ue to poor exposure a pre-construction visit by a palaeontologist is unlikely to yield results. It us recommended that a palaeontologist visits the site post-excavation but pre-roadside cladding. A **“Chance Find Protocol”** has been included to cover any fossil find during construction. Should this take place then a suitably qualified palaeontologist must be consulted. The “Chance Find Protocol” must form part of the Environmental Management Programme (EMPr) for the site,

8. REFERENCES

Cisneros, J. C., Rubidge, B. S., Mason, R. & Dube, C. (2008). "Analysis of millerettid parareptile relationships in the light of new material of Broomia perplexa Watson, 1914, from the Permian of South Africa. Journal of Systematic Palaeontology, 6, 453-462". Journal of Systematic Palaeontology. **6**(4): 453–462.

Green, D (1997). Palaeoenvironments of the Estcourt Formation (Beaufort Group), KwaZulu-Natal. MsC (unpubl.), Department of Geology and Applied Geology, University of Natal Durban.
Hastie, WW; Watkeys, MK; Aubourg, C (2014). Magma flow in dyke swarms of the Karoo LIP: Implications for the mantle plume hypothesis. Gondwana Research 25 (2014) 736–755.

Neveling, P.J. Hancox & B.S. Rubidge (2005) Biostratigraphy of the lower Burgersdorp Formation (Beaufort Group; Karoo Supergroup) of South Africa –
implications for the stratigraphic ranges of early Triassic tetrapods. *Palaeont. afr.*) 41: 81–87.

Sahris Palaeosensitivity Map: https://sahris.sahra.org.za/map/palaeo

Watkeys, M.K., 2006. Gondwana break-up: a South African perspective. In: M.R. Johnson, C.R. Anhaeusser and R.J. Thomas (Editors), The Geology of South Africa, Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria, 531-539.

9. DETAILS OF SPECIALIST

Dr Alan Smith
Private Consultant: ***Alan Smith Consulting, 29 Brown's Grove, Sherwood, Durban, 4091***

&

Honorary Research Fellow: ***Discipline of Geology, School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban***.

Role: Specialist Palaeontological Report production

Expertise of the specialist:

- PhD in Geology (University of KwaZulu-Natal), Pr. Sc. Nat., I.A.H.S.
- Expert in Vryheid Formation (Ecca Group) in northern KZN, this having been the subject of PhD.
- Scientific Research experience includes: Fluvial geomorphology, palaeoflood hydrology, Cretaceous deposits.
- Experience includes understanding Earth Surface Processes in both fluvial and coastal environments (modern & ancient).
- Alan has published in both national and international, peer-reviewed journals. He has published + 50 journal articles with 600 citations (detailed CV available on request).
- Attended and presented scientific papers and posters at numerous international and local conferences (UK, Canada, South Africa) and is actively involved in research.

Selected recent palaeo-related work includes:

- Desktop PIA: Proposed middle income housing units on Portion 23 of Farm Lot H Weston 13026, Bruntville, Mpofana Local Municipality. Client: UMLANDO.
- Desktop PIA: Proposed ByPass Pipeline for Ulundi bulk water pipeline upgrade. Client: UMLANDO.
- Fieldwork PIA: Bhekuzulu Epangweni KZN water reticulation project, Cathkin Park. Client: Mike Webster, HSG Attorneys.
- Fieldwork PIA: Mpungoze water supply scheme, Empangeni. Client: Enviropro.
- Fieldwork PIA: Helpmekaar Dam. Client: Afzelia environmental consultants.
- Desktop PIA: Zuka valley, Ballito. Client: Mike Webster, HSG Attorneys.
- Mevamhlope proposed quarry palaeontology report. Client: Enviropro.

- Desktop PIA: Proposed Lovu Desalination site. Client: eThembeni Cultural Heritage.
- Desktop PIA: Tinley Manor phase 2 North & South banks: eThembeni Cultural Heritage
- Desktop PIA: Tongaat. Client: eThembeni Cultural Heritage.
- Palaeontological Assessment Reports (3) to Scatec Solar SA (Pty) Ltd on an Appraisal of Inferred Palaeontological Sensitivity for a Potential Photo Voltaic Park at (1) Farm Rooilyf near Groblershoop, N Cape; (2) Farm Riet Fountain No. Portions 1 and 6, 18km SE of De Aar, N Cape; and (3) Dreunberg, near Burgersdorp, Eastern Cape. Client: Sustainable Development Projects.