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ATTENTION: TO WHOM IT MAY CONCERN

CaseID: 12800

NKUNGUMATHE IRRIGATION SCHEME: UTILIZING EXISTING TRACK AS ACCESS ROAD TO PUMP STATION

The Nkungumathe Irrigation Scheme is located 13 km North of the Nkandla town and is currently in construction. This scheme consists of 18 Ha of irrigable land over 11 irrigation blocks on the banks of the Mhlatuze River. The layout of the scheme is presented on page 6 of Annexure A. The project was commissioned by the DRDLR and JG Afrika was appointed as the consultants on this project. The beneficiary of this project is the Nkungumathe Farming co-operative, made up of previously disadvantaged community members based in the area.

Due to the presence of graves on site, Umlando Archaeological Surveys and Heritage Management were appointed to undertake a heritage study. The heritage study report is presented in Annexure A. As per their recommendations, one rising main pipeline was redesigned such that it is no longer within 20m of graves.

The proposed pump station is next to the river. Access is required from to the pump station for the occasional maintenance, repairs to pumps and/or operations. Besides the occasional vehicle, there will be no considerable and/or noticeable increase in traffic due to the site's remoteness.

We would like to inform you of our intention to utilize an existing track for access to the pump station. However, there are existing graves next to this track. See **Figure 1** indicating the track next to the graves. From advice provided to us from our heritage study consultants for this project, we do not see any potential risk of disregard or risk of damage to the graves

on site. See covering letter by Mr Gavin Anderson (Annexure B) from Umlando Archaeological Surveys and Heritage Management.

Figure 1: Layout of existing track and grave position

It should be noted that the existing track is higher than the graves and post depositional slumping of human remains will not pose a risk. We will be fencing off the graves to make it more visible to vehicles that may arrive and leave site.

Our community liaison officer (CLO) has been facilitating with the community regarding utilizing this track for access to the pump house. The family who own the graves have been identified (Mncunu family) and they do not have a problem regarding using the track as an access road. The CLO has also consulted the local councillor, Mr Mncunu and he also does not object to the access on this track.

E KOCH
for: JG AFRIKA (PTY) LTD

ANNEXURE A

HERITAGE SURVEY OF THE PROPOSED NKUNGUMATHE IRRIGATION SCHEME

FOR JG AFRIKA

DATE: 29 JULY 2018

By Gavin Anderson

Umlando: Archaeological Surveys and Heritage Management

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Abbreviations

HP	Historical Period
IIA	Indeterminate Iron Age
LIA	Late Iron Age
EIA	Early Iron Age
ISA	Indeterminate Stone Age
ESA	Early Stone Age
MSA	Middle Stone Age
LSA	Late Stone Age
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

INTRODUCTION

The Department of Rural Development and Land Reform (DRDLR) have appointed JG Afrika Pty Ltd (JG Afrika) to undertake Feasibility Assessments, Detailed Design and Construction Supervision of three irrigation schemes in KwaZulu-Natal. These three projects are the Horseshoe Irrigation Project (Horseshoe), Mkhuphula Irrigation Project (Mkhuphula) and Nkungumathe Irrigation Project (Nkungumathe) in the Ezinqoleni, Msinga and Nkandla Local Municipalities, respectively. Feasibility and preliminary design for each site have been covered in independent reports submitted. This report deals with the HIA for the Nkungumathe Irrigation Scheme

The study area is located within the Nkandla Local Municipality of KwaZulu-Natal. More specifically, the study site is located approximately 13 km north of the town Nkandla. The project consists of 12 farm plots with sizes ranging from 0.5 ha to 8.3 ha in extent. Figures 1 – 4 show the locality of the project.

The Nkungumathe scheme is situated along the banks of the Mhlathuze River, which is the proposed water source for the irrigation requirements of this project. The potential irrigation area comprises of 12 separate blocks, divided into two separate command areas, each with its own pump, bulk water pipes and reservoir. The two areas referred to as the upper and lower command areas can be operated independently while the lands are allocated to individual small-scale growers.

Umlando was appointed by JG Afrika to undertake the HIA study.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA

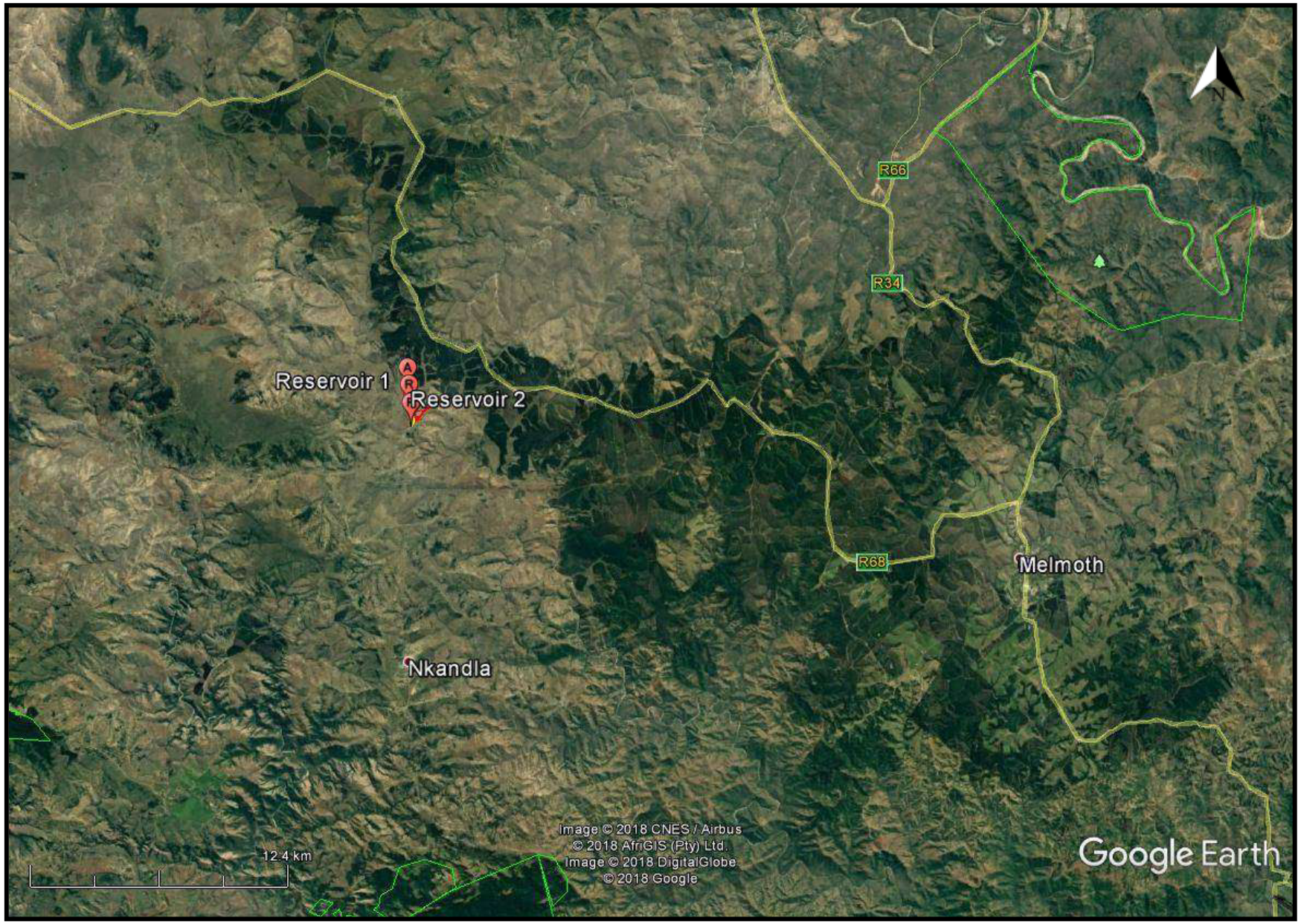


FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA

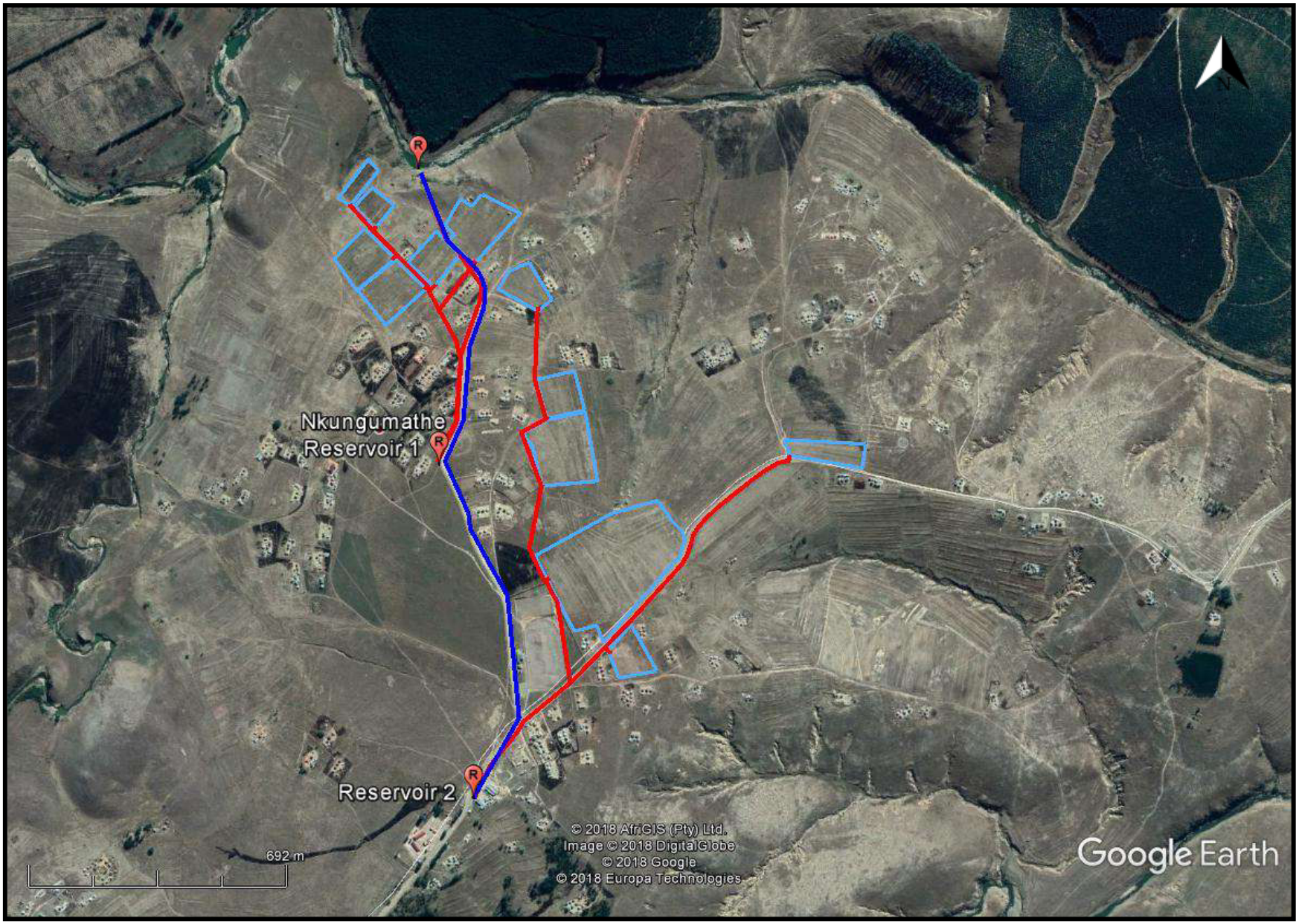
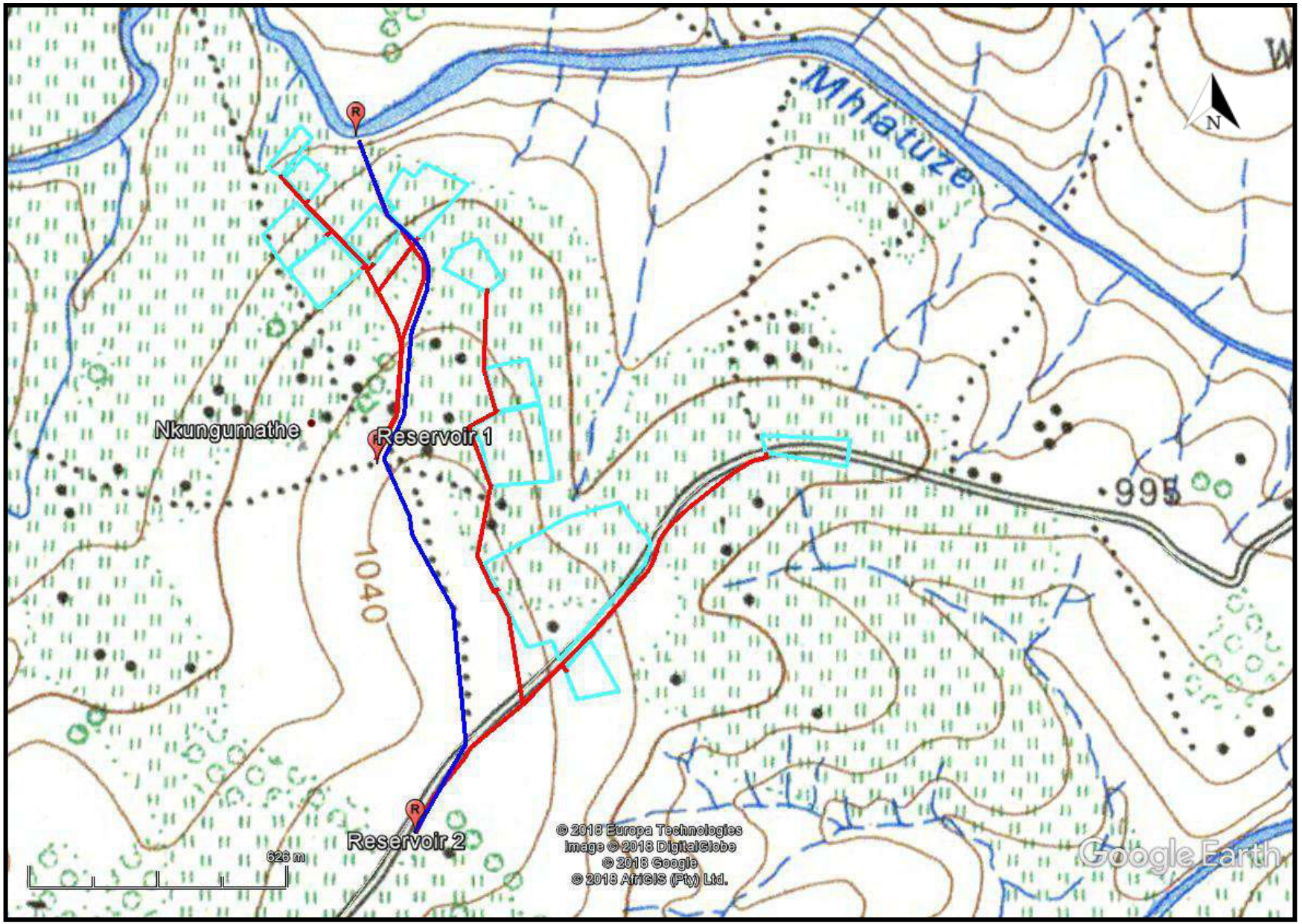


FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA[1]



[1] Red = gravity mains; blue = rising mains, turquoise = field outline

FIG. 4: SCENIC VIEWS OF THE PIPELINE ROUTE

KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

"General protection: Structures.—

- 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 Council having been obtained on written application to the Council.
- Where the Council does not grant approval, the Council must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- The Council may, by notice in the *Gazette*, exempt—
- A defined geographical area; or
- defined categories of sites within a defined geographical area, from the provisions of subsection where the Council 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.
- 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.—No person may damage, alter, exhume, or remove from its original position—

- the grave of a victim of conflict;
- a cemetery made up of such graves; or
- any part of a cemetery containing such graves, without the prior written approval of the Council having been obtained on written application to the Council.
- General protection: Traditional burial places.—
- No grave—
- not otherwise protected by this Act; and
- 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 Council having been obtained on written application to the Council.

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

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

- 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 Council having been obtained on written application to the Council.
- 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 Council without delay.
- The Council 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 Council to be inappropriate within 50 metres of a rock art site.
- 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 Council having been obtained on written application to the Council.
- 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 Council having been obtained on written application to the Council.

- 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, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government." (KZN Heritage Act of 2008)

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. These 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.

The above significance ratings allow one to grade the site according to SAHRA's grading scale. This is summarised in Table 1.

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 archaeological database indicates that there are archaeological sites in the general area (fig. 5). These sites include all types of Stone Age and Iron Age sites. No sites occur in the study area. There have been no previous HIA studies in the footprint.

No national monuments, battlefields, or historical cemeteries are known to occur in the study area.

The 1937 aerial photographs indicate that there were two large settlements where the Gravity Mains will occur (fig. 6). The sites were not visible during the survey, but are visible from the aerial imagery. The two areas should be treated with caution as areas for possible human remains.

The 1965 1:50 000 topographical map indicates that there are no settlements within the pipeline footprints (fig. 7).

The more recent Google Earth imagery shows three areas that are settlements (but were not visible during the survey). These are GE01, GE02, and GE03. The three areas should be treated with caution as areas for possible human remains.

Table 2 lists the location of these sites.

FIG. 5: LOCATION OF KNOWN HERITAGE SITES NEAR THE STUDY AREA

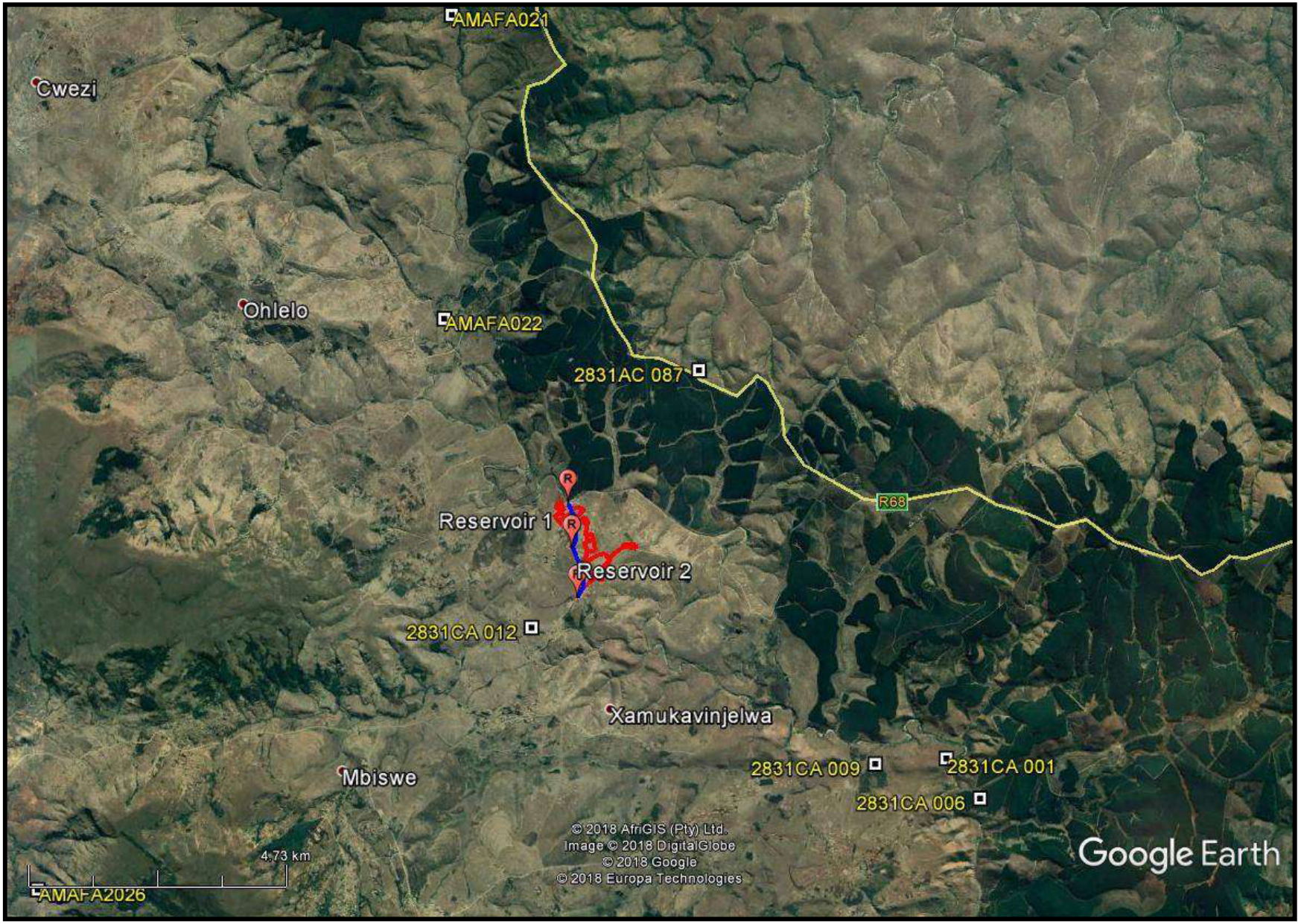
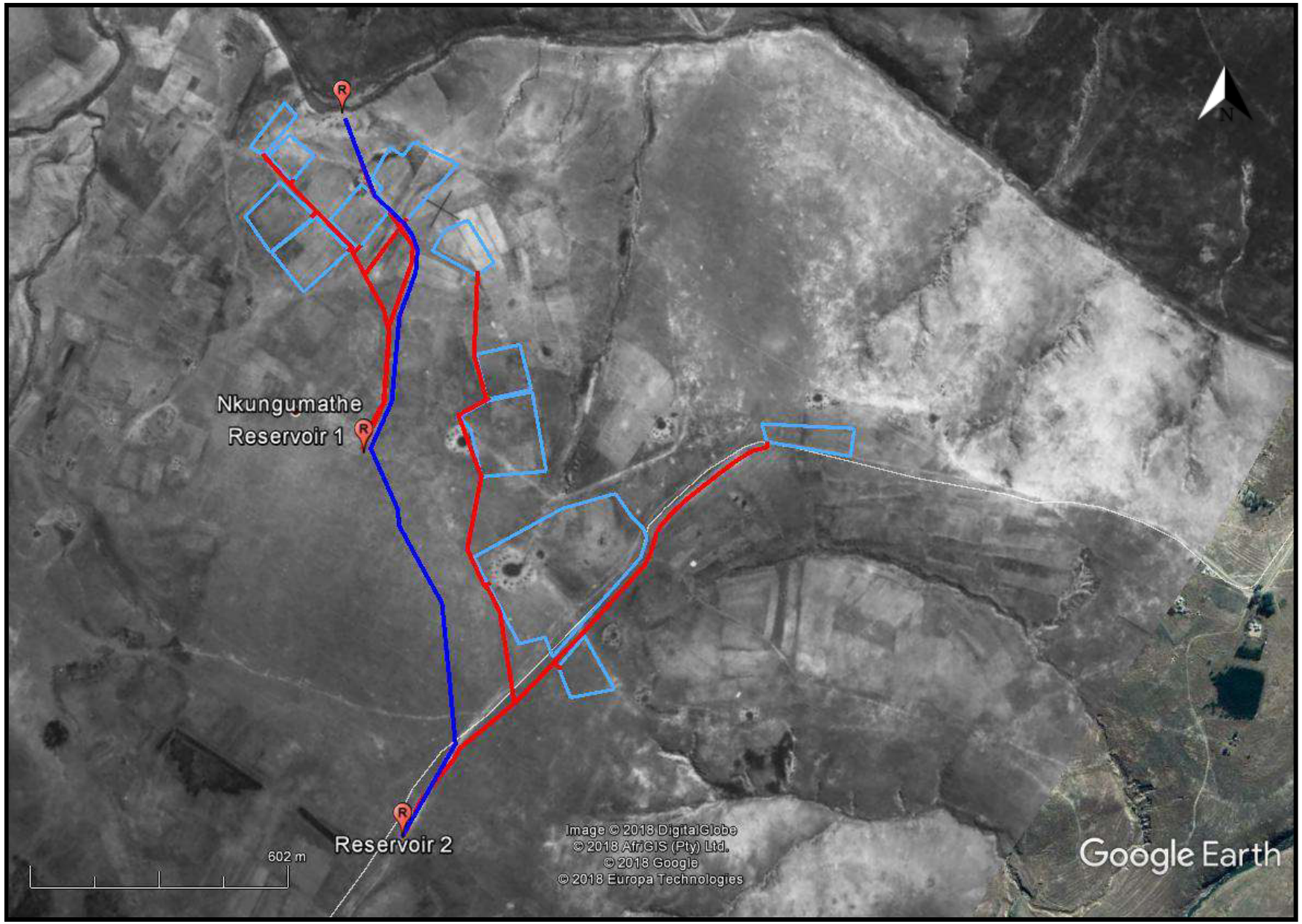
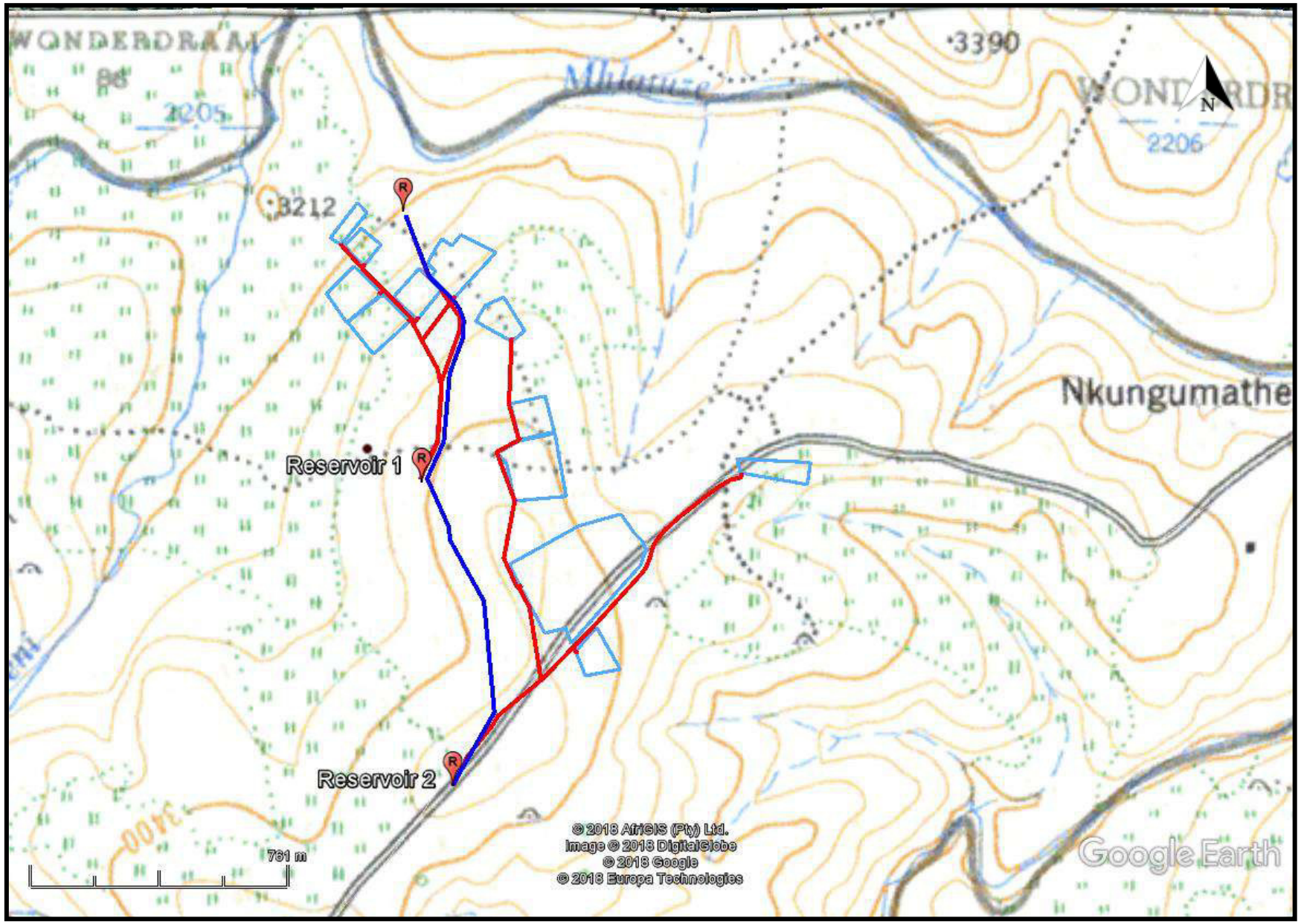


FIG. 7: STUDY AREA IN 1937[2]



[2] 117C_007_40723

FIG. 8: STUDY AREA IN 1965



PALAEONTOLOGICAL IMPACT ASSESSMENT

A desktop PIA was undertaken by Dr Gideon Groenewald (Appendix A) The study notes that only a small portion of the proposed irrigation scheme has moderately sensitive rocks for Palaeontological Heritage (fig. 9). Most of the site area is underlain by very old metamorphic rocks with a Low to Very Low significance of containing significant fossils.

The development consist of low impact excavations that will probably exceed 1,5m in depth. A phase 1 PIA is not required before construction in those areas where trenching is less than 1.5m in depth. If any fossils are noted then they should be reported to the PIA and/or Amafa KZN.

No further mitigation for Palaeontological Heritage is recommended at this stage for this project. However, a suitably qualified palaeontologist is required to investigate all trenching deeper than 1.5m. These trenches will be impacting the unweathered sediments of the Dwyka Group. The palaeontologist must be on site at least **once a month during large-scale excavations** into Karoo aged formations.

FIELD SURVEY

A field survey was undertaken in July 2018. Ground visibility was very good in most of the areas. The rising mains and reservoirs tend to occur in the road reserve or open areas next to buildings. While the desktop indicated several older sites may occur in the area, many of them have been built over, or damaged by new infrastructures.

Several sites were recorded during the survey and their locations are given in Table 2 and Figure 10.

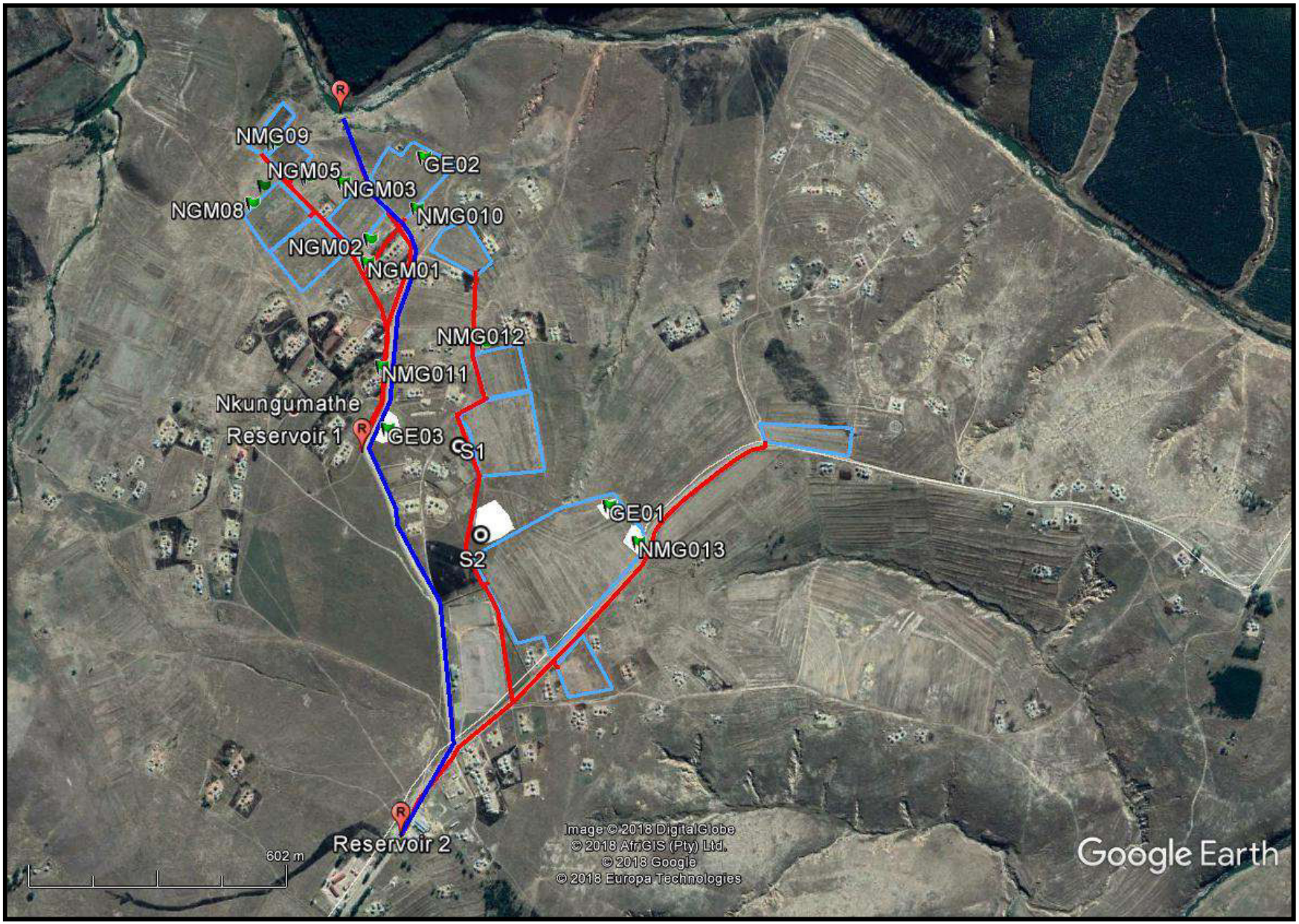
FIG. 9: PALAEONTOLOGICAL SENSITIVITY OF TEH STUDY AREA

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

TABLE 2: LOCATION OF RECORDED SITES

NAME	LATITUDE	LONGITUDE	ALTITUDE (M)	DESCRIPTION	SIGNIFICANCE	MITIGATION
S1	-28.511764	31.091974	1037	Settlement (1937)	Low	Possible graves, consult with community
S2	-28.51361	31.092505	1041	Settlement (1937)	Low	Possible graves, consult with community
GE01	-28.513058	31.095516	1013	Settlement (Google Earth)	Low	Possible graves, consult with community
GE02	-28.505678	31.091037	996	Settlement (Google Earth)	Low	Possible graves, consult with community
GE03	-28.511446	31.09025	1037	Settlement (Google Earth)	Low	Possible graves, consult with community
NGM01	-28.507936000	31.089699000	989.8	Kraal (WP545)	Low	None
NGM02	-28.507443000	31.089760000	987.5	House kraal (WP546)	Low	None
NGM03	-28.506510000	31.089110000	972.7	Houses and kraals (WP547)	Low	None
NGM04	-28.506077000	31.088144000	962.9	Grave (WP548)	High	20m buffer
NGM05	-28.506062000	31.088197000	962.2	Gave (WP549)	High	20m buffer
NGM06	-28.506245000	31.087100000	955.1	Grave (WP550)	High	20m buffer
NGM07	-28.506233000	31.087081000	955.9	Grave (WP551)	High	20m buffer
NGM08	-28.506612000	31.086823000	957.1	Cemetery (WP552)	High	20m buffer
NMG09	-28.505289000	31.087384000	949.1	Graves x 7 (WP553 - 554)	High	20m buffer
554	-28.505298000	31.087262000	948.3	Graves x 3	High	20m buffer
NMG010	-28.506786000	31.090885000	987.9	Gave (WP555)	High	20m buffer
NMG011	-28.510140022	31.090090318	1006.0	Graves x 2 (WP556)	High	20m buffer
NMG012	-28.509641000	31.092543000	1005.9	Cemetery (WP557)	High	20m buffer
NMG013	-28.513853000	31.096384000	1000.7	Many house foundations (WP558)	Low	Possible graves, consult with community

FIG. 10: LOCATION OF RECORDED SITES



NGM01

The site is located 20m to the south of a dirt road. NGM01 consists of a stone walled kraal ~10m in diameter (fig. 11), No other features were observed near the kraal. The kraal post-dates the 1937, and probably 1965, maps.

The site might be affected by the rising mains that occur 1m to the west.

Significance: The site is of low significance.

Mitigation: No mitigation is required but the community should be consulted regarding possible graves downhill of the kraal. These are unlikely due to the cemetery nearby.

SAHRA Rating: 3C

FIG. 11: STONE WALLED KRAAL AT NGM01

NGM02

The site is located downhill form an existing settlement. NGM02 consists of a settlement with various house foundations and walling (fig. 12). The settlement covers an area 60m x 25m in size. No obvious graves were visible. The site post-dates the 1965 map.

The site will not be affected by the rising mains.

Significance: The site is of low significance.

Mitigation: No further mitigation is required. The community should be consulted regarding possible graves at this site.

SAHRA Rating: 3C

FIG. 12: ABANDONED SETTLEMT AT NGM02

NGM03

The site is located to the northeast of an existing settlement. NGM03 is a settlement ~30m x 60m in size, with 3 – 4 houses (fig. 13). It has been recently abandoned. No previous graves occur at the site.

The site will not be affected by the rising mains.

Significance: Low

Mitigation: No further mitigation is required

SAHRA Rating: 3C

FIG. 13: SITE NGM03

NGM04 and NGM05

These two sites are two graves located near each other (fig. 14). There was a settlement just uphill from the graves but it is only visible on Google Earth. The graves are the standard stone cairns that are 12m x 1m in size. There are no inscriptions.

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 14: SITE NGM04

NGM06 and NGM07

NGM06 and NGM07 are located northwest of the last agricultural field before the river. They consist of two graves amongst the ruins of a settlement (fig. 15). NGM06 is a raised stone cairn with no inscription. NGM07 is a formal grave with a headstone and a capstone.

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 15: SITE NGM06 and NGM07

NGM08

The site is located northwest of the last agricultural field before the river. NGM08 is a cemetery of many graves and is ~30m^2 (fig. 16). It is clearly separated from NMG06 and NMG07. Most of the graves are stone cairns...

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 16: SITE NGM08

NGM09

The site is located between two fenced off agricultural fields. NGM09 consists of approximately ten graves (fig. 17). All of the graves are stone cairns and are of varying sizes.

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 17: SITE NGM09

NGM010

The site is located uphill of an existing agricultural field. NGM010 consists of two graves near each other. The graves are stone cairns (fig. 18)

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 18: SITE NGM010

NGM011

The site is located near the edge of road. NGM011 consists of two graves that are stone cairns in a field (fig. 19).

The site might be affected by gravity mains.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction begins. The gravity mains need to be moved to the side of the road, or preferably to the opposite side of the road in order to keep a 20m buffer between the graves and the pipeline footprint.

SAHRA Rating: 3A

FIG. 19: SITE NGM011

NGM012

The site is located to the north of an agricultural field. NGM012 consists of several graves that make up a cemetery (fig. 20).

The site will not be affected by the rising mains.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 20: SITE NGM012

NGM013

The site is located in the eastern side of an agricultural field. NGM013 consists of several house foundations (fig. 21). No graves were noted, but they could occur in the dense grass.

The site will not be affected by the rising mains that is located on the opposite side of the road.

Significance: The graves are of high significance.
Mitigation: No further mitigation is required.
SAHRA Rating: 3A

FIG. 21: SITE NGM013

MANAGEMENT PLAN

Most of the graves, or cemeteries, recorded during the survey will not be effected by the irrigation scheme. Only one site, NMG011, falls within the 20m buffer zone between a grave and a development. I suggest that the rising mains are moved to the opposite side of the road.

All excavations less than 1.5m in depth do not require a palaeontologist on site. However, where trenching is deeper than 1.5m, then a suitably qualified palaeontologist needs to survey the area. This is more important in the Dwyka Formations.

CONCLUSION

A heritage survey was undertaken for the proposed Nkungumathe Irrigation Scheme Scheme, Nkandla, KZN. . The potential irrigation area comprises of 12 separate blocks, divided into two separate command areas, each with its own pump, bulk water pipes and reservoir.

A heritage survey and palaeontological desktop study was undertaken for this project. The heritage survey noted several areas with human graves near the existing agricultural fields. These graves will not be affected. However, two graves occur near the road and will require the pipeline to be moved.

Much of the area is in an area of moderate palaeontological sensitivity. However, the upper 1.5m of deposit is unlikely to yield fossil remains. A qualified palaeontologist will be required o inspect all trenches that exceed 1.5m in depth.

REFERENCES

Maps

117C_007_40723

2831CA Nkabndla 1965, 1980

Database

Natal Museum Site Record Database

SAHRA Database

Umlando Database

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

PALAEONTOLOGICAL DESKTOP IMPACT ASSESSMENT

DESKTOP PALAEONTOLOGICAL ASSESSMENT FOR THE PROPOSED NKHUNGUMATHE IRRIGATION SCHEME DEVELOPMENT IN THE NKANDLA LOCAL MUNICIPALITY, KING CETSHWAYO DISTRICT MUNICIPALITY IN THE KWAZULU-NATAL PROVINCE.

FOR

Umlando

DATE: 4 July 2018

By

Gideon Groenewald
Cell: 078 713 6377

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a Desktop Palaeontological Assessment survey for the proposed Nkhungumathe Irrigation Scheme Development in the Nkandla Local Municipality, King Cetshwayo District Municipality, Kwazulu-Natal Province.

The development is a well-planned irrigation scheme with water supply from the Mhlathuze River. The main aim is to develop relatively small plots with sizes ranging from 0.5 ha to 8.3 ha in extent and excavation into substrate rock formations will be avoided.

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 (revised 2017) as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The development site applicable to the application for the proposed Nkhungumathe Irrigation Scheme Development in the Nkandla Local Municipality, King Cetshwayo District Municipality, Kwazulu-Natal Province is underlain by Very Highly and Highly to Moderate sensitive rocks for Palaeontological Heritage.

No significant fossils are expected in any formation at this stage of the development and it is very important to note that a suitably qualified palaeontologist must visit all the sites indicated as Moderately sensitive, only if obvious unweathered rocks are exposed during excavation for trenches.

If fossils are recorded the palaeontologist must prepare a “Chance Find Protocol” document for inclusion in the EMPr of the Project.

It is recommended that:

The EAP and ECO must be informed of the fact that a Moderate to Very Low sensitivity for Palaeontological sensitivity is allocated to large parts of study area underlain by Karoo and Pre-Karoo aged rocks that will most probably be very deeply weathered.

No further mitigation for Palaeontological Heritage is recommended for this project **before excavation of deeper than 1.5m is done**.

In areas where excavations **will exceed 1,5m** (see geotechnical reports) in the sections allocated a Moderate sensitivity, a suitably qualified palaeontologist must do a Phase 1 PIA and develop a “Chance Find Protocol” (CFP). This study must be done **during the first month of the planned excavation**.

Recommendations contained in the resultant Phase 1 PIA and CFP must be approved by AMAFA and SAHRA for inclusion in the EMPr of the project.

These recommendations must be included in the EMPr of this project.

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INTRODUCTION

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The development is a well-planned irrigation scheme with water supply from the Mhlathuze River. The main aim is to develop relatively small plots with sizes ranging from 0.5 ha to 8.3 ha in extent and excavation into substrate rock formations will be avoided.

Legal Requirements

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 (revised 2017) as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

Aims and Methodology

A Desktop investigation is often the only opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa's National Estate.

Following the "*SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports*" the aims of the palaeontological impact assessment are:

- to identifying exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assessing the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

Prior to a field investigation, a preliminary assessment (desktop study) of the topography and geology of the study area is made, using appropriate 1:250 000 geological information (2830 Dundee) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) are identified within the study area and the known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas are identified within the development footprint to focus the field investigator's time and resources. The aim of the desktop survey is to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the minimal extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008) and Groenewald et al., (2014)	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a

	professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) compulsory.
BLUE	Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. Collection of a representative sample of potential fossiliferous material recommended. At least a Desktop Survey and "Chance Find Protocol" is compulsory. The Chance Find Protocol must be included in the EMPr for the project.

GREY	Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during implacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits. At least a Desktop Survey and "Chance Find Protocol" document is compulsory. The Chance Find Protocol must be included in the EMPr of the project.

When rock units of Moderate to Very High Palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures must be incorporated into the Environmental Management Plan. A suitably qualified Palaeontologist must clear all projects falling on Low to Very Low Palaeontological sensitive geology.

Scope and Limitations of the Desktop Study

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant

palaeontological and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA and the Kingdom of Lesotho. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc.).

Locality and Proposed Development

The proposed Nkhungumathe Irrigation Scheme Development in the Nkandla Local Municipality, King Cetshwayo District Municipality, Kwazulu-Natal Province is situated north of Nkandla to the north of Durban.

The development falls in undisturbed rural terrain underlain by sandy and clayey soils of mainly weathered rocks of the Pre-Karoo Basement rocks. (Figure 1).

Figure 1 Locality of the Nkhungimathe Irrigation Development

The general proposal for the development is a dominantly small holding development with plots varying from 0,5ha to 8,3ha (Figure 2).

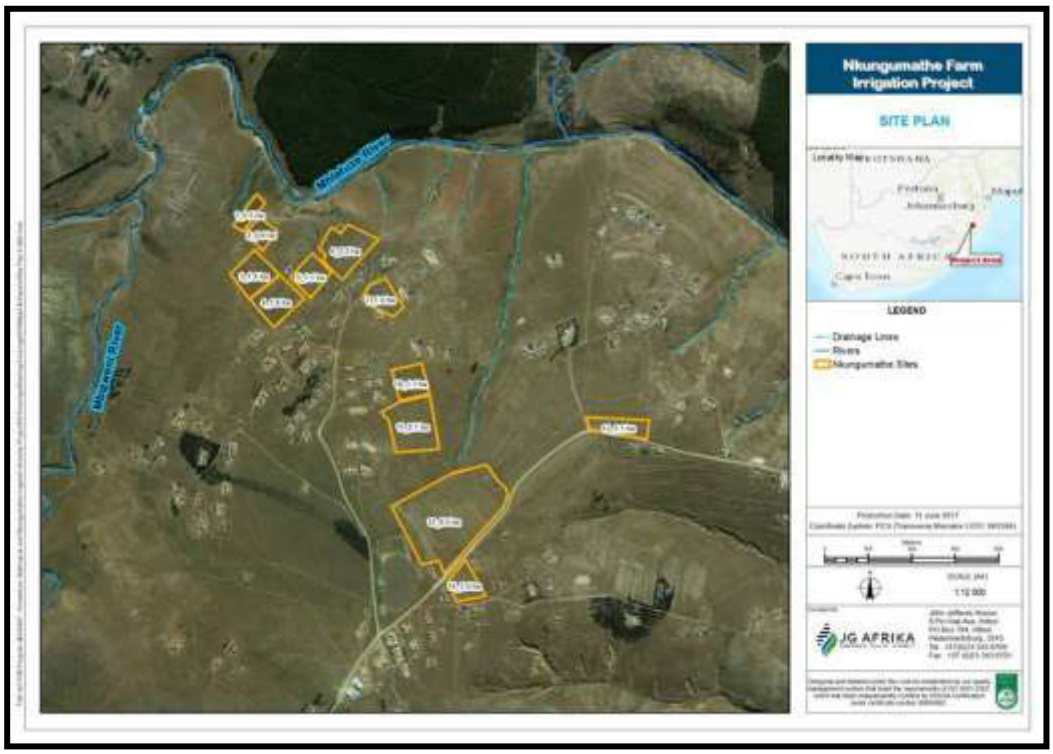

Figure 2 Layout of the proposed plots planned for the Nkhungunmathe Irrigation Development

GEOLOGY

The site of the development falls on very deep sand and clay from weathered rocks of Pre-Karoo Randian aged Nsuze Group and Hlagothi Complex as well as Carboniferous to Permian aged mudstone, shale and sandstone of the Dwyka Group, Karoo Supergroup (Figure 3) (Johnson et al, 2009; Groenewald, 2012). The project spans a complex geology but is dominated by very large areas that are deeply weathered and that will be disturbed by agriculture.

Figure 3 Geology underlying the study area, dominated by very old geological formations

Pre – Karoo Basement Rocks

Hlagothi Complex

The Randian aged Hlagothi Complex consists mainly of Hartzbergite and Pyroxinite with varying mineral complexes and will not contain any life forms.

Nsuze Group

The Randian aged Nsuze Group of metamorphic group of sedimentary rocks consisting of quatzites, phyllite, lava, tuff, iron formation and chert beds.

Karoo Supergroup

Dwyka Group

The Carboniferous Permian aged Dwyka Group consists mainly of tillite and shale, with minor sandstones. The formation weathers to a deep clay-rich soil and it is unlikely that fossil rich rocks will be exposed during this project.

PALAEONTOLOGY

Pre – Karoo Basement Rocks

Hlagothi Complex

The Randian aged Hlagothi Complex will not contain any fossils.

Nsuze Group

The Randian aged Nsuze Group can contain stromatolites in the old chert beds and in dolomite associated with the iron formations. The chance find of these fossils during this project is very unlikely.

Karoo Supergroup

Dwyka Group

The Carboniferous Permian aged Dwyka Group is well-known for the presence of trace fossils as well as important vertebrate fossils (*Mesosaurus*) and invertebrates in KwaZulu-Natal (Groenewald, 2012).

In general the Dwyka Group is however, highly weathered in this area and due to the deep soils chosen as target areas for this project, no finding of significant fossils are expected in any of the developments for this project.

PALAEONTOLOGICAL IMPACT AND MITIGATION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the desktop investigation. The desktop investigation confirms that the study area is underlain by relatively deep (>2m) clay soil associated with the large range of geological formations, ranging from Randian to Permian aged fossilliferous units (Figure 4).

The areas underlain by Moderately sensitive rocks for Palaeontological Heritage underlies small parts of the site, whereas most of the sites are underlain by very old metamorphic rocks with a Low to Very Low significance of containing

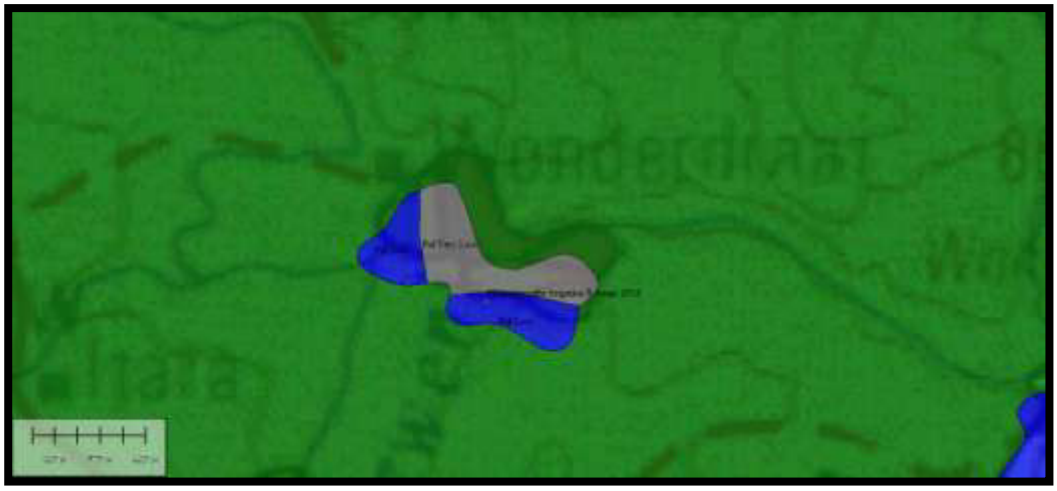

Figure 4 Palaeontological sensitivity of the study area varies from Medium to Very Low

significant fossils (Figure 4).

The fact that the development entails low impact excavation for the installation of pipelines and local excavation that will exceed 1,5m, parts of the development will result in deep (>1.5m) excavations into the sandy soil, for trenching for infrastructure.

It is not recommended that a phase 1 PIA be done **before** excavation exposed significant trenching deeper than 1,5m. It is important that the ECO reports any suspicious looking material for inspection by a suitably qualified HIA and/or PIA specialist.

No further mitigation for Palaeontological Heritage is recommended at this stage for this project. It is however recommended that a suitably qualified Palaeontologist be appointed to do a Phase 1 PIA during the time of excavation

into the subsoils and rocks on site if unweathered sediments are exposed in the Dwyka Group. The ECO must be vigilant and if fossils area recorded during the construction period, the appointed Palaeontologist must be on site at least **once a month during large scale excavations** into Karoo aged formations on site.

If any fossils are unexpectedly recorded during excavations of more than 1.5m depth, and specifically in sections allocated a green (Moderately sensitive) color (Figure 4). The palaeontologist must prepare a "Chance Find Protocol" (CFP) within the first week of exposure of these rocks in the entire study area. This CFP report must be included into the EMPr of the project and upgraded continuously during the construction phase where excavations of deeper than 1,5m are planned for this project.

CONCLUSION

The development site applicable to the application for the proposed Nkhungumathe Irrigation Scheme Development in the Nkandla Local Municipality, King Cetshwayo District Municipality, Kwazulu-Natal Province is underlain by Very Highly and Highly to Moderate sensitive rocks for Palaeontological Heritage.

No significant fossils are expected in any formation at this stage of the development and it is very important to note that a suitably qualified palaeontologist must visit all the sites indicated as Moderately sensitive only if obvious unweathered rocks are exposed during excavation for trenches.

If fossils are recorded the palaeontologist must prepare a "Chance Find Protocol" document for inclusion in the EMPr of the Project.

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Recommendations contained in the resultant Phase 1 PIA and CFP must be approved by AMAFA and SAHRA for inclusion in the EMPr of the project.

These recommendations must be included in the EMPr of this project.

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QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, 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 palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Dr Gideon Groenewald
Geologist

ANNEXURE B

Umlando: Archaeological Surveys & Heritage Management
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4 October 2019
CaseID: 12800

To whom it may concern

This is to confirm that I agree with the utilization of the existing track above the graves as an access road to the pumping station. Due to the lack of space in the area, no other option is available and the buffer zones around graves need to be reconsidered.

The graves will be fenced off so as to make a physical buffer between them and the track.

Yours sincerely

Gavin Anderson