



MOKOLO-CROCODILE WATER AUGMENTATION PROJECT PHASE 2 (MCWAP-2)

Heritage Impact Assessment

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CREDIT SHEET

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ABBREVIATIONS

Abbreviation	Meaning
AD	Anno Domini
APM	Archaeological Paleontological and Meteorite
BP	Before Present
c.	Circa
BCE	Before Common Era
CE	Common Era
CFP	Chance Find Protocol
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	<i>Early Iron Age</i> (indicated in italics to avoid confusion) / Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESSS	Environmental and Social Safeguard Standard
HIA	Heritage Impact Assessment
I & AP	Interested and Affected Parties
ICOMOS	International Council on Monuments and Sites
ICP	Informed Consultation and Participation
IFLA	International Federation of Library Associations and Institutions
IMP	Integrated Management Plan
LIA	Late Iron Age
LSA	Late Stone Age
MCWAP-2	Mokolo Crocodile Water Augmentation Project Phase 2
MSA	Middle Stone Age
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
OUV	Outstanding Universal Value
PIA	Palaeontological Impact Assessment
PS	Performance Standard
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Resource Information System
TFCA	Transfrontier Conservation Area
UN	United Nations
VIA	Visual Impact Assessment
WHS	World Heritage Site
ZAR	Zuid-Afrikaansche Republiek

GLOSSARY OF TERMS

A **'place'** is defined as:

A site, area or region;

A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);

A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Archaeological' means:

Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;

Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and

Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;

Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'Circa' is used in front of a particular year to indicate an approximate date.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place.

'Paleontological' means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace. **'Structure'** means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

Executive Summary

This report represents the final report on the heritage sensitivity of the proposed Mokolo Crocodile Water Augmentation Project – Phase 2 (MCWAP-2) and the subsequent management of said sensitivities. It embodies the results of three different investigations and their resultant reports. These reports are respectively,

- PROPOSED MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (PHASE 2A) (MCWAP-2A): WATER TRANSFER INFRASTRUCTURE AND BORROW PITS, LIMPOPO PROVINCE. Phase 1 – Heritage Impact Assessment – Final Report. Compiled by PGS in July 2018.
- PHASE 1 PALAEOLOGICAL ASSESSMENT SURVEY, SITE VISIT AND “CHANCE FIND PROTOCOL” (CFP) FOR THE PROPOSED. MOKOLO CROCODILE WATER AUGMENTATION PROJECT PHASE 2 (MCWAP-2) IN THE WATERBERG DISTRICT MUNICIPALITY, LIMPOPO PROVINCE. Compiled by Gideon Groenewald in August 2020.
- This report; MOKOLO-CROCODILE WATER AUGMENTATION PROJECT PHASE 2 (MCWAP2) Heritage Impact Assessment. Compiled by G&A Heritage Management Properties (Pty) Ltd in August 2020 as amended and submitted in October 2020.

The full reports will be appended to this report.

The 2018 HIA report compiled by PGS investigated most of the areas to be affected by the proposed pipeline and its associated infrastructure and borrow pits. There were however significant gaps in the report due to several factors such as changes in alignment and the placement of borrow pits as well as certain areas that could not be accessed during the initial study for a variety of reasons. This report aims to correct these gaps and to integrate the findings of the palaeontology study into one report. The investigation found the study area to be all but devoid of heritage sites.

The 2020 investigations also included a Walk-down of the entire alignment and all previously proposed and all newly proposed borrow pit areas and associated infrastructure to ensure that any alterations to the alignment would not result in damage to known as well as unknown heritage features.

This report can therefore be seen as an integration of the heritage findings of the 2018 as well as 2020 investigative season as well as the results of the 2020 palaeontological investigations. It will also provide a Chance Finds Protocol for any Archaeological or Palaeontological chance finds. This is to be included in the final Environmental Management Programme (EMPr) for the project and should be enforced by the Environmental Control Officer (ECO) appointed for the project. As part of the 2020 heritage study, specialists will also educate construction workers during a one-day workshop on the identification of heritage components.

Overview of Findings and Recommendations

2018 Heritage Impact Assessment – PGS

Palaeontology

Ms. Elize Butler of Banzai Consulting was commissioned to undertake a paleontological desktop study for the proposed MCWAP-2A development.

She found that the proposed Mokolo Crocodile River (West) Water Augmentation Project is underlain by various geological sediments.

According to the SAHRIS *PalaeoMap*, it is recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required (pending the discovery of newly discovered fossils) in geological sediments with a low, very low and moderate Palaeontological

Sensitivity. The majority of the proposed development is thus deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. All route alternatives were found to be in the above-mentioned geological sediments and therefore none of the routes were preferred above the other and none were a no-go option.

However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

The Malmani Subgroup of the Chuniespoort Group (Transvaal Group) has a high Palaeontological sensitivity. The proposed development of the central pipeline is underlain by the Malmani Subgroup development and thus has a high palaeontological sensitivity. It is thus recommended that an EIA level palaeontology report should be conducted to assess the value and prominence of fossils in the central pipeline development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

Fieldwork

The field assessment of the largest portion of the proposed pipeline routes were undertaken by driving along the adjacent and available roads, including the track running along the railway line servitude. A concerted effort was made to conduct walkthroughs of those sections of the pipeline footprints not accessible by road. Furthermore, and whenever possible, all potential heritage sites identified during the assessment of the historic maps and SAHRIS were also visited in the field. Additionally, with the exception of a few areas defined in Section 3.1 of the appended 2018 HIA report, that were not covered, all the non-pipeline footprints (i.e. borrow pits, construction camps, etc.) were assessed by way of intensive walkthroughs.

A total of 18 archaeological and heritage sites were identified during the fieldwork. These were numbered from MCWAP Site 1 to MCWAP Site 18. These identified sites included the following:

- Five black homesteads where the potential risk for the presence of unmarked stillborn graves exist. See MCWAP Site 1, MCWAP Site 3, MCWAP Site 11, MCWAP Site 12 and MCWAP Site 16.
- Five sites containing confirmed graves and possible graves. See MCWAP Site 2, MCWAP Site 4, MCWAP Site 7, MCWAP Site 13 and MCWAP Site 14.
- Three historic farmsteads which are older than 60 years. See MCWAP Site 5, MCWAP Site 6 and MCWAP Site 15.
- Two Stone Age sites. See MCWAP Site 8 and MCWAP Site 18.
- Two metalworking sites associated with the Iron Age. See MCWAP Site 9 and MCWAP Site 10.
- Memorial where cremated ash may have been placed. See MCWAP Site 17.

Impact risk assessments were undertaken to calculate the impact risk of the proposed development on these identified heritage sites.

General Recommendations

The following general mitigation measures are required:

- Whenever possible, all heritage sites identified during this study with a significance of Medium and higher, must be preserved in situ by designing the development footprints in such a way that a buffer area of at least 50m is kept clear between any development footprints and construction activities and these heritage sites. In cases where the preservation of such sites and buffer areas are not possible, site-specific mitigation measures would be required (refer Section 9.2 of the appended 2018 HIA report).
- All those areas that could not be accessed during the fieldwork, must be assessed in the field by a heritage specialist / archaeologist before construction commences. These areas were not assessed in the field due to a number of reasons, including cases where the landowners were not willing to provide permission to any of the project consultants to undertake fieldwork on their land, cases where landowners did not respond to messages requesting access to their properties, development footprints and properties for which no landowner details were provided as well as those areas that were not assessed in the field due to the temporal and budget restrictions. Refer Section 1.3 of the 2018 HIA report appended to this report for a detailed list of all the components of the study area that could not be accessed during the fieldwork.
- The archaeological research assessment of the Motlhabatsi (Matlabas) drainage basin that was undertaken by Jan Aukema for his Masters degree from the University of the Witwatersrand, revealed a substantial number of sites. The proposed Central Pipeline Route passes through a section of the Matlabas drainage basin that represented the area of study for Jan Aukema's archaeological research. As the exact coordinates and site localities for the numerous archaeological sites identified by Aukema are not presently available, it is very difficult to accurately establish the distances between the closest of Aukema's archaeological sites and present study area. From the site distribution map published by Huffman (1990:118), it would appear that the following sites are located closest to the present study area: Wn1 on the farm Welgevonden, Ho1 on the farm Haarlem Oost and Gr1 on the farm Groenrivier. It is recommended that all components of the proposed development footprints must be assessed in the field by way of walkthroughs undertaken by a heritage specialist / archaeologist before construction commences. This walkdown inspection was completed as part of the 2020 HIA investigations.
- Although significant sections of the pipeline footprints were assessed by vehicle along the railway and road servitudes, the landscape within which this development is proposed is not characterised by a plethora of archaeological and heritage sites. This statement is supported by the fact that although an intensive field assessment was undertaken, which included walkthroughs of almost all the non-pipeline development footprints (i.e. borrow pits, construction camps etc.), only 18 heritage sites could be identified across the entire length of the proposed development footprint which extends over an area in excess of 150km. As a result, it is not deemed necessary for additional walkthroughs to be undertaken apart from the ones required for those areas which were not included in the current fieldwork (see previous bullet item) and the ones required by the previous General Recommendation in proximity to the Matlabas River. Rather, it is recommended that an archaeological and heritage workshop be conducted with the project Environmental Control Officer (ECO) before construction commences to allow the ECO to undertake constant monitoring of construction activities and identify any archaeological and heritage sites which may be located along the pipeline route

and which were not identified during the current fieldwork. Additionally, an archaeological watching brief can augment the work of the ECO during construction.

- An assessment of the South African Heritage Resources Information System (SAHRIS) of SAHRA was undertaken to establish whether any previous archaeological and heritage impact assessments had revealed archaeological and heritage sites within, and in close proximity, to the present study area footprints. One of these previous reports from the immediate surroundings of the study area identified a cemetery containing four graves located approximately 65m north-west of proposed Borrow Pit 13-14, and 55m south-west of the access road to this borrow pit. The coordinates for this site are as follows: S 23.711420 E 27.497340. Due to the closeness of this cemetery to this borrow pit, the construction team and Environmental Control Officer must be made aware of the position of this site to ensure that it is not disturbed or damaged during construction.
- It is important to note that the impact assessment risk calculations undertaken for the identified heritage sites are based on the current layout of the proposed pipeline and its alternatives. Should the position and layout of any of the footprints change, the impact assessment calculations will have to be modified.

2020 Palaeontological Impact Assessment – Gideon Groenewald

The development site applicable to the application for the proposed Mokolo Crocodile Water Augmentation Project Phase 2 (MCWAP-2), Lephalale and Thabazimbi Local Municipalities, Waterberg District Municipality in the Limpopo Province is underlain by Vaalian Aged stromatolitic dolomite, Mokolian aged quartzitic sandstone and shale, Carboniferous and Permian to Permo-Triassic aged sandstone and mudstones and Quaternary aged surface deposits which varies in palaeontological sensitivity from very Low to very high (Table 1 found in the 2020 PIA report appended to this report). No significant fossils are expected from the Mokolian aged diabase or the Jurassic aged dolerite dyke areas, but the association of termitaria with these rock types are significant in terms of possible Human burial sites.

Significant fossils are expected in areas with deep exposure, and more fossils are expected during excavation for trenching in areas indicated in red and orange on the Palaeontological sensitivity map. It is important that a suitably qualified Palaeontologist be appointed to visit the site of the development to identify potential fossils in areas indicated as High and Very Highly significant during the first week of excavations. If any fossils are exposed during the lifetime of the project, the finds must be reported as soon as possible to the relevant authority (SAHRA) for collection and safe keeping of Palaeontological Heritage.

In areas underlain by the Malmani Subgroup the field investigation confirmed the presence of stromatolites (Table 2 of the appended 2020 PIA report), and it will be very important that a suitably qualified Palaeontological Specialist be appointed to do a Phase 2 PIA and to upgrade the "Chance Find Protocol" document. The CFP document must then be included as part of the EMP of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

- The EAP and ECO must be informed of the fact that a high and very high Palaeontological Sensitivity is allocated to the parts of study area underlain by Transvaal Supergroup and Karoo Supergroup sedimentary rocks and a moderate sensitivity over the rest of the site underlain by Waterberg Group Quartzitic sandstone and shale. A moderate sensitivity is allocated to areas

covered in Quaternary aged sand. Diabase and dolerite will not contain fossils but can be associated with important termateria.

- Further mitigation for Palaeontological Heritage is recommended for this project before excavation of deeper than 1.5m is done. Collection of a representative sample (1 m³) of stromatolitic dolomite must be done during the first week of excavation into these rocks and the sample must be transported to the ESI at WITS university for further studies.
- A suitably qualified palaeontologist must do a Phase 2 PIA and upgrade the “Chance Find Protocol” (CFP) when fossils are recorded from any formation in this area during excavations.
- Recommendations contained in this Phase 1 PIA must be approved by SAHRA.
- These recommendations must be included in the EMP of this project.

2020 Heritage Impact Assessment – G&A Heritage Properties (Pty) Ltd

The 2020 HIA was aimed at filling the gaps in the 2018 report by PGS and found the following:

Remainder of the Farm Mooivallei 342KQ

This site was investigated, and no heritage sites could be identified.

Portion 4 of the Farm Rhenosterpan 361LQ

This property was accessed during the fieldwork survey however no sites of heritage significance could be identified along the proposed pipeline alignment.

Portion 7 of the Farm Paarl 124KQ

No sites were identified.

Portion 6 of the Farm Paarl 124KQ

No sites could be identified.

Remainder of the Farm Paarl 124KQ

No sites of heritage significance could be identified.

Portion 1 of the Farm Leeuwbosch 129 KQ

No sites found.

Borrow Pit 41

No sites found.

Remainder of the Farm Zyferbult

No sites found.

Borrow Pit SS1

No sites.

Borrow Pit 13

No sites.

Borrow Pit 14

No sites.

Borrow Pit 41

No sites.

Borrow Pit 51

No sites.

New Paul Hugo Weir

No sites.

Sandriver Gauging Weir

No sites.

Bierspruit Gauging Weir

No sites.

Alternative D4

No sites found.

Other known sites

Sites designated Wn1 on the farm Welgevonden, Ho1 on the Farm Haarlem Oost, Gr 1 on the Farm Groenrivier and the sites associated with the Motlhabatsi basin were all found to be well outside of the impact zone of the pipeline and of no relevance for this study.

Walk-down Survey

After a comprehensive walk-down of the proposed alignment it was found that the proposed pipeline will not impact on any sites of heritage significance and no new heritage features could be identified. Although several heritage sites were noted on the proposed properties affected, none of these were found to be close enough to the investigated corridor to be endangered. These sites are listed in order to prevent any secondary impacts to them.

General

Technical Scope of HIA

The Heritage Impact Assessment is meant to deliver, evaluate and inform on the following aspects:

- a) The identification and mapping of all heritage resources in the area affected;
- b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in the relevant legal descriptions, development proponent requirements and as per international best practise approaches and charters;
- c) An assessment of the impact of the development on such heritage resources;
- d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
- f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

The following categories of heritage objects are considered.

Graves: A place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. This may include any of the following:

- 1) Ancestral graves
- 2) Royal graves and graves of traditional leaders
- 3) Graves of victims of conflict i.e. graves of important individuals
- 4) Historical graves and cemeteries older than 60 years
- 5) Other human remains, buried or otherwise.

The removal of graves is subject to the following procedures:

- Notification of the impending removals (using local language media and notices at the grave site)
- Consultation with individuals or communities related or known to the deceased
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable
- Procurement of a permit from the relevant controlling body
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery)
- Observation of rituals or ceremonies required by the families

Movable objects: this includes objects such as historic or rare books and manuscripts, paintings, drawings, sculptures, statuettes and carvings; modern or historic religious items; historic costumes, jewellery and textiles; fragments of monuments or historic buildings; archaeological material; and

natural history collections such as shells, flora, or minerals. Discoveries and access resulting from a project may increase the vulnerability of cultural objects to theft, trafficking or abuse.

- 1) Objects recovered from the soil or water including archaeological and paleontological objects and material, meteorites and rare geological specimens
- 2) Ethnographic art and objects
- 3) Military objects
- 4) Objects of decorative art
- 5) Objects of fine art
- 6) Objects of scientific or technological interest
- 7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings
- 8) Any other prescribed categories, but excluding any object made by a living person

Battlefields: Older than 75 years.

Heritage “Places”: A ‘place’ is defined as:

- a) A site, area or region
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure)
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures)
- d) An open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place
- e) Traditional buildings used in cultural ceremonies.

Heritage Structures: Refers to single or groups of architectural works found in urban or rural settings providing evidence of a particular civilisation, a significant development or a historic event. It includes groups of buildings, structures and open spaces constituting past or contemporary human settlements that are recognised as cohesive and valuable from an architectural, aesthetic, spiritual or socio-cultural perspective.

Means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

Archaeological Sites: any combination of structural remains, artefacts, human or ecological elements and may be located entirely beneath, partially above, or entirely above the land or water surface. Archaeological material may be found anywhere on the earth’s surface, singly or scattered over large areas. Such material includes burial areas, human remains, artefacts and fossils. Archaeological sites may include:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;

- b) Rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked, whether on land or in the maritime cultural zone, and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

Paleontological resources: Refers to any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Sacred or Spiritual Sites: Natural Features with cultural significance include sacred hills, mountains, landscapes, streams, rivers, waterfalls, caves and rocks; sacred trees or plants, groves and forests; carvings or paintings on exposed rock faces or in caves; and paleontological deposits of early human, animal or fossilised remains. This heritage may have significance to local community groups or minority populations.

Geographical / Spatial Scope of HIA

The project is located within the western part of the Limpopo Province. The footprint of the proposed project traverses the Thabazimbi Local Municipality (LM) and Lephalale LM, which fall within the Waterberg District Municipality (DM) boundary and the R572 and R521 Provincial tar roads form the southern and western boundaries respectively. The core stretches from the farm Rhodes Drift in the west for 35 km to the farm Riedel in the east, and from the Limpopo River in the north to the R572 tar road in the south.

The proposed pipeline route commences from the Vlieëpoort Mountains at the weir site on the Crocodile River, in the south-western point of the project area. From there it runs in a predominantly northern direction along existing roads, farm boundaries and a railway line, until it reaches its destination near Steenbokpan at the Medupi power station.

Thabazimbi is situated approximately 10 km to the north-east of the Vlieëpoort weir site and Lephalale is situated approximately 30 km to the east of the pipeline route's terminal point.

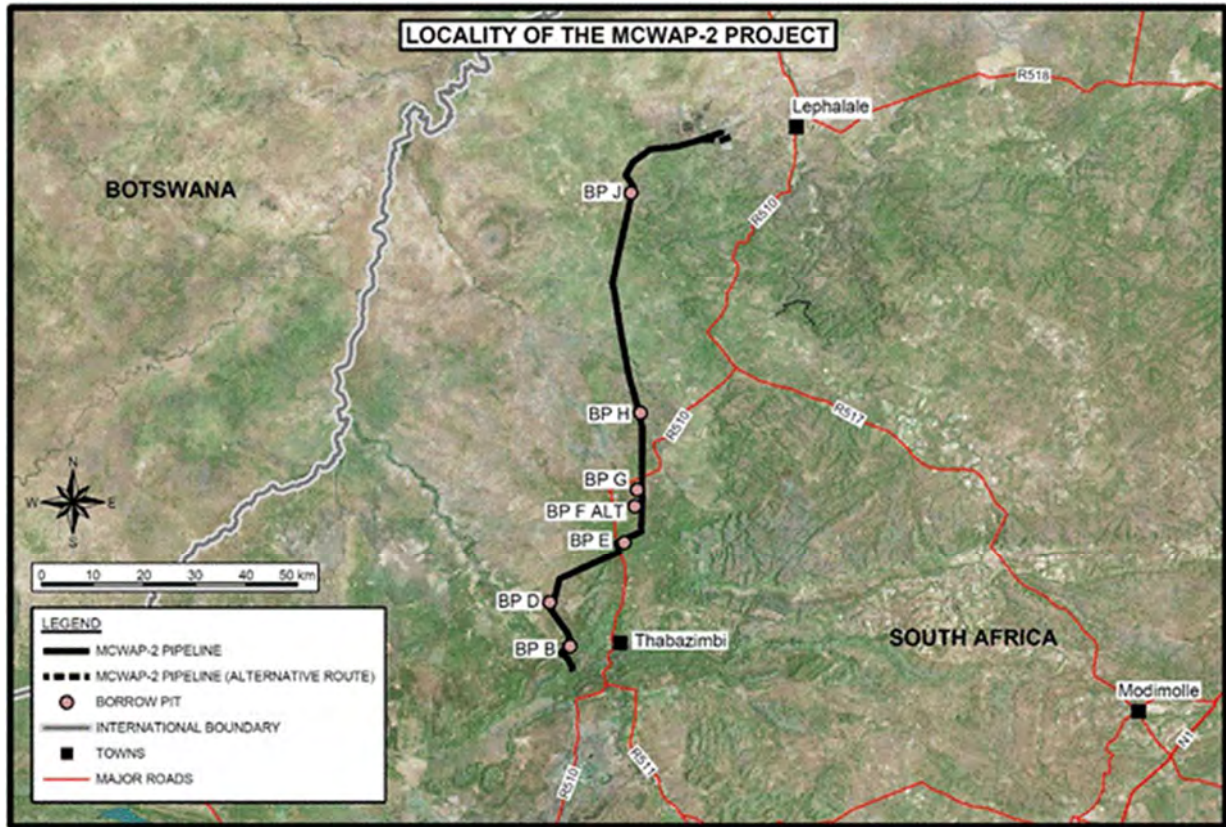


Figure 1. Proposed location for pipeline (MCWAP-2A)

Temporal Scope

The proposed project will consist of three phases:

- Construction
- Operation
- Decommissioning

Due to the nature of the proposed development impacts on heritage sites are only anticipated during the construction and operational phases of the proposed developments. There is still no well-defined decommissioning phase.

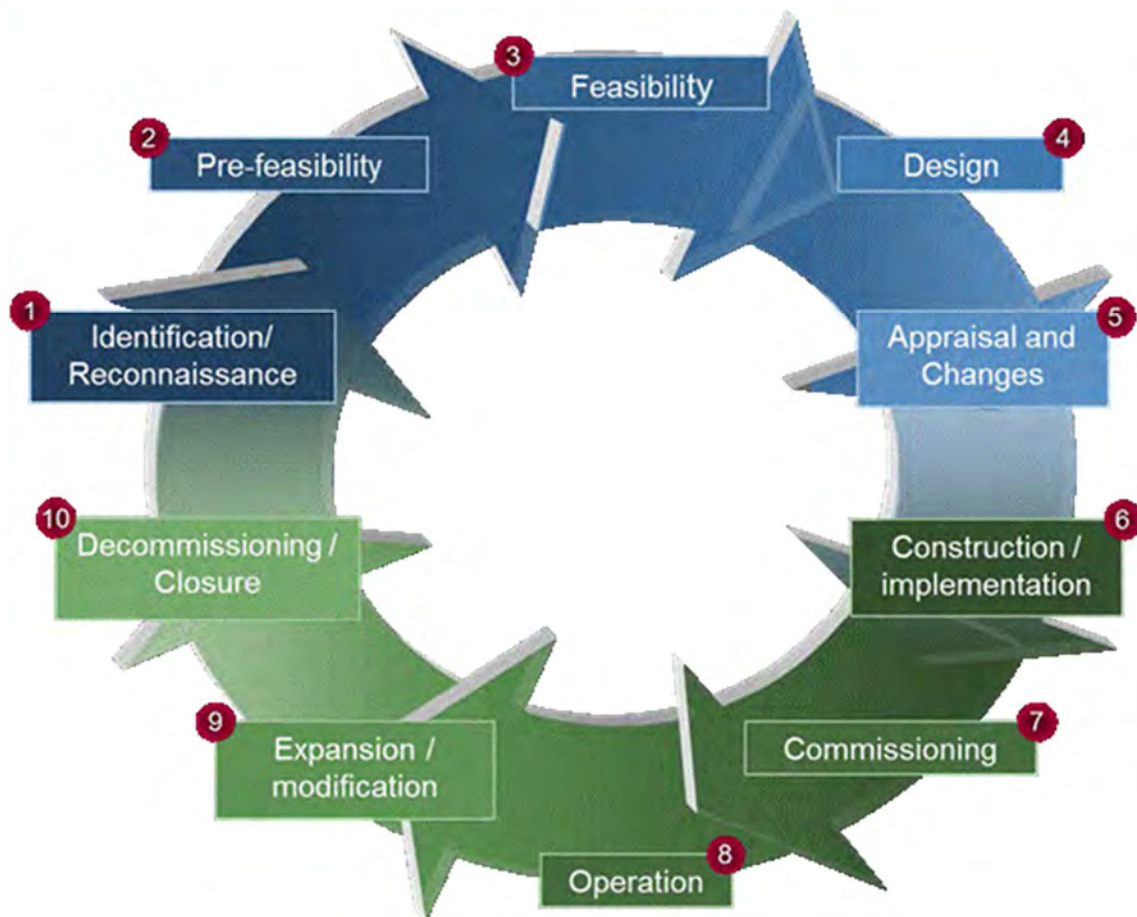


Figure 2. Project life cycle

Possible Construction Phase Impacts

As with all earthmoving activities impacts on tangible heritage resources are anticipated. Since the construction phase of the project will involve extensive excavations this impact could also occur on subterranean deposits. Often heritage sites are buried beneath years of alluvial deposits and there is no practical way of determining their location. This only becoming known once the covering matrix is excavated. The Chance Finds Protocol in this report will mitigate and manage such finds.

The construction of any associated infrastructure for the pipeline construction can also impact on heritage sites. Here we include secondary activities such as construction camps, access roads and temporary services, among others.

Operational Phase

Although the majority of anticipated impacts are expected during the construction phase of the project there could be possible impacts on heritage resources during the operational phase as well. Potential impacts relate to maintenance activities, possible flooding if the pipeline fails as well as increased access to the areas because of service roads being built. Unforeseen erosion due to focussed run-off because of the altered environment is also a possible impact. These impacts should be managed through the long-term environmental management plan for the project.

Legislative Context

The protection of our heritage resources is specifically addressed by the National Heritage Resources Act no 25 of 1999, however certain provincial bylaws might also be applicable.

National Heritage Resources Act no 25 of 1999. Specifically, the following sections, apply.

- Section 34 – protection of structure older than 60 years.
- Section 35 – protection of heritage resources.
- Section 36 – protection of graves and burial grounds. The Human Tissues Act as well as the provincial Crematoria and Burial Grounds Bylaws will also be applicable.
- Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m² in extent, etc.
- Authority – South African Heritage Resources Agency (SAHRA) and Limpopo Provincial Heritage Resources Authority (LIHRA)

National Legislation and Policies

- Department of Environmental Affairs Cultural Heritage Survey Guidelines and assessment tools for protected areas in South Africa
- National Environmental Management: Protected Areas Act 57 of 2003 and its regulations
- National Heritage Resources Act 25 of 1999 and its regulations
- South African Heritage Resources Agency Conservation principles
- South African Heritage Resources Agency Guidelines for basic management plan format for rock art and other archaeological sites to be opened to the public
- South African Heritage Resources Agency Guidelines for the development of plans for the management of heritage sites or places
- South African Heritage Resources Agency Minimum standards for archaeological site museums and rock art sites open to the public

The National Heritage Resources Act (25 of 1999)

In terms of the National Heritage Resources Act, there are several implications for places that are declared National Heritage Sites.

Section 27 of the National Heritage Resources Act specifies that:

- (4) a written motivation for the declaration must be prepared and kept on record by SAHRA;
- (15) SAHRA is responsible for the protection of national heritage sites;
- (18) No person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any national heritage site without a permit issued by SAHRA;
- (19) SAHRA may make regulations, with the consent of the owner, to safeguard the site, to specify conditions of use and development, and to regulate the admission of the public, including fees.
- (20) Any branch of the State or supported body which is the owner of a heritage must maintain it according to a minimum standard and according to a procedure prescribed by SAHRA after consultation with the relevant Department of Works.
- (21) SAHRA may, by agreement with the owner, conserve or improve any national heritage site, construct fences, walls or gates around it, acquire or construct and maintain an access road to a national heritage site, and erect signs on or near it.
- (22) No person other than the owner of a national heritage site may make reproductions in two or three dimensions of the site for profit without a permit issued by SAHRA and the agreement of the owner. SAHRA may prescribe the fees payable for these reproduction rights and must deposit such fees in a trust fund dedicated to the conservation of the site or of heritage resources in general.

Section 38 of the National Heritage Resources Act allows SAHRA to call for a heritage impact assessment report if certain activities, such as road or bridge building, subdivision or consolidation of erven, or re-zoning are likely to impact on heritage resources. This is done only if an impact assessment is not required under any other law, such as the Environment Conservation Act (No. 73 of 1989) or the National Environmental Management Act (Act No. 107 of 1998).

Section 44(2) of the National Heritage Resources Act states that when any person plans to present a national heritage site to the public, or erect a plaque or other permanent display or structure associated with the presentation, the contents of the interpretive material or programmes must be submitted to SAHRA at least 60 days in advance so that SAHRA may comment as part of the consultative process,

In terms of Section 47(2), SAHRA is responsible for adopting a plan for the management of each national heritage site in accordance with the best principles that can be applied. In addition, sub-section (3) states that a conservation management plan may at the discretion of SAHRA and for a period not exceeding 10 years, be operated solely by SAHRA or in conjunction with an environmental or tourism authority on such terms as SAHRA may determine. In terms of Section 42, the responsibility for implementing such a management plan can be delegated to the owner of the property, or to another authority or conservation body, if a formal heritage agreement is drawn up between SAHRA and that body with the agreement of the owner.

In addition, all heritage resources in the country are legally protected by the general provisions for archaeology and palaeontology under Section 35. No person may destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site, and no person may remove from its original position, collect, own or export, any archaeological or palaeontological material or object that has come from a site that is more than 100 years old, without a permit issued by SAHRA.

Methodology

Heritage Management

This study defines the heritage component of the EIA process being undertaken for the proposed MCWAP Phase 2. The HIA consists of several components;

1. Evaluation and finalization of the original HIA report submitted by PGS on 7 December 2019.
2. Significant sections of the approved pipeline route were not assessed due to a number of reasons and as a result the following areas were investigated during the 2020 HIA to ensure that the route is covered in totality:
 - a. The remainder of the farm Mooivallei 342 KQ;
 - b. Portion 6 of the farm Paarl 124 KQ;
 - c. Portion 7 of the farm Paarl 124 KQ;
 - d. Remainder of the farm Paarl 124 KQ;
 - e. Portion 1 of the farm Leeuwbosch 129 KQ (a section of the property which is rented out by the landowner);
 - f. Borrow Pit 41;
 - g. The remainder of the farm Zyverbult 324 LQ;
 - h. Portion 4 of the farm Rhenosterpan 361 LQ;
 - i. Borrow Pit 13;
 - j. Borrow Pit 14;
 - k. Borrow Pit 41;
 - l. Borrow Pit 51; and
 - m. Archaeological research assessment of the Motlhabatsi (Matlabas) drainage basin that revealed a substantial number of sites. The following sites are located closest to the present study area:
 - i. Wn1 on the farm Welgevonden;
 - ii. Ho1 on the farm Haarlem Oost; and
 - iii. Gr1 on the farm Groenrivier.
3. The field work and assessment will result in a report that:
 - a. Identifies all heritage resources;
 - b. Provides an evaluation of the significance of the resources;
 - c. Outlines any impact that the proposed development or site alteration will have on the resources; and
 - d. Provides recommendations towards conservation methods and/or mitigative measures that would minimise impacts to those resources.
4. Address Conditions of the Environmental Authorisation.
5. The Scope of Work required to adhere to the conditions of the Environmental Authorisation can be summarised as follows:
 - a. In accordance with the HIA recommendations and the EA, a walk down survey must be conducted on the approved pipeline route and associated infrastructure sites. The walk down survey must cover sections of the pipeline route which were previously not surveyed (as listed above). The focus of the walk down survey is to confirm whether recorded heritage sites will be directly affected or if the impact can be avoided by shifting the pipeline route within the 100 m approved servitude.
6. The field work and assessment must result in a report that:
 - a. Documents (GPS coordinates and map) all sites, objects and structures identified;
 - b. Assesses and designs appropriate mitigation measures for each of the recorded archaeological and heritage sites as well as any additional sites that may be recorded along sections of the central pipeline route which were not surveyed previously; and
 - c. Sites recorded within associated infrastructure sites (including campsites) must also be assessed.
7. Additional nine (9) Borrow Pits
 - a. Conduct a Heritage Impact Assessment for each of the nine (9) borrow pits not previously surveyed.
8. Construction Tasks
 - a. Conduct an archaeological and heritage workshop with the ECO prior to construction; and act as the standby Archaeologist throughout the duration of the construction phase.

9. Mitigation Report

- a. Compile a Phase 2 Archaeological Mitigation report for any destroyed heritage or archaeological sites.

Site Visit / Fieldwork Details

A physical survey of the project footprint was carried out from the 20th to the 24th of July 2020 by Roy Muroyi (Archaeologist) and again on the 15th of October by Stephan Gaigher. The aim of the physical survey was to identify, record/document and map out any archaeological or heritage resources within the project area, along the proposed water pipeline as well as the footprint of the proposed borrow pits. The survey followed the pipeline route from the Crocodile River to Lephhalale. Areas earmarked for the proposed borrow pits were also assessed. The assessed farm portions included; Hanover 667 KQ, Donkerpoort 344 KQ Portion 10, Mooivalei 342 KQ Portions 0,10,8,64, & 1, Paarl 124 KQ Portion 6, Leeuwbosch 129 KQ Portion 1, Zondaskuil 130 KQ Portion 0, Diepkuil 135 KQ Portion 2,4 &3, Blaauwpan 133 KQ Portion 0, Ruigtevley 97 KQ Portion 4, 5, 6, Witklip KQ 665 Portion 4, Groenrivier 95 KQ Portion RE/37, Matsulan 98 KQ, Matlabas 94 KQ Portion 2, Haarlem OOST 51 KQ Portion 0,16,13,15, 13 and Pontes Estates 744 LQ.

Field investigations were performed on foot. Where possible eroded trenches and animal burrows were investigated for deposits of heritage materials. Small scale trowel tests were done in some areas.

The survey session of the 14th of October covered any areas that were not previously accessible due to landowner activities.

Consultations

Consultations with landowners were held, where possible.

It is expected that the heritage component will be included in the larger public participation that will form part of the EMP process by the lead consultant.

Assumptions

It is assumed that the footprints as indicated to investigators are correct and comprehensive.

Gaps / Limitations / Uncertainty

The original survey of the alignment in August 2020 encountered some obstacles in terms of access to sites, however this was rectified during the October assessment.

Specialist-specific Methodology

The scope of work includes the identification and assessment of archaeological, cultural, historic and built sites within the study area; interrogation of project-specific aerial imagery; archival study of existing data and information for the study area as well as site inspection and fieldwork. This site work includes communicating with local inhabitants to confirm possible locations of heritage and cultural sites.

Previous Studies

An assessment of the South African Heritage Resources Information System (SAHRIS) of SAHRA was undertaken to establish whether any previous archaeological and heritage impact assessments had revealed archaeological and heritage sites within, and in close proximity, to the present study area footprints.

This assessment has revealed that a number of previous reports had study areas which either incorporated sections of the present study area, or adjoined it. However, as part of these previous

studies, no archaeological or heritage sites were identified within the present study area. The closest of any of these previously identified sites to the present study area, is a cemetery containing four graves that was identified during a survey of the proposed Matimba B Power Station (Van Schalkwyk, 2005).

All these previous studies located on the SAHRIS system, will be briefly discussed in chronological order below. In each case, the results of each study is shown in bold.

- KUSEL, U. 2003. Cultural Heritage Resources Scoping Report Proposed Housing Development for Regorogile (Rosseauspoort 319 KQ Sec 5). African Heritage Consultants CC. No indication of archaeological or historical sites or material was found on the proposed development area in this HIA.
- VAN SCHALKWYK, J. 2005. Heritage Impact Scoping Report for the Proposed New Matimba B Power Station, Lephalale District, Limpopo Province. An unpublished report for Bohlweki Environmental. Four heritage sites were identified. These include: a cemetery containing four graves (two of which date to the 1930s), a single grave dated to 1958, a small scatter of undiagnostic Iron Age ceramics and finally, Nelsonskop, where cupules, incisions, stone walling and ceramics were identified. It is important to note that the coordinates for the cemetery containing four graves is located approximately 65m north-west of proposed Borrow Pit 13-14, and 55m south-west of the access road to this borrow pit. The coordinates for this site are as follows: S 23.711420 E 27.497340.
- KUSEL, U. 2007. Cultural Heritage Resources Impact Assessment Of Hanover 341 KQ in the Thabazimbi Area Limpopo Province. African Heritage Consultants CC. No indication of any important cultural heritage resources or graves could be found on the proposed development area in this HIA.
- PISTORIUS, J. 2007. A Phase 1 Heritage Impact Assessment Study for a Proposed New 132kV Power Line Running from the New Matlabas Substation to the Proposed New Bulge Substation in the Limpopo Province of South Africa. Unpublished Report for Landscape Dynamics. No heritage resources of significance were found in this HIA.
- NEL, J. 2011. Addendum to Phase 1 Archaeological Impact Assessment for the Boikarabelo Coal Mine (Proposed Railway Link From the Farm Kruishout To The Farm Buffelsjagt) Lephalale Local Municipality, Waterberg District, Limpopo Province. Digby Wells Environmental. Eleven cultural resources were identified and recorded, including: five burial sites, three MSA lithic concentrations, two isolated potsherds and one dilapidated homestead.
- HIGGETT, N. 2012. Ledjadja Coal (PTY) LTD - Phase 1 Archaeological Impact Assessment For MBET Pipeline. Digby Wells Environmental. Four archaeological resources were identified. These include one Stone Age find spot and three historical structures: a cement foundation, a mud brick house and pre-1960's farmstead.
- HUTTEN, M. 2012. Heritage Impact Assessment for the Proposed Development of Kambaku Private School on the Farm Vlakplaaats 137 KQ, approximately 15km North of Thabazimbi, Limpopo Province. Hutten Heritage Consultants. No heritage resources were identified by the HIA.
- VAN SCHALKWYK, J. 2012. Heritage Impact Assessment for the Proposed Mixed Use Development and Solar Park On Portion 1 of the Farm Steenbokpan 295IQ and the Remainder of Farm Vangpan 294IQ in the Lephalale Region, Limpopo Province. An unpublished report for Interdesign Landscape Architects. Three features of cultural heritage significance were identified. These include: a single European grave dated 1923, an informal burial place with three marked graves and a small memorial dedicated to a person who died in an aeroplane crash in 1995.

- COETZEE, F. 2014. Cultural Heritage Assessment for the Proposed Mara Trails Camp, on the Farm Jagtersrus 418 KQ, in the Marakele Park (Pty) Ltd, Section of the Marakele National Park, Limpopo Province. Department of Anthropology & Archaeology, University of South Africa. No heritage resources sites were identified in the HIA.
- HUTTEN, M. 2015. Heritage Impact Assessment for the Proposed Extended Delta Solar Park west of Lephalale, Limpopo Province. Hutten Heritage Consultants. No heritage resource sites or finds of any value or significance were identified in the indicated study area.
- GAIGHER, S. 2016. Heritage Impact Assessment (HIA) Report for the Proposed Re- alignment of the Railway Line at the proposed 37 open pit, Amandelbult Mine, Limpopo Province. G&A Heritage. No sites of heritage significance were identified on site.
- KRUGER, N. 2017. Archaeological Impact Assessment (AIA) for the Improvement of National Route R510 Section 2 from Km 6.3 at Bierspruit Bridge to Km 33.4 near Thabazimbi, Thabazimbi Local Municipality, Waterberg District Municipality, Limpopo Province. Exigo Sustainability. Two heritage sites were identified: one site with three historical houses and one cemetery.
- COETZEE, F. 2018. Cultural Heritage Impact Assessment: Phase 1 Investigation for Proposed Development of New Access Roads and Upgrades to Marataba Tails Lodge and Marataba Safari Lodge within the Marataba Section of the Marakele National Park, Lephalale Local Municipality, Waterberg District Municipality, Limpopo Province. A total of three sites were recorded: one being foundations of an erstwhile Reformed Church, one Iron Age site and one historical structure.
- SUTTON, M. 2018. Heritage Impact Assessment for the Proposed Medupi Power Station Flue Gas Desulphurisation Retrofit Project and associated infrastructure, Lephalale, Limpopo Province, South Africa. NGT Holdings (PTY) LTD. Three heritage sites were identified: One site consists of two old brick structures on the farm Kromdraai and the other two sites are possible grave sites.
- KRUGER, N. 2018. Archaeological Impact Assessment (AIA) of Demarcated Areas on Portions of Rooipan 357IQ and Zandfontein 382IQ for the Proposed Transnet Waterberg Rail Corridor Expansion Project (Diepspruit Loop) in the Waterberg District Municipality, Limpopo Province. Exigo Sustainability. No sites or features of heritage potential were located in the project area.
- KRUGER, N. 2018. Archaeological Impact Assessment (AIA) Of Demarcated Areas on a Portion of Blaauwpan 133KQ for the Proposed Transnet Waterberg Rail Corridor Expansion Project (Marakele Loop) in the Waterberg District Municipality, Limpopo Province. Exigo Sustainability. No sites or features of heritage potential were located in the project area.

Archival and Historical Maps

An assessment of available archival and historical maps was undertaken as a way to identify potential heritage sites located within the study area and its immediate surroundings. The First and Second Editions of the following topographical map sheets were assessed for this study:

- First Edition of the 2427CB Topographical Map Sheet that was surveyed in 1963
- Second Edition of the 2427CB Topographical Map Sheet that was surveyed in 1980
- First Edition of the 2427AD Topographical Map Sheet that was surveyed in 1963
- Second Edition of the 2427AD Topographical Map Sheet that was surveyed in 1980
- First Edition of the 2427AB Topographical Map Sheet that was surveyed in 1963
- Second Edition of the 2427AB Topographical Map Sheet that was surveyed in 1984

- First Edition of the 2327CD Topographical Map Sheet that was surveyed in 1969
- Second Edition of the 2327CD Topographical Map Sheet that was surveyed in 1980
- First Edition of the 2327CB Topographical Map Sheet that was surveyed in 1969
- Second Edition of the 2327CB Topographical Map Sheet that was surveyed in 1980
- First Edition of the 2327DA Topographical Map Sheet that was surveyed in 1969

Description of Affected Environment

The Study Area and Surroundings during the Stone Age

The South African Stone Age is the longest archaeologically identified phase identified in human history and lasted for millions of years.

Period from 2.5 million years ago to 250 000 years ago

The Earlier Stone Age is the first and oldest phase identified in Southern Africa's archaeological history and comprises two technological phases. The earliest of these phases is known as Oldowan which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5 million years ago.

One of the nearest known researched and published Early Stone Age sites to the present study area, is an open site named Blaaubank. This site is located in a gravel donga near Rooiberg some 38km east by southeast of the present study area. Lithics associated with both the Early and Middle Stone Ages were identified at this site (Wadley et.al., 2016). Earlier Stone Age material was also excavated by Revil Mason in the Olieboomspoot Shelter (Mason, 1969). This highly significant Stone Age site is located approximately 23km east of the closest point along the present study area footprints. Klein (2000) suggests that the Earlier Stone Age habitation of the Olieboomspoot Cave possibly commenced between 1 million and 500-400 thousand years ago.

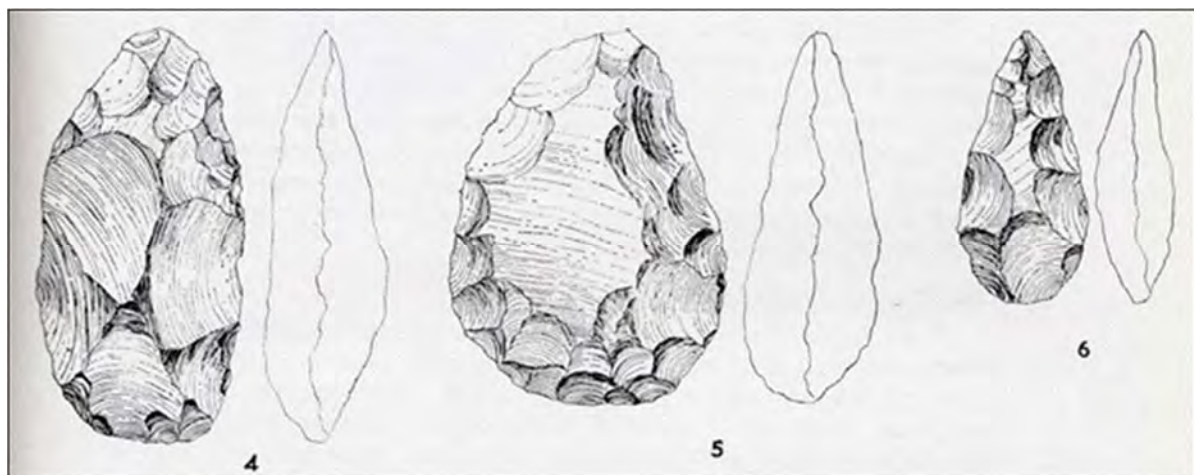


Figure 3. ESA Stone hand axes

250 000 to 40 000 years ago

The Middle Stone Age (MSA) dates to between 250 000 to 40 000 years BP. MSA dates of around 250 000 BP originate from sites such as Leopards Kopje in Zambia, while the late Pleistocene (125 000 BP) yields a number of important dated sites associated with modern humans (Deacon & Deacon, 1999). The MSA is characterised by flake and blade industries, the first use of grindstones, wood and bone artefacts, personal ornaments, use of red ochre, circular hearths and a hunting and gathering lifestyle.

A number of MSA sites are known from the surroundings of the study area, many of which were identified during previous heritage and archaeological studies. For example, a total of seven MSA sites were identified in an area roughly 5.8km north-west of the northern section of the study area. For the most part these latter sites comprise findspots consisting of one or two lithics (Higgitt et. al., 2013). A similarly low density of lithics were identified around a pan during the present study area as well (see

MCWAP Site 18). Further south, and south of the present study area, number of Middle Stone Age occurrences and findspots were identified during the archaeological and heritage survey of the Amandelbult Mining Lease Area in 1994 (Van Schalkwyk et.al., 1994). These occurrences were all identified to the west of the R510 tar road between Rustenburg and Thabazimbi. During the present fieldwork, a low-density surface scatter of MSA lithics was identified within the southern components of the study area (refer MCWAP Site 8).

MSA artefacts have also been recovered from the Olieboomspoor Shelter (located 23km east of the study area) as well as a number of other rock shelters from the wider surroundings such as New Belgium 608 LR, Schurfpoot 112 KR and Goergap 113 KR (Birkholtz and Steyn, 2002).

Period 40 000 years ago to the historic past

The Later Stone Age is the third phase identified in South Africa's archaeological history. It is associated with an abundance of very small stone artefacts known as microliths. In Southern Africa, the Later Stone Age is characterised by the appearance of rock art in the form of paintings and engravings.

One of the nearest known researched and published Later Stone Age sites to the present study area, is Olieboomspoor, located approximately 23km east of the closest point along the present study area. Various scientists have undertaken archaeological excavations at this site, with the work of Dr. Maria van der Ryst focussing on the last 2 000 years of the site's extensive Holocene occupational sequence. She observes that "apart from the remarkably large lithic assemblage and many thousands of ostrich eggshell beads and blanks produced at OBP, favourable preservation conditions resulted in the recovery of a wide range of tool types made from organic materials, as well as a representative assemblage of macroscopic plant taxa." (Van der Ryst, 2006).

Interestingly, research on the Later Stone Age in the Waterberg Plateau suggests a discontinuity between Middle Stone Age and Later Stone Age settlement of several thousand years, with settlement of the area by Later Stone Age hunter gatherers occurring in the 11th and 12th Centuries and coinciding with settlement by Iron Age peoples (Van der Ryst 1998). While the relationship between Stone Age people and Iron Age settlers was initially characterised by peaceful interaction and trade, the relationship seems to have degraded into one of subjugation of the former, a process that was exacerbated by an influx of increasing numbers of white settlers into the area as well. The farm Vaalpenspan 90 KQ, which adjoins a section of the Pipeline Alternative C, is a reminder of the marginalised remnants of the hunter gatherers, 'Vaalpense' being the name given to people of mixed agropastoralist and hunter gatherer descent (Van der Ryst, 1998).

One of the nearest and possibly also one of the more significant Later Stone Age rock art sites to the present study area, is in all likelihood Nelson's Kop. Located 4.9km north-east of the closest component of the present study area (namely Borrow Pit 51) and situated 32km east by north-east of Steenbokpan, Nelson's Kop is a rock engraving site comprising animal spoor and incisions (Van Schalkwyk, 2005). The presence of rock engravings, stone walling and Iron Age ceramics at Nelson's Kop indicates that it was associated with both the Stone Age and Iron Age.

Further south, roughly 5.8km south-west of the southern section of the study area (the closest point being the Bierspruit Gauging Weir), a cave containing the remnants of Later Stone Age rock art was identified during an archaeological survey of the farms Buffelsfontein 353 KQ and Tygerskloof 354 KQ (Huffman, 2004). Furthermore, the Waterberg Mountains located east of the study area, is known for its many rock art sites. These include rock art sites containing shaded paintings such as at Haakdoordraai (Pager, 1973) and the depiction of a fat-tailed sheep at Dwaalhoek 185 KQ (Van der Ryst 1998). These two rock art sites are located some distance east of the present study area.



Figure 4. Example of cupules found at Nelson's Kop

The Study Area and Surroundings during the Iron Age

The arrival of early farming communities during the first millennium, heralded in the start of the Iron Age for South Africa. The Iron Age is that period in South Africa's archaeological history associated with pre-colonial farming communities who practiced cultivation and pastoralist farming activities, metal working, cultural customs such as lobola and whose settlement layouts show the tangible representation of the significance of cattle (known as the Central Cattle Pattern) (Huffman, 2007).

The Iron Age of Southern Africa is divided into an Early Iron Age (AD 200 – AD 900), Middle Iron Age (AD 900 – AD 1300) and Late Iron Age (AD 1300 – AD 1840) (Huffman, 2007).

The tangible remains of the Iron Age are frequently identified in the general surroundings of the study area, and these may include potsherds, stonewalled settlements, grinding stones and metal smelting and forging sites.

AD 150 – AD 650

The Bambata facies of the Benfica Sub-Branch of the Kalundu Ceramic Tradition represents the earliest known Iron Age period within the surroundings of the greater area.

The decoration on the ceramics from this facies is characterised by "...fine decoration, multiple bands and cross-hatching on long rim, alternating blocks of stamped and incised lines in neck." (Huffman, 2007:215).

Olieboomspoor, located 23km east of the closest point along the present study area footprints, contains a relatively large collection of Bambata ceramics. Smaller collections of Bambata ware were also

identified at other Waterberg sites, such as Goergap and Skeurkrans (Van der Ryst, 2006). These two farms are however located some distance east of the present study area.

AD 500 – AD 750

The Happy Rest facies of the Happy Rest Sub-Branch of the Kalundu Ceramic Tradition represents the second known Iron Age period within the surroundings of the study area, and especially so the northern end of the study area. The decoration on the ceramics from this facies is characterised by “...thickened rim, multiple bands of mixed decoration techniques, ladder stamping.” (Huffman, 2007:221).

AD 750 – AD 1000

The Diamant facies of the Kalundu Ceramic Tradition represents the third known Iron Age period within the surroundings of the entire study area. The decoration on the ceramics from this facies is characterised by “...tapered rims with broadly incised herringbone.” (Huffman, 2007:225). During an archaeological assessment of the drainage basin of the Motlhabatsi (Matlabas) River undertaken by Jan Aukema for the purposes of his Master’s Thesis from the University of the Witwatersrand, a number of Diamant facies sites were identified near the south-western foot of the Waterberg. One of these sites, Kb1, dates to AD 570 ± 50 (Pta-3616) and contains ceramics showing stylistic similarities to both Happy Rest and Klein Afrika (Huffman, 1990). Site KB1 is located approximately 14km east of the closest point along the present study area. The name of this ceramic facies is derived from the farm name on which a number of these sites were first identified, namely Diamant 228 KQ.

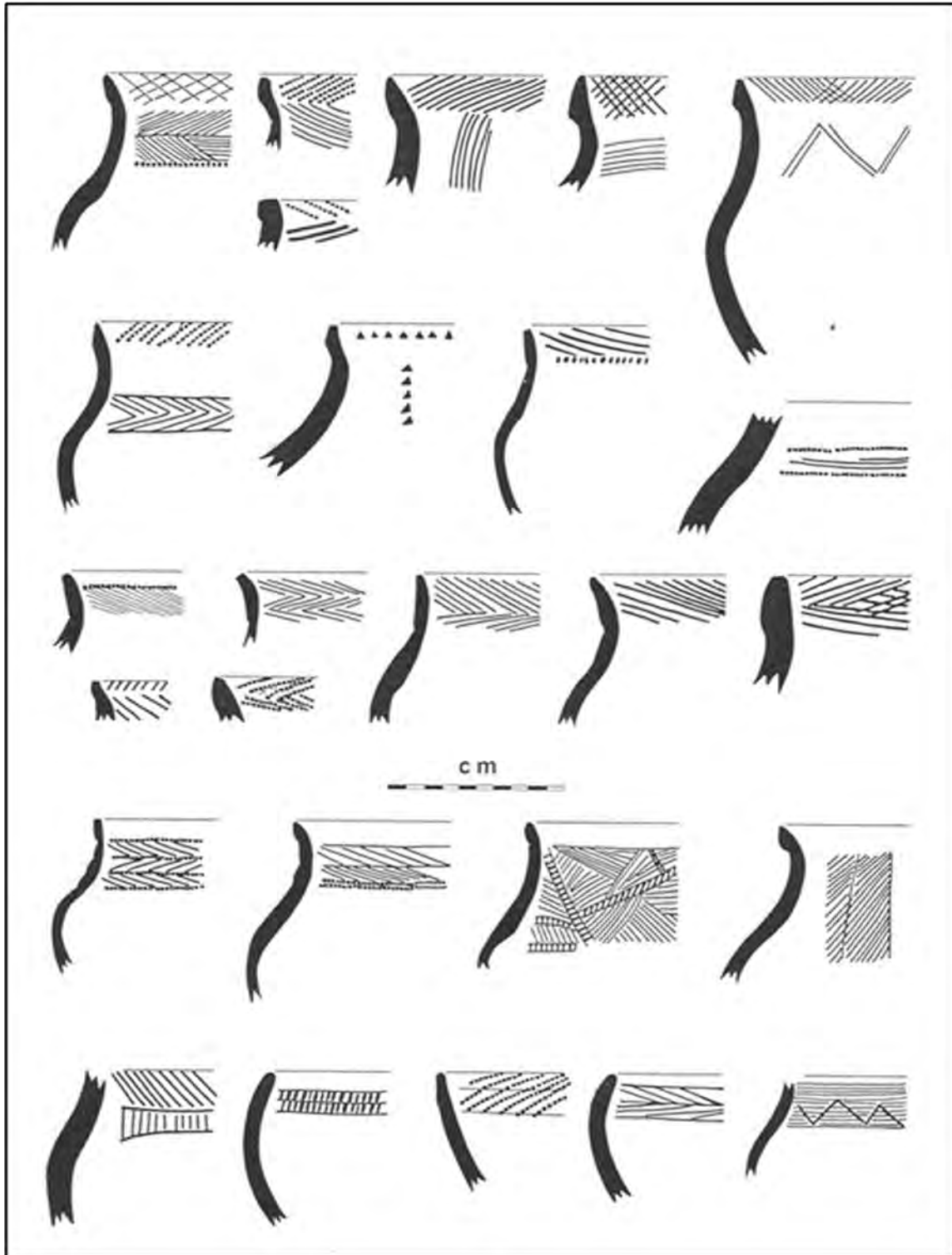


Figure 5. Ceramic associated with the Diamant facies

AD 1000 – AD 1300

The Eiland facies of the Kalundu Ceramic Tradition represents the fourth known Iron Age period within the surroundings of the greater area. The decoration on the ceramics from this facies is characterised by “...fine herringbone with stamping.” (Huffman, 2007:221). Examples of Eiland traditional sites were found on the farms Kirstenbos (east of the Lephhalala River) (Van der Ryst, 1998) and Wentzel (near the Limpopo-Motlhabatsi confluence) (Huffman, 1990). This latter Eiland site was identified during a

survey of the drainage basin of the Motlhabatsi (Matlabas) River undertaken by Jan Aukema and had been dated to AD 990 ± 50 (Pta-4513). Wentzel is located approximately 25km south-west of the closest point along the present study area. During the same survey, a number of other Eiland sites were located closer to the study area (Huffman, 1990).

In his Motlhabatsi research, Jan Aukema discerned three phases belonging to the Early Iron Age (*EIA*), the first and second phases of which were excavated from Diamant (see previous section). Dates ranging between 1400 to 1200 years ago were associated with these first two phases. The third phase in the Early Iron Age sequence, shows similarities with the Eiland tradition, and is associated with dates of approximately 1000 years ago.

Moving away from the Motlhabatsi drainage basin, Aukema identified at least three different settlement phases in the Iron Age sequence of the Waterberg Plateau. This three-phased sequence was based on his research of the Lephalala Drainage Basin. The first of the three phases in the Iron Age sequence of Aukema, is the Eiland tradition. The subsequent two Iron Age phases identified in the Waterberg Plateau by Aukema are both associated with the Late Iron Age. As such, Aukema saw the Eiland tradition as the final expression of the Early Iron Age in the region (Huffman, 1990).

AD 1350 – AD 1750

Ongoing research in KwaZulu-Natal has focused on the second phase of the Blackburn sequence, known as Moor Park. During the fourteenth century, the Moor Park farmers were the first to colonize the higher altitude grasslands of South Africa's interior. In doing so, they opened up possibilities for greater economic specialization and interdependence, not least because of the impossibility of smelting iron where suitable fuel was lacking. The same lack of timber also encouraged the adoption of stone as a building material (Mitchell and Whitelaw, 2005).

The Moor Park facies of the Blackburn Branch of the Urewe Tradition is associated with pottery characterised by punctuates, rim notching and appliqué (Huffman, 2007). A number of migrations of Nguni speakers from present-day Kwazulu-Natal into the interior of South Africa, the surroundings of present-day Pretoria and also further north-west into the Waterberg, are known to have occurred. These migrations were not single-entity movements of people but rather ‘...uncoordinated movements...(of)...several small groups...’ driven into the interior by reasons which included weather conditions.

In terms of the study area and surroundings, the Moor Park facies is especially associated with a second such Nguni migration which is associated with the Manala and Ndzundza Ndebele under their leader Musi (Huffman, 2007). The Moor Park facies also represent the second Iron Age settlement phase identified by Jan Aukema in the Waterberg Plateau, and in this area can be associated with settlements on mountaintops, stonewalling and undecorated ceramics (Huffman, 1990).

Examples of Moor Park sites in the surroundings of the study area, include Buffelsfontein, approximately 25km east of the present study area.

AD 1500 – AD 1700

The Madikwe facies of the Moloko Branch of the Urewe Ceramic Tradition represents the fifth known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by “...multiple bands of cord impressions, incisions, stabs and punctuates separated by colour.” (Huffman, 2007:201).

Within the surroundings of the southern section of the study area, the Madikwe facies is associated with the earliest arrival of Sotho-Tswana people. Further north, the Letsibogo facies also represents an early Sotho-Tswana facies associated with the surroundings of the study area.

The third and final phase in the Iron Age sequence of the Waterberg Plateau identified by Jan Aukema is represented by multichrome Moloko ceramics that can be linked to the Sotho-Tswana. This phase can be dated to the later eighteenth to early nineteenth centuries (Van der Ryst, 1998).

AD 1550 – AD 1750

As indicated above, the Letsibogo facies of the Moloko Branch of the Urewe Ceramic Tradition represents a second early Sotho-Tswana facies that is associated with the northern end of the study area and its surroundings. The decoration on the ceramics from this facies is characterised by “...lines of punctuates separating black and red zones.” (Huffman, 2007:189).

As is the case with the Madikwe facies, the Letsibogo facies represents one of three separate facies derived from the co-called Icon facies, the third being Olifantspoort. Letsibogo sites are primarily found in southern Botswana (north of the study area) as well as in the Blouberg (north-east of the study area). The closest known Letsibogo-type sites were identified in an area roughly 20km north and north-east of the study area (Huffman & Van der Walt, 2013).

Ethnographic and Oral Historical Information on the Nguni and Sotho-Tswana Chiefdoms living within the Study Area and Surroundings during the Late Iron Age and the early Historic Period

Oral histories and ethnographic sources provide information on the groups that occupied (and moved through) the study area and surroundings during the last years of the Late Iron Age and the beginning of the Historic Period. In this section, available information on some of these groups will be provided.

AD 1600 – AD 1800s

As mentioned before, Aukema’s preliminary research findings point towards the identification of three settlement phases. The second phase can be associated with the influx of Northern Ndebele in the region for the period between the sixteenth and seventeenth centuries AD (Van der Ryst, 1998).

This movement of Northern Ndebele into the area during these centuries is supported by various sources. Jackson (1983) for example mentions that the predecessors of the Langa Ndebele migrated from the Hlubi territory in present day KwaZulu-Natal somewhere around 1650 AD. According to De Beer (1986), a group of Hlubi migrated from Kwazulu-Natal into the area surrounding Pretoria. Oral history also indicates that their area of influence stretched all the way to the Waterberg, with the Crocodile and Limpopo Rivers as the western and northern borders of their land with the Tswana. De Beer also mentions the migration of other Hlubi groups such as the Langa to areas such as present-day Mokopane, and furthermore states that all these Hlubi migrations must have occurred after 1600 AD. Parsons (1995) mentions the movement of Ndebele from the area where Pretoria is situated today, on to the Waterberg Plateau during the period 1600 to 1750.

Oral tradition indicates that the Waterberg plateau was ruled by the Kekana and Langa Ndebele chiefdoms at the end of the seventeenth century (Van der Ryst, 1998). The influence of the Langa, particularly, in terms of the present study area can be seen during the period 1830-1840, when a war was being fought with the BaPhalane (see below) who at the time were settled on the western side of the Odi River.

As mentioned before, the Nguni migration into the surroundings of the study area can also be associated with the Manala and Ndzundza Ndebele under their leader Musi (Huffman, 2007).

It must be noted, however, that these Ndebele migrations into the surroundings of the study area did not represent the only Late Iron Age groups associated with the surroundings of the study area. It is especially the Sotho-Tswana (Kwena and Kgatla groupings) and their origins that are of importance here as well.

Around 1500 AD two groupings, or 'chiefdoms' as Legassick (1969:100) calls them, started to diffuse from two core areas. These two groupings came to be known as the Kwena and Kgatla lineages. The first important core area was situated at a place referred to as Rathateng, near the confluence of the Marico and Crocodile Rivers. A number of diffusions and migrations occurred from this Kwena nucleus area (Legassick, 1969; Pistorius, 1995). While one group (Hurutshe) moved northwards towards the Limpopo, another group migrated south across the Vaal. The third group trekked upstream all along the Crocodile River to present-day Brits and the general vicinity. On the map published by Legassick (1969:124) a fourth group referred to as the 'Gananwa', also moved from the Rathateng core area east over the Crocodile River and then north- eastward.

The Kgatla lineage is seen as originating at a place called Mabyanamatsywaana, near Brits. From here consequent migrations and diffusions occurred in various directions (Pistorius, 1995). Both Legassick (1969) and Hall (1981) refer to places such as Schilpadfontein (Pretoria district) and Dirolong (Rustenburg district) as possible areas of origin.

It must be stressed that, according to Hall (1981), the Iron Age residents of his study area south and south-east of the Marakele National Park, were Kgatla. According to the literature cited by him the Kgatla have been staying in this area even before 1800 AD. It is interesting to note the comment made by Breutz (1989) that the earliest Kgatla chiefs lived to the north of the Tswana, and quite possibly south-east of Thabazimbi near the Rooiberg tin mines. During the Mfecane many of these Kgatla groups were disturbed, but later returned (Hall, 1981).

The Kgatla is derived from the Bahurutshe, which in turn is derived of Tswana. Some time in history they moved from Lehurutshe eastward and settled somewhere between the Magaliesberg Mountains and the Waterberg Mountains. Here they split into four groupings, more or less at the same time. These are the Bakgatla-ba-ga-Mosetlha, Bakgatla-ba-ga- Kgafela, Bakgatla-ba-ga-Mmakau and the Bakgatla-ba-ga-Motsha (Van Zyl, 1958). In terms of the present study area, the first two of these groupings will be discussed in more detail below.

AD 1700s – AD 1800s

Van Zyl (1958) traces the history of the Kgatla, and specifically the Bakgatla-ba-ga-Mosetlha history, by reconstructing the succession of chiefs as laid down through oral history. In chronological order, they were Mokgatla (who is seen by some as the founder of the Kgatla), Phulane, Mosetlha (the founder of the Bakgatla-ba-ga-Mosetlha), Mushi, Malebe (Mathibe), Sikwane, Nchaupe I (Tlhabane), Makapane (Mmankala), Thipe, Nchaupe II (Solomon Makapan) and Mathibe (Hendrik Makapan).

Although the aim of section is not to go into any detail regarding the succession history of the Bakgatla-ba-ga-Mosetlha, it is worthwhile to mention the chiefs as it provides a framework for the history of these people as related in oral tradition.

Mosetlha, the founder of the Bakgatla-ba-ga-Mosetlha, for example, had a capital (known as Malebone), which was situated a few kilometers west of where Bela-Bela is situated today. At one stage he fought with the Ndebele of Mokopane.

Nothing much is remembered about Mushi's reign, apart from the fact that he lived in more or less the same area as Mosetlha.

Malebe moved to Vaalboschbult (Khupong) near the Pienaars River. He had two sons Sikwane and Makanye with his first wife. It was Sikwane who succeeded his father as chief.

At the time of Sikwane's death, his son Nchaupe I, was too young to govern and his uncle, Makanye, acted as regent. During this time Mzilikazi's Khumalo-Ndebele came through the area and Makanye moved northwest with his people. Once they crossed the Ngotwane River, dissent and uncertainty as to where they should go occurred. While Makanye and a small following moved further north to Ngamiland (present-day Botswana), Nchaupe I moved back in the direction of where the group used to

stay. He kept to the north of the Waterberg Mountains, ending up with the Langa Ndebele, where they stayed for quite some time before moving to their old homes south of the Waterberg Mountains.

The history of the Kwena baPhalane starts with the BaKwena living in modern day Botswana. The chief was Pukwe, who had two sons, Motshodi and Letlape. A division and rift occurred between the two brothers, and Letlape and his followers left and crossed the Odi (Crocodile) River.

Letlape was succeeded by his son Mokohe, and they lived at the junction of the Thokwe (Sand) River and the Odi (Crocodile) River. This was at the beginning of the eighteenth century (Breutz, 1953). According to Breutz (1989), this settlement was called Tlhapelabjale (on the farms Wachteenbietjedraai and Klipgat). It is interesting to note that the Transvaal Native Affairs Department (1905) indicates that they settled at Gopane, near the junctions of the Bier Spruit and the Crocodile River. It is interesting to note that other sources suggest that the settlement of the Kwena baPhalane on the western bank of the Crocodile River, may either have been on the farms Buffelshoek 351 KQ or Haakdoorndrift 373 KQ. The Bierspruit Gauging Weir is located on the western boundary of the farm Buffelshoek, with the New Paul Hugo Weir located on the eastern boundary of the farm Haakdoorndrift.

During this time Mokohe and his followers hunted many impala (phalane), and as a result called themselves the baPhalane. Looking for a suitable place to settle, they moved east of present-day Thabazimbi through Bothapatshwene (Makips Nek on the farm McKip-zyn-rand). During this stage they attacked the baPule (or baModikele) living at Krantzberg (Modikele). The baPule were integrated into the tribe. The baPhalane also fought other groups in the area, such as the baNku, baNareng, baMokopane and baLaka (Ndebele) (Breutz, 1953).

Between ca. 1790 and 1820 the BaPhalane lived at Mmapela in the baLaka (Ndebele) country. In approximately 1820, during the reign of Mafodi, they moved back to the Thokwe River, on the western side of the Odi River. Between 1830 and 1840, the baPhalane waged a war with the baMmapela (Ndebele) during which many people were killed. Another war was fought during this time with the BaKgatla-ba-ga-Kgafela. The remainder of the baPhalane fled to a hill known as Modise wa Mogopa, which is located some distance to the south.

The Bakgatla-ba-ga-Kgafela represents one of the Late Iron Age groups that can be associated with the close to immediate surroundings of the present study area. According to available oral history, the Bakgatla-ba-ga-Kgafela frequently moved around within the general area located between the Waterberg to the north-east and Pilanesberg to the south-west. During the period between the late 1600s and 1869, the Bakgatla-ba-ga-Kgafela had relocated 20 times. This said, the north-eastern Pilanesberg near present-day Moruleng was frequently settled during this period.

Two of the Bakgatla-ba-ga-Kgafela settlements were located in closer proximity to the present study area. The first of these was Sefikile hill, on the farm Spitskop 410 KQ, and which is located roughly 30km south-west of the present study area. The oral history tells us that during the end of the eighteenth century Kgosi Pheto, the chief of the Bakgatla-ba-ga-Kgafela, settled at Sefikile hill. They remained here until the death of Pheto in c. 1805 (Hall et.al., 2008). During a heritage survey, Dr. J.C.C. Pistorius identified the occurrence of damaged stone walled sites and a graveyard along the base of Sefikile hill at Sefikile village (Pistorius 2012). It can be assumed that the damaged stone walled sites can be associated with the settlement of the Bakgatla-ba-ga-Kgafela at this hill.

The second settlement of the Bakgatla-ba-ga-Kgafela in proximity to the study area occurred during the early 1820s, when Kgosi Pilane moved his people to the farm Schildpadnest 385 KQ. They named their settlement here Mmamodimokwana (Hall et.al., 2008). The farm Schildpadnest is located approximately 12km south of the closest point along the study area footprint, namely the Bierspruit Gauging Weir. It was here, at Schildpadnest, that the Bakgatla-ba-ga-Kgafela were attacked by Mzilikazi's Khumalo Ndebele (Matabele) in c. 1828.

AD 1800s

Breutz (1953) mentions that the baModikele is derived from both the 'Transvaal Ndebele' (Mapela) and Khumalo Ndebele (Matabele). These Matabele deserted Mzilikazi before his invasion of the western parts (before ca. 1828), and settled in the Krantzberg. A section of them joined the BaPhalane under Mokoke, while the rest stayed at Krantzberg (Modikele Hill) and became known as the BaModikele. The BaModikele later settled at Tsopane in the Waterberg District (Breutz, 1953).

During his travels through the interior of southern Africa from 1834 to 1836, Dr. Andrew Smith came upon a group of impoverished "Baquans" who mentioned the existence of a group known as "Mooricail" living high up along the "Maclamatsi" River (Kirby, 1940:185). Kirby (1940) is of the opinion that the group is in fact the baModikele, and that the river was the Matlaba (Matlabas). Smith also mentions that the "Bamooricail" were emigrants of the "Bakala" (Kirby, 1940).

The Study Area and Surroundings during the Mfecane

The Mfecane (Difaqane) is a period of upheaval during the end of the Iron Age and the start of the Historical Period. These years of unrest originated primarily in the migration of three Nguni groups from present day Kwazulu-Natal into the present day Free State as a result of the conquests of the Zulu under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi.

There is quite some evidence, in the form of defensive hilltop settlement and aggregation, that the Late Iron Age in the region was a time of upheaval and conflict, initially as a result of the influx of the Ndebele and later by European settlers (Hall, 1985). The Difaqane period in the study area and surroundings saw Mzilikazi first establishing himself along the Magaliesberg Mountains between 1827 and 1832, before relocating to the Marico River valley in 1832. Their settlement and movement during this period unsettled many Sotho and Tswana groups who fled east to seek refuge (Huffman 1990).

1820s – 1830s

The period between 1821 and the late 1830s in the interior of southern Africa was characterised by the migration of Khumalo-Ndebeles (Matabele) under Mzilikazi through the region. This period, known as the Difaqane, is often associated with disturbances and warfare.

The Khumalo-Ndebele used to live on the tributaries of the Black Umfolozi, in present day Kwazulu-Natal, before migrating into the central regions of South Africa. Rasmussen (1978) mentions that these Ndebele arrived in the interior during 1821.

In c. 1828, the Bakgatla-ba-ga-Kgafela were attacked by Mzilikazi's Khumalo Ndebele (Matabele) at Schildpadnest, located some 12km south of the present study area.

The important period for the present study comprise the years 1832 to 1837, during which the Khumalo-Ndebeles and Mzilikazi settled in the Marico River Valley. Coetzee (n.d.) has it that when Mzilikazi settled near the Marico River, many of the Tswana who used to stay there, fled seeking refuge in the mountains of the Kransberg, located a short distance east of the study area. In fact, as a result of the events of the Difaqane, Kransberg became vernacularly known as 'Marakeli', which means 'Place of Refuge'. The Marakele National Park still commemorates this name.

Another indication of the impact of the Difaqane on the study area and surroundings, is a cave known as Gatkop (Hall, 1985), which is located approximately 28.5 kilometers south-east of the closest point along the study area. This site was documented by Simon Hall during his research of the Rooiberg Iron Age. Oral history has it that the cave was used as a place of refuge from Matabele. Wooden kraals and pottery was still visible when Hall visited the site (Hall, 1981).

Not all historians are convinced that the period of disturbances associated with the movement of the Khumalo-Ndebele through the interior of southern Africa, can be seen as the main element of Difaqane, and neither can it be viewed in isolation. Historians and archaeologists such as Margaret Kinsman, Guy Hartley, Simon Hall and Neil Parsons have shown that the period of disturbances associated with the 1830s is not only the result of the migration of Khumalo-Ndebeles, but also of years of disturbances prior to that, as a result of African migrations and conflict, as well as the influx of Europeans (Parsons, 1995).

The Study Area and Surroundings during the early Historical Period

The Historical Period within the study area and surroundings commenced with the arrival of newcomers to this area. The first arrivals would almost certainly have been travellers, traders, missionaries, hunters and fortune seekers. However, with time, this initial trickle was replaced by a flood of white immigrants during the 1830s, when a mass migration of roughly 2 540 Afrikaner families (comprising approximately 12 000 individuals) from the frontier zone of the Cape Colony to the interior of Southern Africa took place. The people who took part in this Great Trek were later to be known as Voortrekkers (Visagie, 2011).

1808

In 1808 an expedition under the leadership of Dr. Andrew Cowan and Lieutenant Donovan (both of the 83rd Regiment), accompanied by two soldiers and fifteen Khoi assistants (Becker, 1985), left Cape Town on a perilous overland journey to Delagoa Bay (Le Roux, 1940) (Becker, 1985) (Bergh, 1999).

Both Cowan and Donovan were inexperienced in African travel, and quite naive about the potential dangers of such a journey (Le Roux, 1940). Upon reaching Griekwatown (Klaarwater) they were joined by the much more experienced Reverend R. Anderson as well as a guide and interpreter by the name of Kruger (Le Roux, 1940; Changuion & Bergh, 1999).

From Griekwatown the expedition travelled over Lataku to the land of the Bamangkwetsi, and eastwards across the Notwani and Marico Rivers into the Waterberg.

In the Waterberg, both Reverend Anderson and Kruger left the expedition. Whether this was due to their lack of confidence in the leadership of the expedition, or as a result of their fears for the potential dangers which may lie ahead, is uncertain. All that is known is that Anderson brought with him the last letter written by Dr. Cowan, which is dated 24 December 1808, and indicates the position of the expedition at the time of the departure of Anderson and Kruger as 24° 30' South, and 28° East (Le Roux, 1940) (Bergh, 1999).

From the Waterberg, the expedition moved northwards towards the Limpopo River, never to be heard of again (Le Roux, 1940).

What exactly happened to the expedition remains a mystery. Although some evidence indicates that both Cowan and Donovan died of fever somewhere near the banks of the Limpopo River (Le Roux, 1940), others suggest that they were killed by one of the black groups residing in the area (Becker, 1985). However, it is accepted that the expedition came to an end near Lotsane. In fact, some fifty years later a number of items that could be linked to the expedition (i.e. regimental buttons, pocket knives etc.) were found in this area (Le Roux, 1940) (Changuion & Bergh, 1999).

1825 & 1830

David Hume was a Scottish trader who undertook a number of journeys into the interior of southern Africa. On two of these journeys (1825 and 1830) he passed close to the surroundings of the present study area.

The journey of 1825 took him northwards to Shoshong and eastwards into the Waterberg. From the Waterberg he travelled southwards through the area where Pretoria is situated today, ending back at Kuruman (Changuion & Bergh, 1999).

Hume's journey of 1830 took him along the Limpopo to its confluence with the Ngotwane (Notwani) River, and upstream along the Mahalapye. After travelling further north to Moutloutse (Macloutsie), he returned along the Limpopo to its confluence with the Ngotwane River, from where he travelled back to Kuruman over the Waterberg and Magaliesberg Mountains (Le Roux, 1940) (Bergh, 1999).

1836

The first Voortrekker parties started crossing over the Vaal River (Bergh, 1999).

In the same year, Captain William Cornwallis Harris undertook a journey into the interior of Southern Africa. His route took him through the Magaliesberg Mountains and northwards all along the Crocodile River, up to its confluence with the Marico, from where the party journeyed north-eastwards to eventually turn back near present-day Lephalale (Harris, 1987) (Bergh, 1999).

Late 1830s - 1870s

These years saw the first arrival of Voortrekkers and general establishment of farms in the general region (Bergh, 1999). However, the establishment of farms by the Voortrekkers in the direct vicinity of the study area appears to have been isolated and sporadic during these early years with some settlement only taking place during the 1870s. According to Pont (1965), some of the earliest Europeans in the Waterberg district included a certain Daniël Janse van Rensburg, who established himself in this area in 1837.

Between 1839 and 1840, White farmers from Potchefstroom arrived and settled in the Waterberg. In the ensuing years many others joined them (Changuion & Bergh, 1999).

These first pioneers did not immediately commence farming activities, and provided for themselves primarily through hunting. The hunting of elephants and hippo was especially favoured (Pont, 1965). The fact that the surroundings of the study area used to be a preferred historical hunting ground for the Voortrekkers and their descendants is confirmed by Coetzee (n.d.) who mentions that S.J.P. Kruger, who later became President of the South African Republic, used to hunt in the vicinity of Thabazimbi as well as further north.

At first, most of the early farms were established near the Waterberg Mountains and the rivers. Although farming activities eventually developed in the area, diseases such as tsetse and malaria also hindered these developments, and it took some time before farming was undertaken in earnest (Pont, 1965). The first farming activities undertaken in the area centred around cattle farming, and it was only later that agriculture was also practised (Naudé, 1998). An interesting activity from this time is the exploitation of salt located at various saltpans in the region. Oral historical evidence suggest that President Kruger asked poor Whites to settle in the vicinity of these pans, and to exploit the salt. The activity of salt exploitation led to the establishment of localised bartering systems (Naudé, 1998).



Figure 6. A typical farmstead in the late 1800's Waterberg

1848

The area that was later to be known as the district of Soutpansberg was established in this year (Bergh, 1999). The northern section of the study area fell within this district.

1850s

The region where the northern section of the pipeline route is to be built, fell within the Waterberg District of the Zuid-Afrikaansche Republiek (Bergh, 1999). This section of the study area remained within this district until c. 1990 when the Ellisras District was established. During the 1850's the adult European population for the Waterberg district as a whole consisted of about 150 individuals. By 1873 approximately 575 Europeans lived in the district.

The southern end of the study area fell within the Rustenburg District. Both the district and town of Rustenburg was established in 1851. It would remain within this district until 1977, when it was allocated within the newly established district of Thabazimbi (Bergh, 1999).

1869

Carl Gottlieb Mauch was a German geologist who travelled extensively through the interior of South Africa as well as further north in present-day Zimbabwe. In 1865 he set foot on the continent at Durban, from where he commenced with his various travels (Le Roux, 1940).

The important period of Mauch's life in terms of the present study, is the journey undertaken by him in 1869. In the translated version of his journals edited by Burke (1969), it becomes clear that Mauch visited the areas that form part of the surroundings of the present study area. For instance, in an entry dated Thursday, 9 December 1869, Mauch wrote the following: "...I suddenly found myself at the foot of the Marikele Point, which forms a mighty mountain mass with its three peaks..." (Burke, 1969:33) and makes reference to some abandoned settlements he encountered a few kilometres from "Marikele Point": "On a rocky path I arrive at some old and abandoned kraals, that is, stone walls erected in a circle within which the huts had been built." (Burke, 1969:33).

Mauch later became the first European to document the Zimbabwe Ruins (Le Roux, 1940).

1874

During the reign of Nchaupe I, in 1874, his heir, Makapane, and a number of his followers moved to Mabotse on the farm Waterval, which was located approximately 25 miles north west of Rooiberg. The missionary Reichelmann moved with them. This move occurred largely due to fear for the Boers as well as a lack of water (Van Warmelo, 1944) (Van Zyl, 1958).

According to the Transvaal Native Affairs Department (1905), Makapane came in conflict with the Boers, and as a result the BaKgatla fortified themselves in the Ratlohan Mountains (Kransberg) on the Matlaba (Matlabas?) River. It was apparently here that Makapane died. The Kransberg is where Marakele National Park is currently located, a short distance east of the closest point along the study area footprints.

A year after the death of Makapane, his followers left this area and settled at Ntshwahatsane on the farm Klippoortje (Van Warmelo, 1944) (Van Zyl, 1958).

At the time of Makapane's death, his son Makhotshane, was still too young to govern, and as a result his brother Mathibe ruled as regent. During Mathibe's reign he moved the people to the Rietspruit in the Waterberg.

When Makhotshane (Van Zyl (1958) refers to him as Thipe) became old enough to rule (ca. 1885), Mathibe and his following left and settled at Matlalastad in the Waterberg (Transvaal Native Affairs Department, 1905). Van Zyl (1958) mentions that Mathibe and his following settled on the farm Noodshulp, directly south-west of Bela-Bela. According to the Transvaal Native Affairs Department (1905), Makhotshane was forced to move with his following from Rietspruit to Makapanstad, Pretoria District.

In October 1899, Makhotshane's brother, Solomon Makapane succeeded him after Makhotshane's wife, Ntebeng, acted as regent (Van Zyl, 1958).

The Study Area and Surroundings during the South African War

On 11 October 1899 war broke out between Britain and the two Boer republics of the Orange Free State and Transvaal (Zuid-Afrikaansche Republiek). Although the present study area and surroundings were never part of the main theatre of war, enough actions and events occurred here to warrant discussion in more detail.

11 October 1899

5 June 1900 - During the first part of the war, the Waterberg Commando was placed under the command of General F.A. Grobler. At first, the main objective of the commando was to attack Fort Tuli north of the Limpopo River. However, it was decided from higher up that Grobler should send 500 of his men to Colesberg near the Orange River, while the rest of the commando should be divided into three camps situated at Soutpan, the lower-Lephalala river as well as at a spot between the Matlabas (Motlhabatsi) and Mokolo Rivers.

It is clear that the three camps occupied by the Waterberg Commando during the early part of the war, were located in the surroundings of the study area. The reason for the placement of these defensive camps in these far north-western sections of the Transvaal Republic, was partly to provide protection against British attacks from the north-west and north, but primarily was intended as defence against attacks by the BaKgatla-ba-ga-Kgafela. The South African War of 1899 to 1902 was definitely not only a white man's war, even though for many decades historians have refrained from paying attention to the reality that the war had a significant influence on, and was partaken in, by Coloureds, Indians and Africans (Nasson, 1999). In recent years historians have started to investigate and study the role of

persons of colour in the conflict, and the influence the conflict had on them. In terms of the study area, it is especially the role of the BaKgatla, which is worth mentioning.

At the end of the nineteenth century, the BaKgatla-ba-ga-Kgafela under Linchwe I, were divided into two components. While one section lived under British administration in the Bechuanaland Protectorate, the second component lived within the borders of the South African Republic at Saulspoor (Pilanesberg).

When hostilities broke out, Linchwe I was placed in a difficult situation and found it hard to decide between the two sides. In the end he chose the British side, and this participation reached a climax at the Battle of Derdepoort on 25 November 1899, when Kgatla forces attacked the Boer laager located there. Subsequently, Kgatla regiments were sent into the South African Republic and they attacked Boer forces, as well as raided the tribes believed to be assisting the Boers (such as the Fokeng, Phalane and Kwena) (Morton, 1985).

5 June 1900 – September

1900 - After the fall of Pretoria on 5 June 1900, many of the burghers in the Waterberg and Soutpansberg commando's drifted back home. On 22 August 1900, approximately 10 000 British troops occupied Warmbad (present-day Bela-Bela). They were hindered by between 3 000 to 4 000 Transvaal and Free State burghers, but still managed to occupy the town.

September 1900 – May 1902

In September 1900 command of the Boer forces north of Pretoria was removed from Grobler and handed to General Christiaan Frederick Beyers. A power struggle evolved between General Grobler, Assistant- General De Beer and the newly appointed General Beyers. This period, until the end of the war, was characterised by a change in military strategy applied by the Boer forces. Rather than attempting to face an ever increasing British military force in formal set battles, the Boer Commanders decided to exploit the mobility of the Boer commando's on horse-back by using hit-and-run tactics that became known as the guerrilla phase of the war.

A British force consisting of some 1 300 mounted men and 9 artillery pieces under the command of Lieutenant-Colonel Plumer left Pretoria on 26 March 1901. The objective of the force was to attack the areas north of Pretoria. The 1st of April 1901 saw Plumer in Nylstroom (present-day Modimolle), and by 5 April he was in Potgietersrus (present-day Mokopane). The most important set battle during this time in the Waterberg, occurred at Sandrivierspoort and Tambotierand, which commenced on 20 June 1901. These battlefields were located approximately 66km east of the present study area.

In the diary of one Lieutenant E.I.D. Gordon, of the 12th Mounted Infantry, a map is shown which gives an indication of some of the activities during the Boer War in the Waterberg. On this map he indicates a spot, which appears to be on the Mamba River as a place where a Boer laager was captured. Odendaal (n.d.) mentions that women and children were placed in camps or laagers by Beyers, and that one such a camp, located on the Mamba (Mahoppa) River, was captured by the British. A burgher by the name of Ernst Krogh, who was killed during this attack, was also buried here (Odendaal, n.d.). This incident is supported by Lee (1973), who also mentions that the laager could have been located on the Matlabas River. Another interesting fact is that the British force consisted primarily of Black soldiers (Lee, 1973).

As part of the so-called 'scorched earth' policy initiated by Lord Kitchener, many Boer farmhouses were destroyed. This would certainly also have been true for the surroundings of the study area as well. Another aspect characteristic of the 'scorched earth' policy was the system of concentration camps (also referred to as refugee camps) in which Boer as well as Black women and children were held. The closest of any of these camps to the southern section of the study area, was the one at Modimolle and which was in existence from May 1901 to March 1902. This camp, which was established by the British

authorities and used for the keeping of Boer women and children, resulted in the death of 525 persons, 429 of whom were under the age of 15 years (www.angloboerwar.com).

In terms of the participation of the Bakgatla-ba-ga-Kgafela in the war, by 1901 the Kgatla regiments attacked Boer farms, and forces, as far as Pretoria and Thabazimbi to the north. By the end of the war, the Kgatla forces were effectively in control of the land reaching from Rustenburg in the south, to the present-day border between South African and Botswana in the north (Morton, 1985). This indicates that during the last years of the war, the study area and surroundings were primarily controlled by the Bakgatla. This assertion is supported by Odendaal (n.d.), who mentions that one of Linchwe's regiments reached as far as Vaalpenskraal (possibly Vaalpenspan?) on the Matlabas River. The farm Vaalpenskraal is located on the Crocodile River some 29km from the closest point of the study area, whereas the farm Vaalpenspan is located in proximity to the Matlabas River immediately adjacent to a section of the present study area.

Many of the Boer farmhouses were burnt down during these attacks, and the raiding of cattle and sheep often occurred.

May 1902

The Anglo-Boer War came to an end with the signing of the Peace Treaty of Vereeniging in May 1902.

After 1902

That the war caused a lot of suffering and bitterness is quite evident and the treatment of the National Scouts by the Boer communities from the Waterberg region serves as an example of this. The National Scouts were burghers who joined forces with the British (Odendaal, n.d.). These National Scouts were hated by those who had fought to the bitter end, and it is mentioned that in certain churches from the region some of the bitter enders did not want to attend Holy Communion with erstwhile National Scouts (Pont, 1965). This feeling of discontent felt towards those who had fought on the British side, is captured by the following section taken from the Nederduitsch Hervormde Gemeente Waterberg register:

“...aan de leden der Gemeente die zich gedurende de laaste oorlog aan de zijde van de vijand hebben geschaard, kennis te geven voor de Kerkraad te komen ten einde zich te verantwoorden...” (Pont, 1965:77).

Another interesting aspect relating to the history of the South African War in these parts, is the so-called Gamlanders or Gamjanners. The Gamlanders were burghers who had decided not to further participate in the war. These boers laid down their arms to Chief Khama of the Bechuanaland Protectorate and also settled there for the remainder of the war (Odendaal, n.d.).

The Study Area and Surroundings during the Twentieth Century

The general surroundings of the study area underwent significant changes and development during the twentieth century, including the further establishment of farms and agricultural development as well as extensive development in the form of iron ore mining, railway and transportation development as well as the establishment of nearby towns such as Lephalale and Thabazimbi.

1902 - 1920

This section was partially compiled during the compilation of a Cultural Resource Management Plan for the Marakele National Park, of which the author of this report was co-author (Birkholtz & Steyn, 2002). While it primarily refers to farms located within this national park, this section provides an understanding of the settlement of farms from the surroundings of the study area during the early twentieth century.

In terms of the farms located on or near the central sections of the study area, Coetzee (n.d.) mentions that Europeans settled on the farms Groothoek, Kareehoek and Matlabas from 1907. It is however

interesting to note the comment made by Naudé (1998) that a homestead was built on the farm Kareehoek as early as 1890. These different dates may be explained if one considers the work of Morton (1985) who mentions that during, and at the end of, the South African War (1899-1902) many of the Boer families evacuated their homes and farms. In many instances it was only after the conclusion of the First World War (1914-1918) that these farms were settled by White farmers again. Morton (1985:188) talks of 'the second Boer colonization' in these regions.

This said, it becomes apparent that many of the farms located in and directly adjacent to the study area were only settled after the end of the South African War. Coetzee (n.d.), for example, mentions that a Mr. Dreyer and Mr. Zagrys Grobler settled at Kareehoek after the end of the war. Although they moved away for a while, they returned to Kareehoek around 1908 -1909. Another new resident on Kareehoek, in 1912, was Grobler's son. During this time all these farms were bought from the government.

The land situated on the mountains where the Marakele National Park is currently located was very cheap, largely due to the fact that it could not be productively used for cattle farming. In 1930, the farm Aapiersrivierpoort could be bought for R1 per acre, while the land on the farms Matlabas Zyn Kloof and Boschfontein was for sale for 25 c per acre (Coetzee, n.d.). In 1922 the farm Diamant was sold for a 1000 pounds by the Dutch Reformed Church (Pont, 1965).

During the late 1920s Mr. Hendrik Pelzer settled on the farm Duikerspan. Although Blaauwpan did not have any occupants, the farms Geelhoutbos, Kareehoek, Matlabas and Kransberg were all settled by this time (Coetzee, n.d.). Research undertaken at the Deeds Office has shown that the first title deed for the farm Geelhoutbosch 269 KQ is registered in the name of Willem Schalk Jacobus van Heerden in 1913.

A number of small schools for the farmer's children were established in the region, namely at Groenvlei, Geelhoutbos, Kareehoek and Matlabas. The only established school by 1914 was situated at Kareehoek, and the first teacher here was from the Netherlands (Coetzee, n.d.).

During the early years, the closest church was situated in Nylstroom (present-day Modimolle). Pont (1965) has it that the Dutch Reformed Church of Waterberg, based in Nylstroom, later held church meetings in the wards. One of these places was Dwarsrivier in the Matlabas area.

According to Mr. Tom Dreyer (pers.com.) the situation improved when Mr. Michael Erasmus donated a large piece of land at Groenrivier to the Reformed Church, which was established here in 1917. The farmers from the vicinity travelled with ox-wagons to this area, and the church activities already commenced on the Friday, lasting the whole weekend. This is supported by Mr. Faan Erasmus (pers.com.) who mentions that the people travelled from far away in their ox-wagons and camped at the church stand at Groenrivier, located on the Matlabas River. During dry periods the river was completely dry, and although the people still attended the church they left the oxen harnessed to the wagons for the entire church service.

In terms of the farms mentioned in this section, the present study area footprint passes through the farms Matlabas, Blaauwpan and Groenvlei. The nearest of the other farms mentioned in this section is Duikerspan, which is located approximately 940m east of the closest point along the present study area footprints. The farms Kareehoek and Geelhoutbosch are located approximately 4.5km south-east and 4.8km east of the closest points along the study area footprints. The farm Aapiersrivierspoort is located 9.7km to the south-east, with the farm Matlabas Zyn Kloof located adjacent to Aapiersrivierspoort and at a similar distance from the present study area. Diamant is located approximately 9.9km east of the study area whereas the farm Groothoek is located 15.6km south-east of the closest points along the study area footprints.

1919

Although iron had been mined and processed from the surroundings of the study area during the Iron Age, the first white person to pay any attention to the iron ore in proximity to present-day Thabazimbi,

was a prospector by the name of J.H. Williams. While on a hunting trip in 1919, he pitched his tent at the spot where the Crocodile River runs out of the gorge known as Vlieëpoort. While hunting around this area, Williams soon realised that the mountains here were rich in iron ore. As a result, he obtained discoverer's rights to extensive sections of these iron ore deposits (Coetzee, n.d.).

The proposed pipeline development starts near the Vlieëpoort, where Williams made these discoveries.

1920s

Coal was first discovered in the vicinity of Lephalale during drilling activities for water (Erasmus, 2004).

1924

In this year the famous geologist Hans Merensky was shown a sample of platinum ore that a Mr. Andries Lombard had found near Lydenburg. Merensky managed to trace a platinum reef all along the outer edge of the Bushveld Complex from Lydenburg to Rustenburg. This reef was to be known as Merensky Reef (Carruthers, 2007). The discovery of the Bushveld Complex was of extensive economic significance for South Africa. As indicated by Wikipedia, the Bushveld Igneous Complex, "...contains the world's largest reserves of platinum-group-metals (PGMs) – platinum, palladium, osmium, iridium, rhodium, and ruthenium along with vast quantities of iron, tin, chromium, titanium and vanadium."

The complex was traced along two zones or belts, known as the Western and Eastern Belt. The Western Belt is of significance for the present study. The relevant government survey reports of the time indicated that the Western Belt, "...extends for about 100 miles as follows: from Brits towards Rustenburg and then northwards, skirting the Pilanesberg on its western side and continuing almost as far as the Crocodile River." See for example The Official Year Book of the Union (1938:862).

1925-1929

The platinum discovery made by Hans Merensky led to a platinum boom in the South Africa. This saw the floating of more than 50 mining companies in the Rustenburg and Lydenburg districts. Some of the smaller concerns closed down reasonably quickly (Wagner, 1973).

Similarly, the identification of the Bushveld Complex meant that the surroundings of the study area were increasingly prospected and mined. One of the most significant mining companies from this area was Potgietersrust Platinums Limited. Registered on 27 August 1925, the company was established with capital to the value of £1, 962,500 in 7.85 million shares valued at 5 shillings each. The company was originally established to work the platinum deposits near Mokopane, but between 1926 and 1929 also acquired the Rustenburg properties of the Premier Rustenburg Platinum Limited, Steelpoort Platinum Syndicate Limited and Eerstegeluk Platinum Mines Limited. The closest property of Potgietersrust Platinums Limited to the present study area, was the farm Schilpadnest 385 KQ (South African Mining Yearbook, 1942) (Wagner, 1973), located 12km south of the closest point along the study area footprints, namely the Bierspruit Gauging Weir.

Early 1930s

In 1930 Iscor decided to mine the iron ore discovered by Williams just over a decade before. Iscor obtained the discoverer rights from Dunswart Iron and Steelworks Limited, which acquired the discoverer rights from a Mr. Delfos, who in turn bought them from the discoverer, J.H. Williams (Coetzee, n.d.).

C.J.N. Jourdan of the Department of Mines was delegated to join Iscor and manage the commencement of the first iron ore mining activities in this area. Accompanied by a Messrs. Sheller and Sacht, who were respectively appointed as mine manager and mine secretary, Jourdan arrived at the proposed mine on 30 November 1930 (Coetzee, n.d.). Prospecting activities commenced in March 1931. Initially, the mine workers established themselves in tents on the northern slope of the mountain. However, the tents were eventually replaced by shacks and with time houses were also built on this same end of the

mountain. It was here, on the same northern slope of the mountain, that the present-day town of Thabazimbi was eventually formally established (Coetzee, n.d.).

1934

The railway line from Northam to Thabazimbi was completed on 26 February 1934 (Bergh, 1999) (www.wikipedia.org). This would have accelerated mining exploration and development in the study area and surroundings.

1941 - 1952

Exploration activities during this time revealed vast reserves of medium grade coal in the vicinity of where Ellisras (present-day Lephale) would later be established (Lang, 1995).

4 May 1953

Although mining houses had been built from the early 1930s onwards at the northern foot of the mountain, the town of Thabazimbi was only officially proclaimed on 4 May 1953. The town's name is derived from the isiZulu word for 'iron mountain' (Erasmus, 2004).

December 1960

The town of Ellisras was laid out on the farm Waterkloof. The name of the town was derived from the two owners of the farm at the time, namely Patrick Ellis and Piet Erasmus (Erasmus, 2004).

1960 - 1980

During this period the railway line which had reached Thabazimbi in 1934, was extended northwards from Thabazimbi to Ellisras (present-day Lephale). Significant sections of the proposed pipeline runs along this Thabazimbi-Lephale railway line.

1973

Iscor commenced with extensive exploration work near the northern end of the study area which located "...exploitable measures estimated at around two billion tons, of which 500 million was classified as blend coking coal." (Lang, 1995:184).

1980

The Grootegeluk Mine commenced production during this year (Mining Mirror, 2007). The residential areas of Onverwacht and Marapong for white and black staff members respectively appear to have been established at roughly the same time (The Finweek, 1980). These areas are located north-east of the northern end of the study area.

1986

The town of Ellisras (present-day Lephale) received municipal status in this year (Erasmus, 2004).

Late 1980s

During the mid-1980s, the 2 Transvaal Scottish Regiment was deployed on the border with Botswana and had its battalion headquarters at Ellisras. The deployment took place during the Border War and counter-insurgency efforts of the South African Army at the time. It represented the first deployment of a South African Citizen Force on the borders with Botswana and Zimbabwe during this war (Mitchell, 1994).

2002

The name of the town of Ellisras was changed to Lephale (Erasmus, 2004).

Findings

As indicated earlier in this report, the Terms of Reference (ToR) for this project consists of several components. Each of these will be discussed here. For this section reference will only be made to the 100m corridor for the proposed pipeline alignment and any sites that could be directly affected by the pipeline route. Heritage sites were identified on nearby sections, and these will be discussed in more detail later, however none of these were within the 100m buffer corridor. Track paths of the 100m corridor is available as an appendix to this report and the GPX files are available from G&A Heritage Properties (Pty) Ltd.

2018 HIA submitted by PGS

Introduction

The field assessment of the largest portion of the proposed pipeline routes were undertaken by driving along the adjacent and available roads, including the track running along the railway line servitude. With the exception of a few areas that were not covered, all the non-pipeline footprints (i.e. borrow pits, construction camps etc.) were assessed by way of intensive walkthroughs.

A fieldwork team comprising an archaeologist (Polke Birkholtz) and two experienced field assistants (Derrick James and John Anderson) conducted fieldwork from Monday, 11 June to Friday, 15 June 2018. A second fieldwork trip was undertaken from Monday, 25 June to Thursday, 28 June 2018. This latter fieldwork trip comprised two fieldwork teams, one of which comprised an archaeologist (Polke Birkholtz) and a fieldwork assistant (Derrick James) and the second team comprising an archaeologist (Lineree de Jager) and a fieldwork assistant (John Anderson). The track logs (in orange) for the survey are indicated in the subsequent pages.

The fieldwork resulted in the identification of a total of eighteen (18) heritage sites. Maps depicting the distribution of these identified heritage sites are shown.



Figure 7. General development footprint as well as track logs in orange

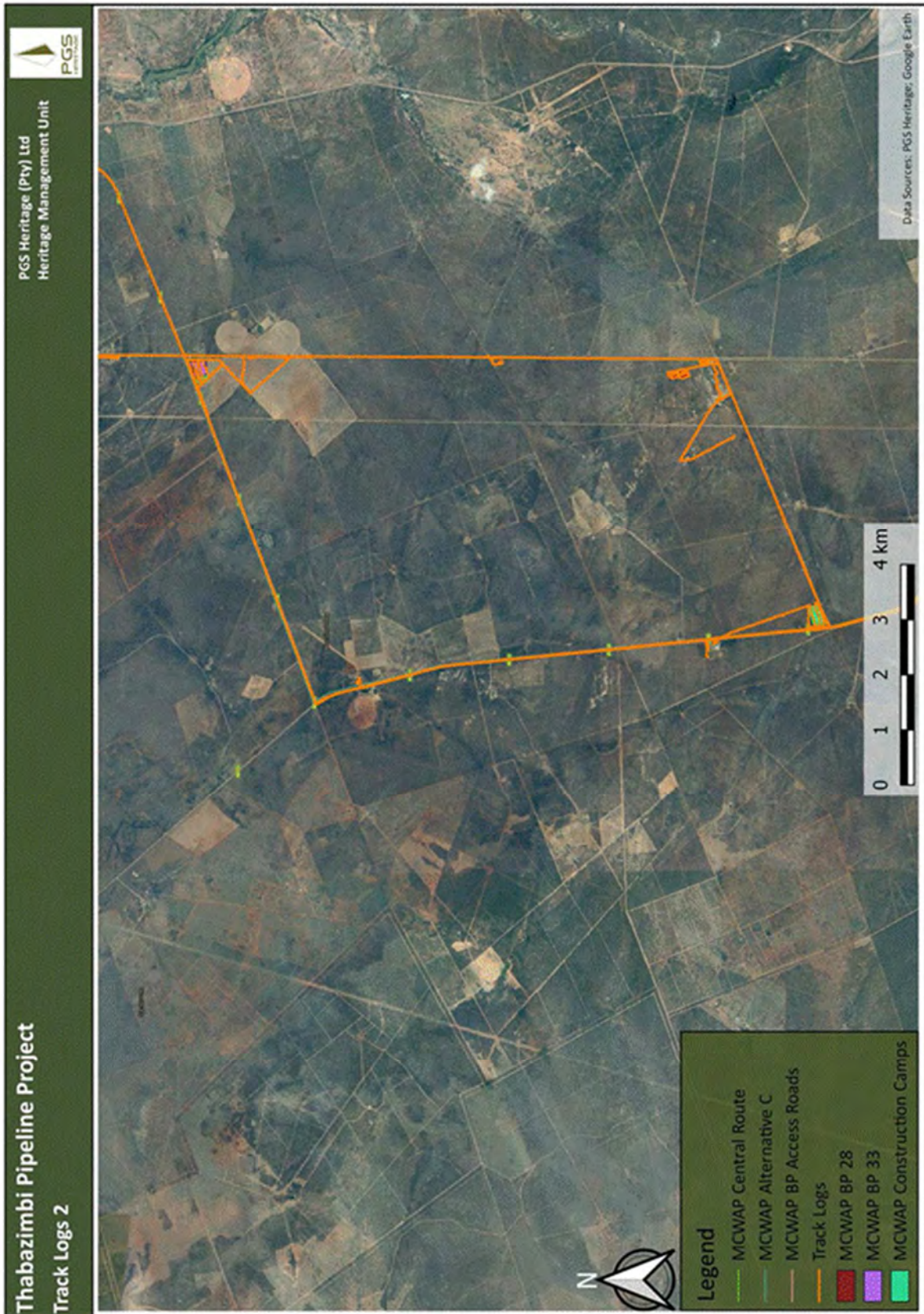


Figure 8. Central section



Figure 9. Central section with track logs and development footprint

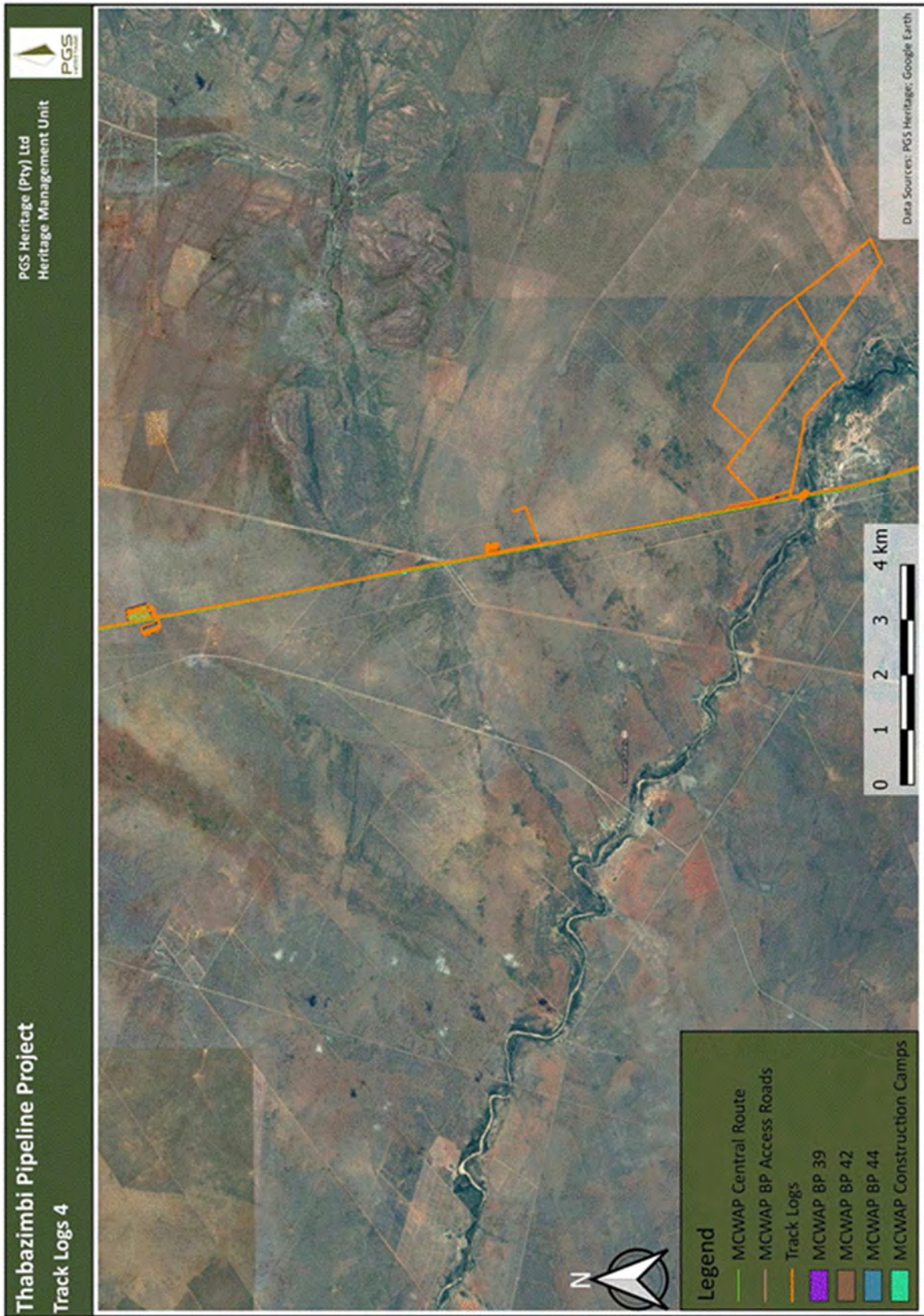


Figure 10. General view of central area

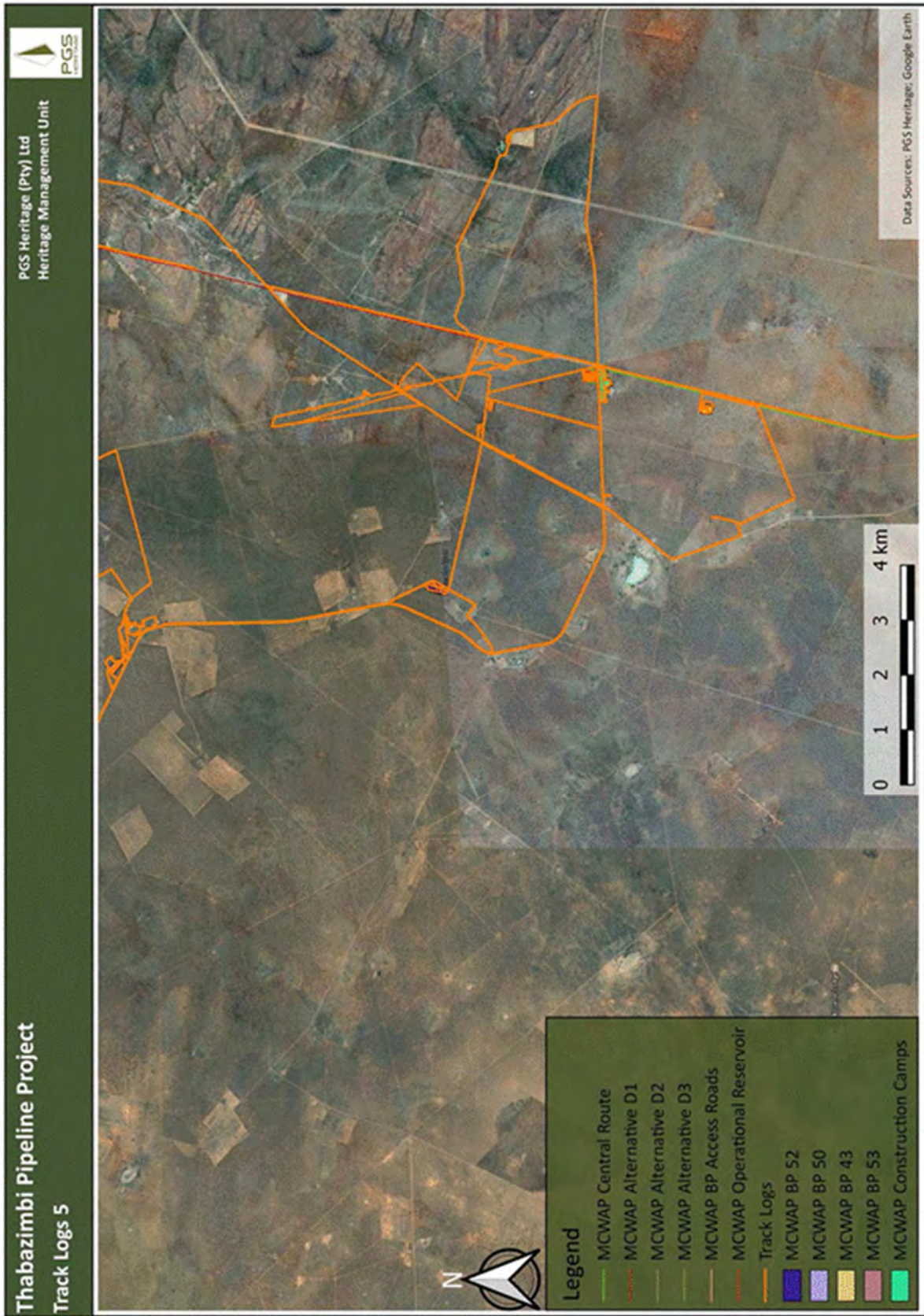


Figure 11. North-central section showing track paths and development footprint

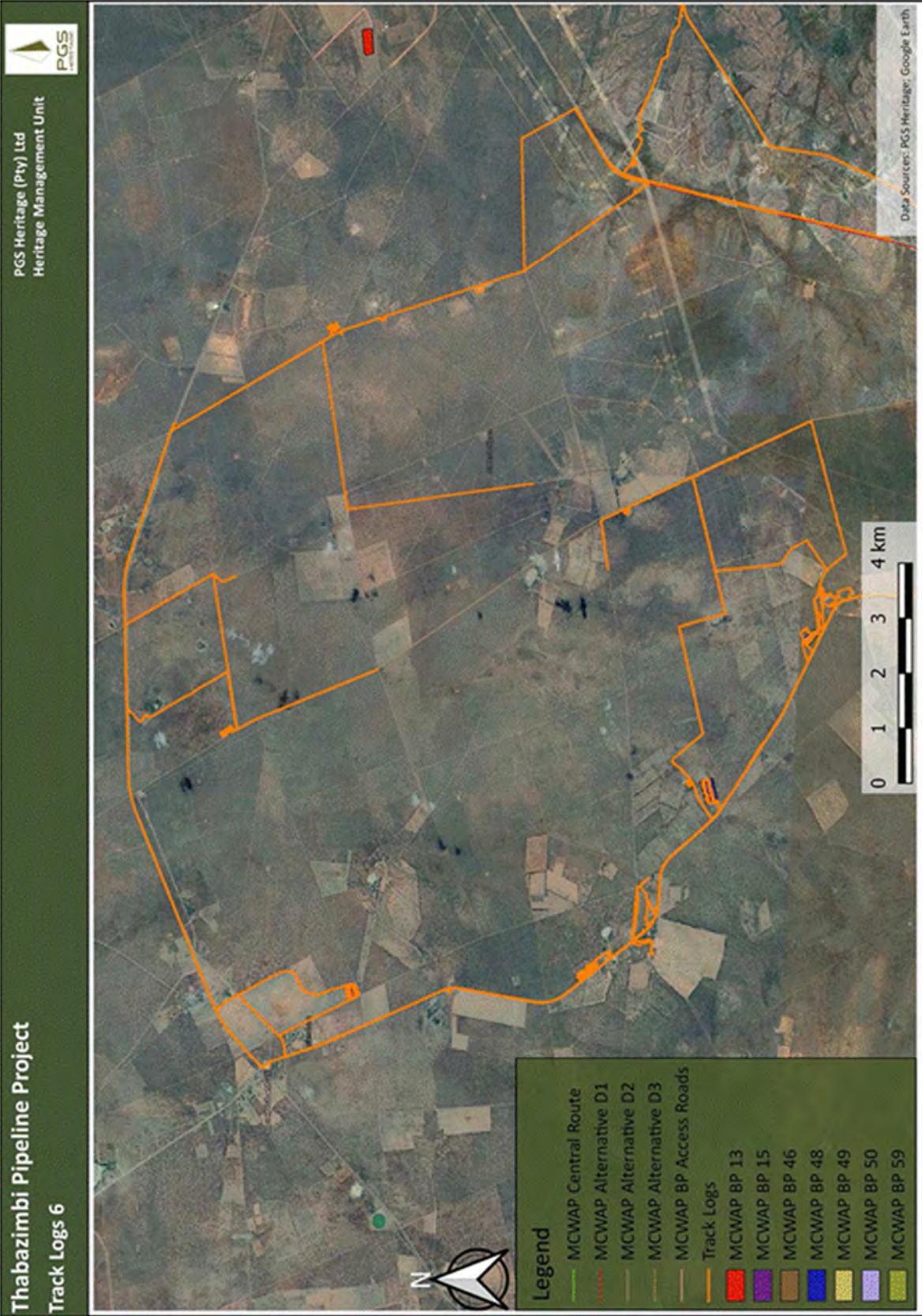


Figure 12. Northern section



Figure 13. Heritage sites within the southern section

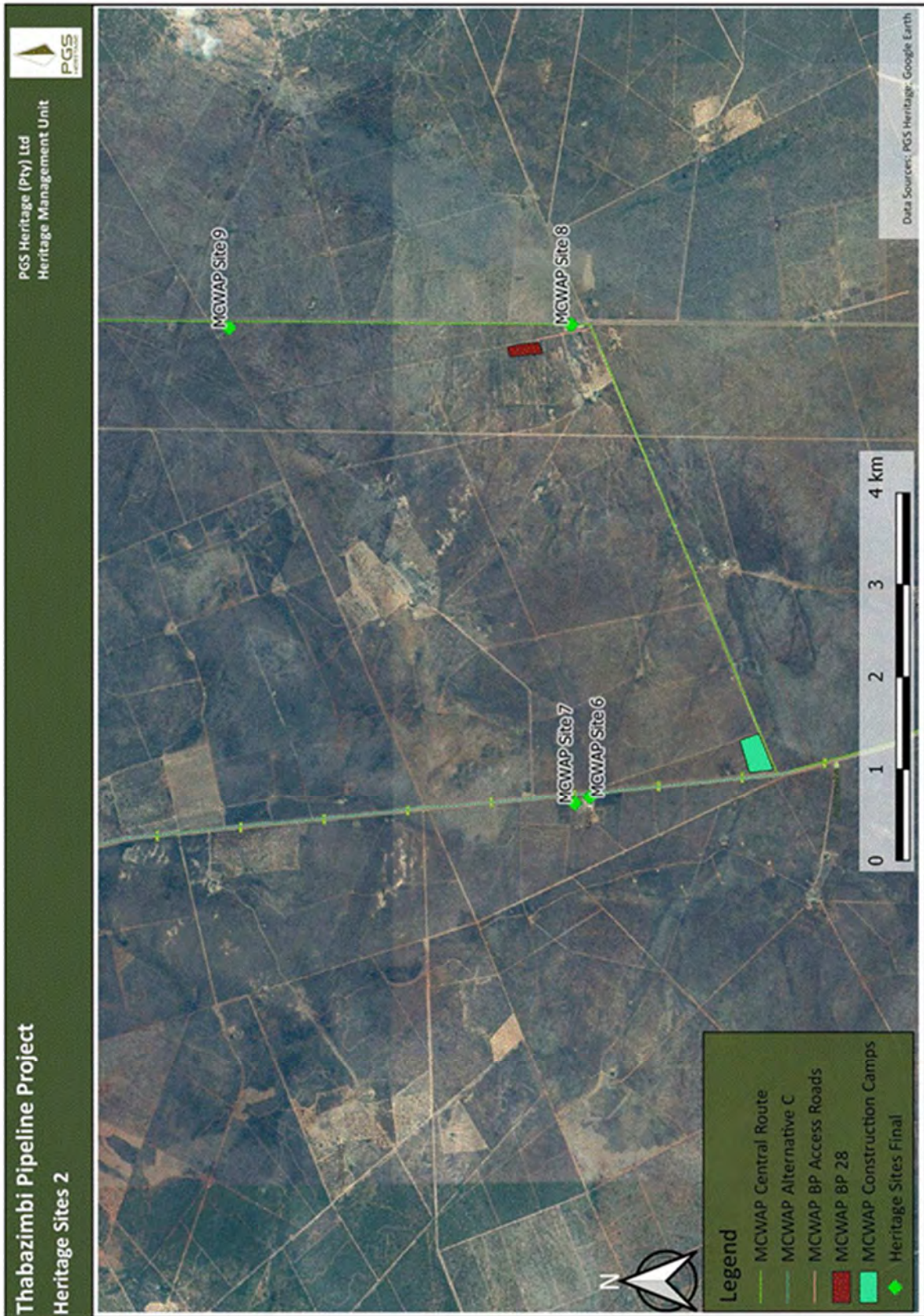


Figure 14. Central section with heritage sites shown

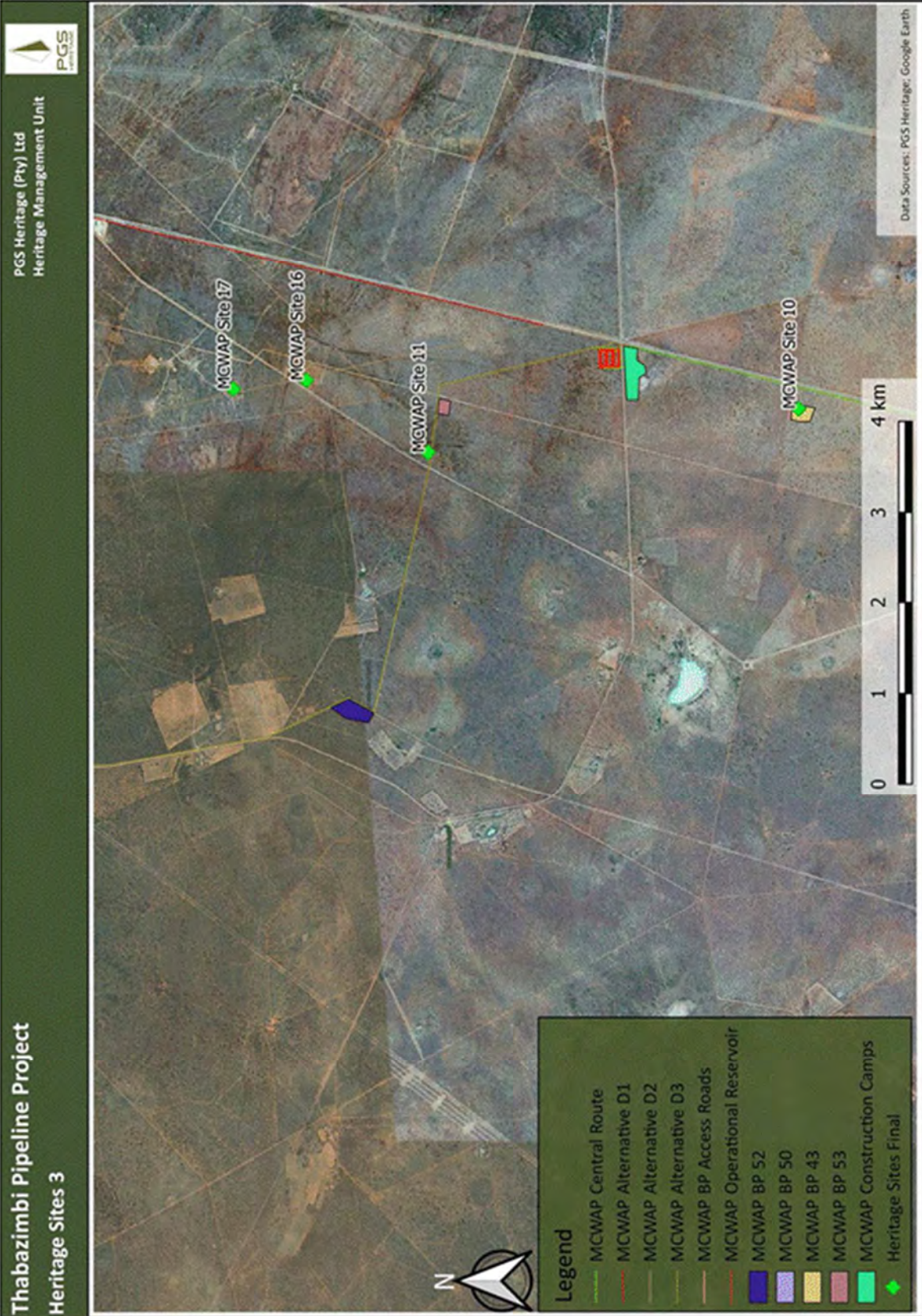


Figure 15. Northern section with heritage sites shown

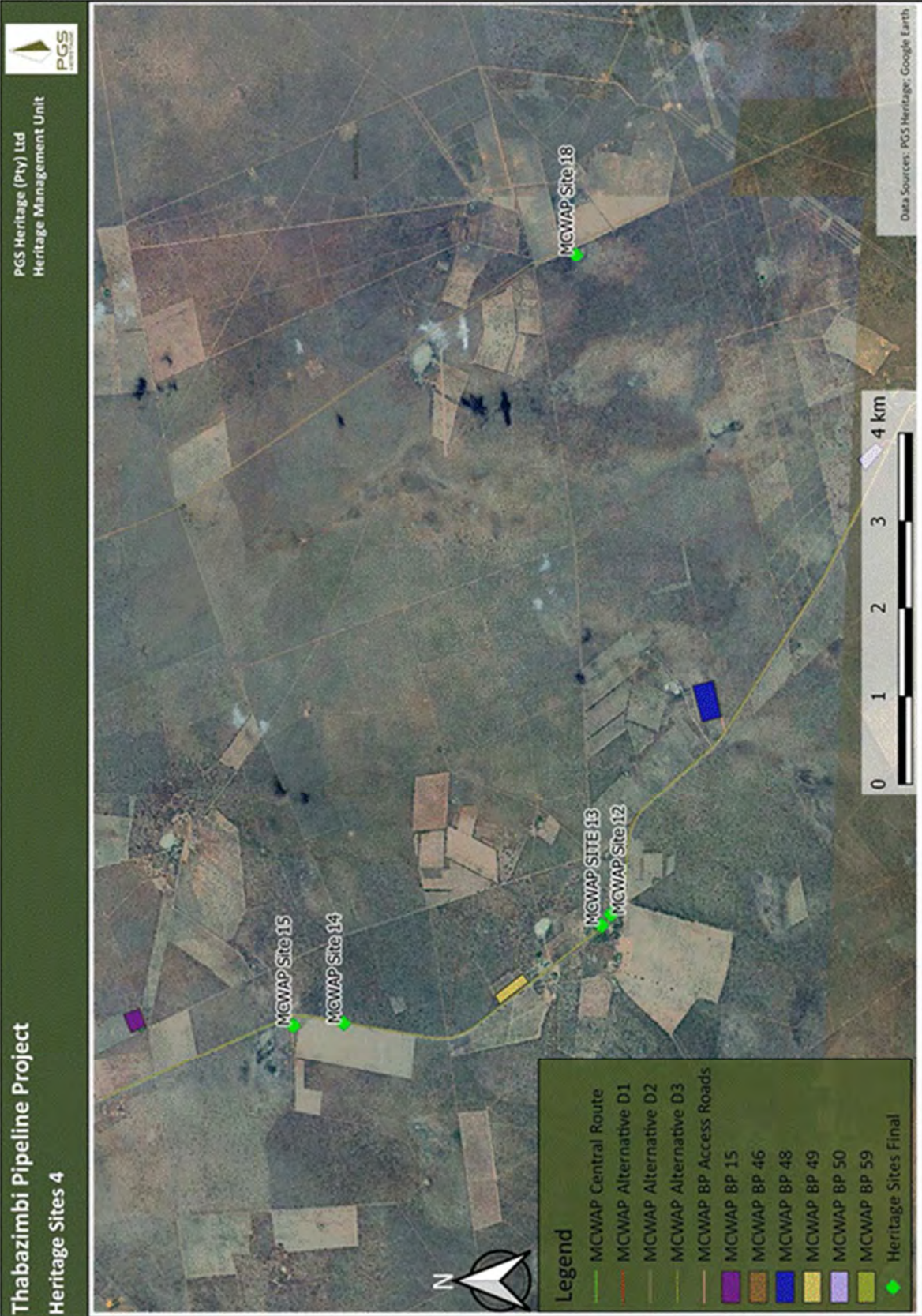


Figure 16. Northern section with heritage sites shown

MCWAP Site 1

GPS Coordinates

S 24.623765

E 27.314196

Site Description

The site comprises a number of features and objects which all suggest that a number of black homesteads used to be located here. The site is poorly preserved and is overgrown with bush, scrub and trees.

All that remains of these homesteads are a number of ash middens, sections of stone foundation structures, at least one oval-shaped stone concentration which may be a grave as well as cultural material in the form of metal, glass and imported ceramic fragments. Examples of these artefacts observed on the surface of the site include a metal lock plate for a door, medicine bottles and broken sections of imported ceramic plates. Bone fragments were also evident across the surface of the site.

With one possible grave in the form of an oval-shaped stone concentration identified during the fieldwork, the likelihood for more graves to be located here remains high. Additionally, based on the information that is presently available, it seems highly likely for the site to have been occupied by black people, quite possibly black farm workers. Past experience has shown that in some cases stillborn babies were buried in close proximity to such black homesteads. These stillborn babies were frequently buried along the sides, or underneath, the parents' dwelling. This seems to be especially true for older sites. As this site is not occupied anymore, no direct information with regards to the presence (or not) of stillborn graves is currently available.

Neither the First Edition of the 2427CB Topographical Sheet that was surveyed in 1963 nor the Second Edition of the same topographical sheet that was surveyed in 1980, depict any homesteads or structures at this site locality. In the wider surroundings, farmworker houses and farmhouses are shown, but the closest of these to the present study area is a farmhouse located approximately 200m to the south-west.

At present it would be very difficult to accurately date the site. The complete lack of plastic artefacts suggest that the site is not very recent. As a result, it is possible for the site to be at least a few decades old, but this is of course not certain. The site is certainly not older than 100 years, but may be just older than 60 years.

Site Extent

The site extends over an area approximately 100m x 50m.

Position of Site relative to Proposed Development

The site coordinates are located 9m north-east of the proposed pipeline, thus within the Department of Environment, Forestry and Fisheries (DEFF) approved corridor. Taking the extent of the site into account, this proposed pipeline passes directly over the site.

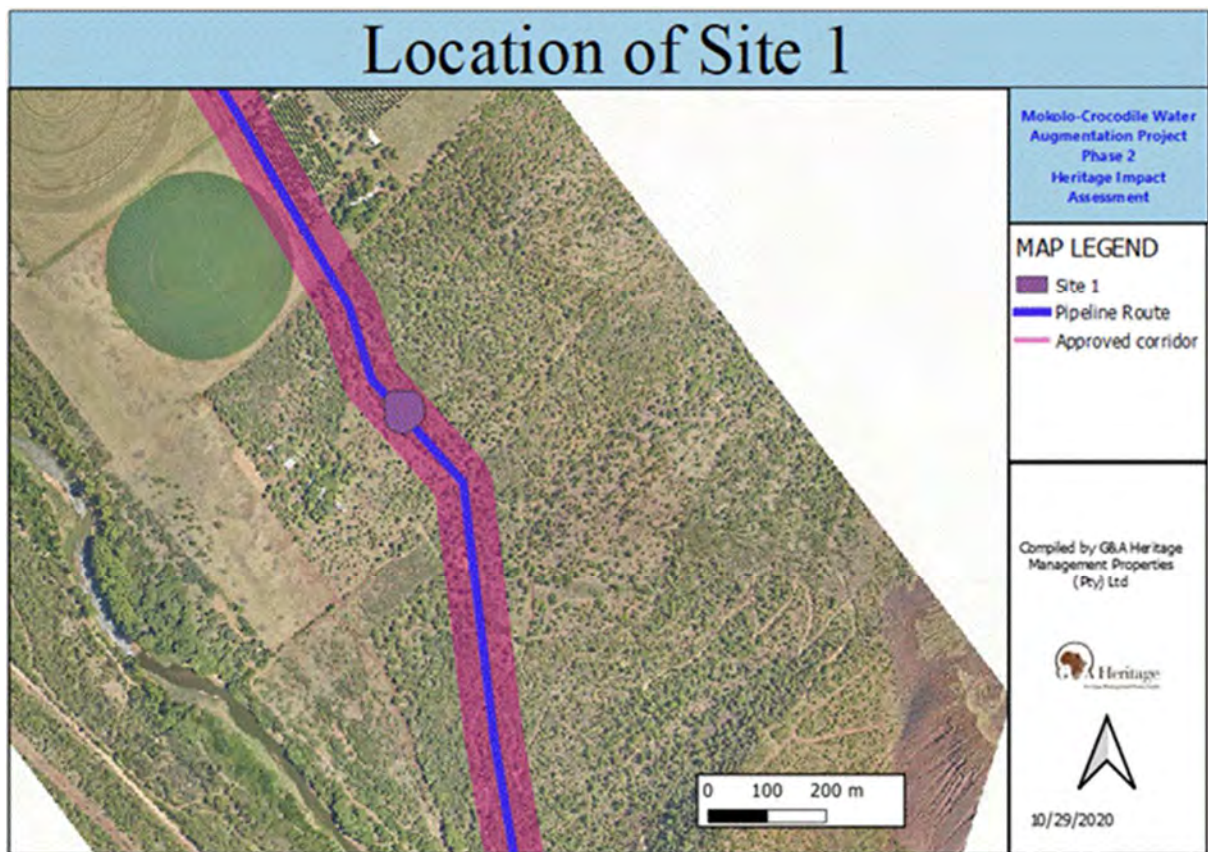


Figure 17. Location of MCWAP Site 1 relative to the pipeline route

Site Significance

Until such time that the presence of graves at this site has been confirmed or disproved, the site must be viewed as containing graves. All graves have high levels of emotional, religious and in some cases historical significance. As such the site is of Generally Protected A (GP. A) or High/Medium Significance. This indicates that the site may not be impacted upon without prior mitigation.



Figure 18. MCWAP Site 1



Figure 19. Stone formation at MCWAP Site 1



Figure 20. Oval shaped stone features that might be a grave



Figure 21. Modern remains at Site 1 with 1cm scale

MCWAP Site 2

GPS Coordinates

S 24.606290

E 27.316570

Site Description

The site comprises two stone concentrations located a few meters apart. Although no grave goods could be identified, the two stone-packed features may be graves.

Neither the First Edition of the 2427CB Topographical Sheet that was surveyed in 1963 nor the Second Edition of the same topographical sheet that was surveyed in 1980, depict any cemeteries or structures at this site locality.

Site Extent

The site extends over an area approximately 15m x 15m.

Position of Site relative to Proposed Development

The site is located within one of the proposed Construction Camps.

Site Significance

Until such time that the presence of graves at this site has been proven or disproven, the site must be viewed as containing graves. It is important to understand that graves and cemeteries have significant heritage value and as a result the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way.



Figure 22. Two possible graves at Site 2

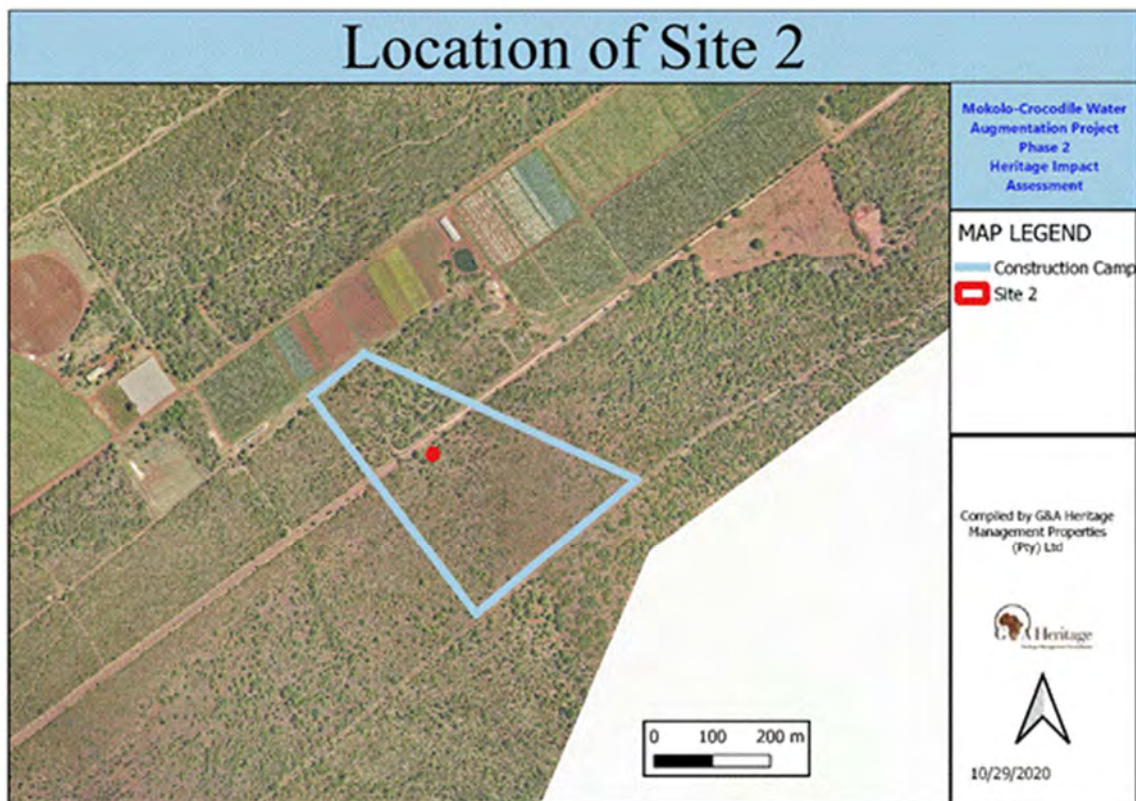


Figure 23. Location of MCWAP Site 2 relative to the pipeline (this site is affected by a possible construction camp)

MCWAP Site 3

GPS Coordinates

S 24.60551

E 27.31593

Site Description

The site comprises a large irregular-shaped stone concentration with no clear function or origin. A lower grinder was identified adjacent to the stone concentration. It is not presently certain whether the stone concentration represents the remains of a homestead or not. For the purposes of this study, a worst-case scenario will be assumed namely that a homestead was located here. The presence of the lower grinder supports this, and also indicates that a black homestead was located here. Past experience has shown that in some cases stillborn babies were buried in close proximity to such black homesteads. These stillborn babies were frequently buried along the sides, or underneath, the parents' dwelling. This seems to be especially true for older sites. As this site is not occupied anymore, no direct information with regards to the presence (or not) of stillborn graves is currently available. Apart from the lower grinder, no cultural material could be observed.

Neither the First Edition of the 2427CB Topographical Sheet that was surveyed in 1963 nor the Second Edition of the same topographical sheet that was surveyed in 1980, depict any cemeteries or structures at this site locality.

Site Extent

The site extends over an area approximately 25m x 25m.

Position of Site relative to Proposed Development

The site is located within one of the proposed Construction Camps.

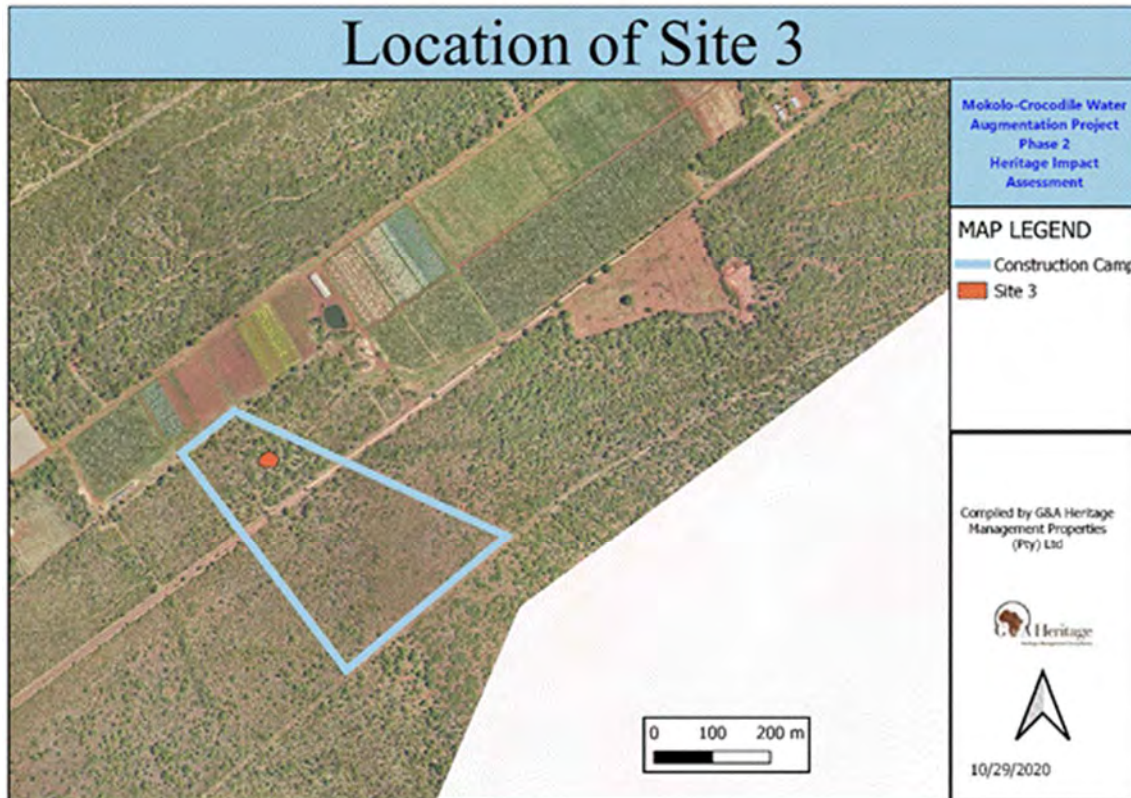


Figure 24. Location of MCWAP Site 3 in relation to Site 2 (possibly affected by a construction camp)

Site Significance

Until such time that the presence of graves at this site has been proven or disproven, the site must be viewed as containing graves. It is important to understand that graves and cemeteries have significant heritage value and as a result the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way. Please refer Section 8 of the appended 2018 HIA report, for the required mitigation measures.



Figure 25. Possible burial site at Site 3

MCWAP Site 4

GPS Coordinates

S 24.608850

E 27.301470

Site Description

A cemetery is located within an agricultural field that is irrigated by centre pivot. The cemetery was evidently historically used as a burial ground by the Burger family and contains three graves all associated with this family. All the graves from this cemetery are orientated from west to east, with the headstones on the west. The three graves will be individually discussed below.

- The first of the three graves to be individually discussed, has a formal rectangular granite headstone with a rectangular granite-lined grave dressing. The surface of the dressing is covered with pebbles. The inscription appearing on the granite headstone is illustrated and shown below.



Figure 26. First burial site at Site 3

- The second of the three graves have a rectangular cement lined dressing with pebbles placed on the dressing surface. It has a rectangular book-shaped granite headstone. The inscription appearing on this headstone is illustrated and shown below.



Figure 27. Second headstone

- The third grave has an oval granite headstone with pebbles placed on the surface of the grave. The inscription appearing on this headstone is illustrated and shown below.



Figure 28. Third headstone

Site Extent

The site extends over an area approximately 10m x 10m.

Position of Site relative to Proposed Development

The site is located approximately 69m south by south-west of the Central Pipeline.

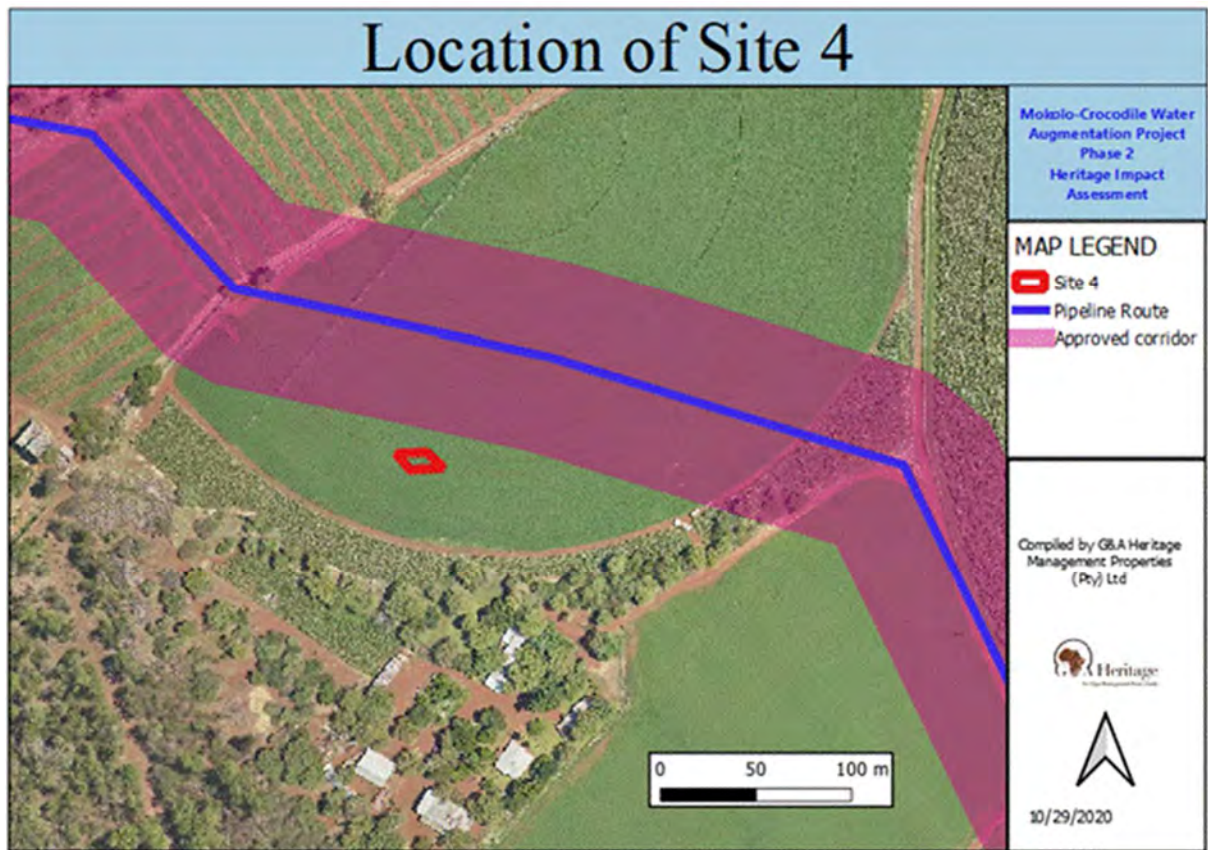


Figure 29. Location of MCWAP Site 4 with proposed pipeline route indicated in blue

Site Significance

It is important to understand that graves and cemeteries have significant heritage value. Such graves and cemeteries also have significant value to the relevant families. As a result, the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way.

MCWAP Site 5

GPS Coordinates

S 24.600409

E 27.293109

Site Description

The site comprises the original farm dwelling on Portion 2 of the farm Mooivallei 342 KQ. It is a brick structure with a corrugated iron roof and has steel windows and wood and steel doors. A number of structures are associated with the farmstead, including a brick rondavel with a corrugated roof, a rectangular brick shed with a corrugated iron roof and an open-sided shed.

According to the landowner, Mr. J.L. van den Berg, the farm dwelling was built by his parents in c. 1941. Mr. Van den Berg added that his family has been living on the farm Mooivalei for many years, and that the Burger family whose graves are buried at MCWAP Site 4, are related to him.

The First Edition of the 2427CB Topographical Sheet that was surveyed in 1963 depicts three buildings here. Five buildings are depicted on the Second Edition of the same map sheet that was surveyed in 1980. The depiction of the site on the 1963 map sheet indicates that the farmhouse and some of its associated structures are at least 55 years old. As indicated by the farm owner, the farmhouse was built in c. 1941. It is therefore clear that the building is older than 60 years.

Site Extent

The site extends over an area approximately 50m x 50m.

Position of Site relative to Proposed Development

The site is located approximately 47m north-west of the pipelines between the Balancing Dams and Desilting Works and the Crocodile River.

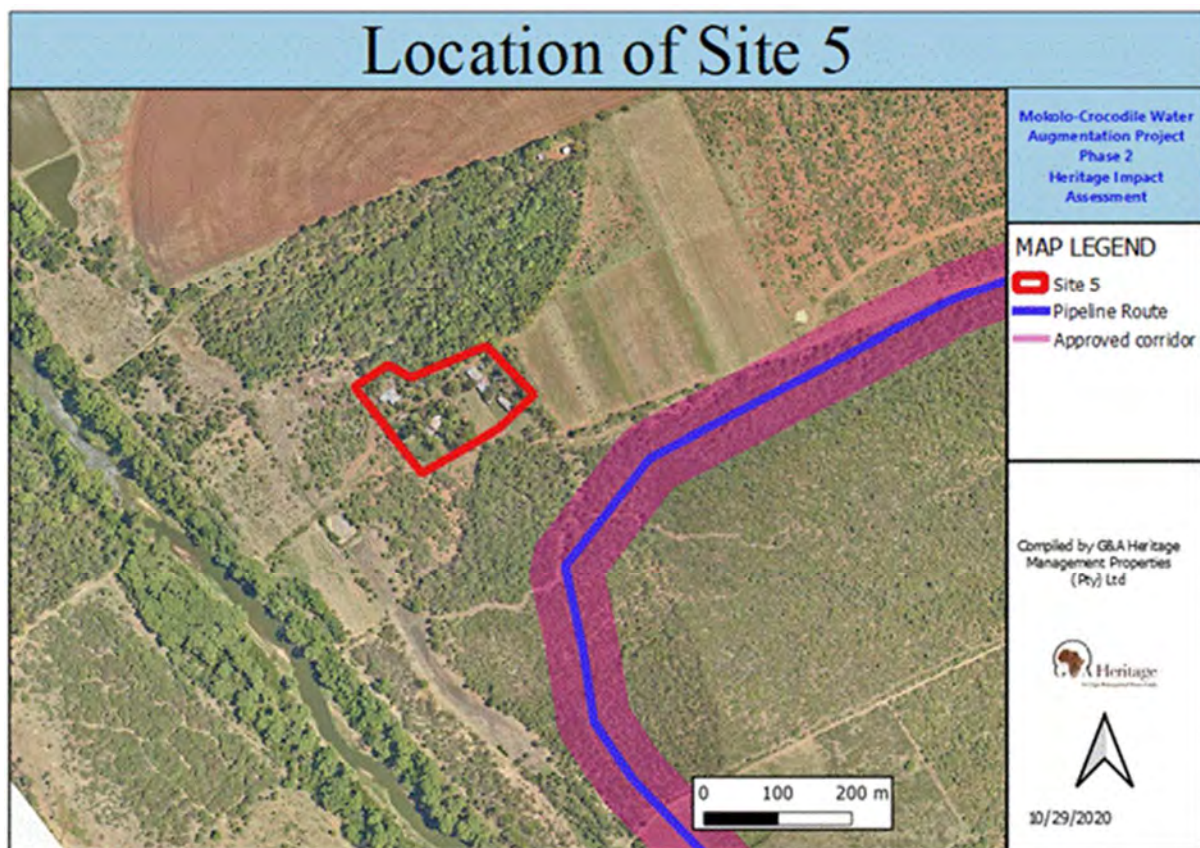


Figure 30. Location of MCWAP Site 5

Site Significance

The farmhouse, and possibly some of its associated structures, are older than 60 years. The site is relatively unique in that not many other farmsteads of a similar age were identified during the fieldwork.

As a result, the site is deemed to be of Medium Significance and is rated as Generally Protected B (GP.B). Please refer Section 8 for the required mitigation measures.



Figure 31. General view of farmhouse

MCWAP Site 6

GPS Coordinates

S 24.386829

E 27.398175

Site Description

The site comprises one of the original farm dwellings on the farm Tarantaalpan 132 KQ. Different phases in the construction of the dwelling can be identified, with the original core of the building comprising a rectangular structure with a hipped corrugated iron roof. At a later stage, two protruded sections were added to the northern and southern ends of the core. The building has steel-framed windows and a chimney on its north-western end. A medium sized baobab tree (*Adansonia digitata*) is located a short distance south-west of the dwelling and was very likely planted by a resident or owner of the farmhouse.

The First Edition of the 2427AD Topographical Sheet that was surveyed in 1963 depicts two buildings here. The same buildings are again depicted on the Second Edition of the same map sheet that was surveyed in 1980. The depiction of the site on the 1963 map sheet indicates that the farmhouse is at least 55 years old. As a result, the building can very likely be older than 60 years.

Site Extent

The site extends over an area approximately 25m x 25m.

Position of Site relative to Proposed Development

The site is located approximately 2.2km from the approved pipeline route and will therefore not be affected.

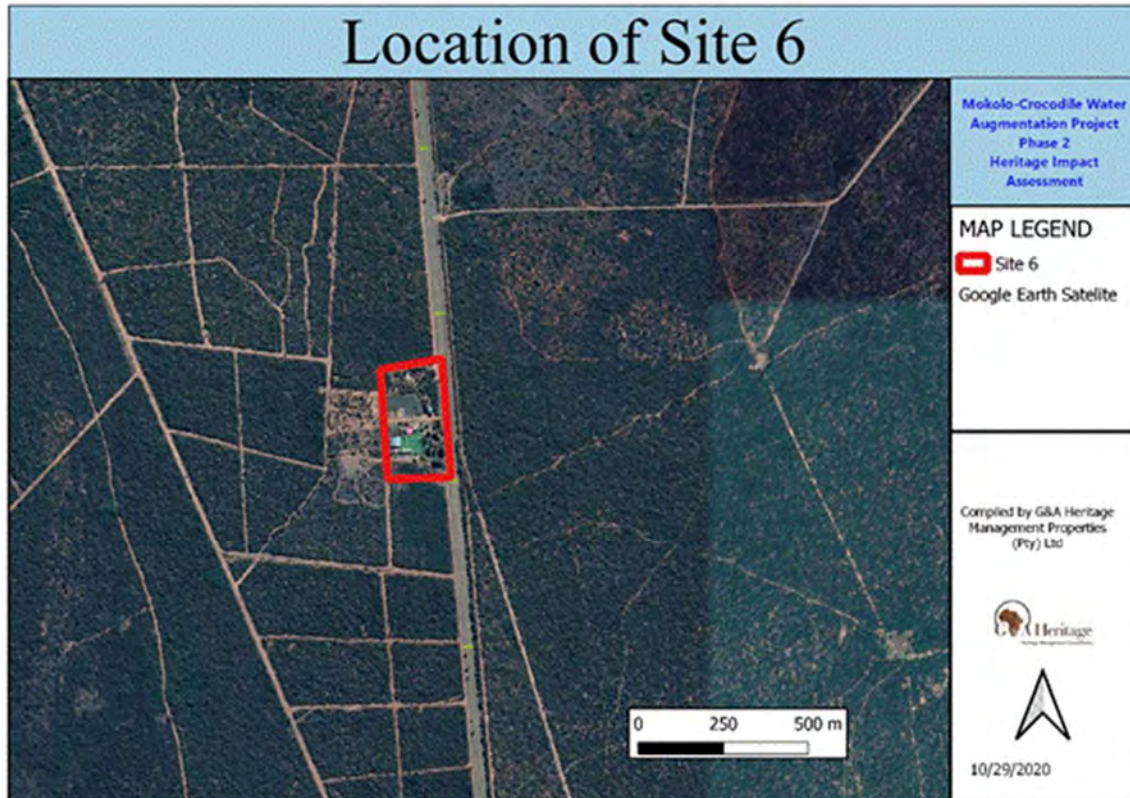


Figure 32. Location of MCWAP Site 6

Site Significance

The farmhouse is quite likely older than 60 years. The site is relatively unique in that not many other farmsteads of a similar age were identified during the fieldwork. As a result, the site is deemed to be of Medium Significance and is rated as Generally Protected B (GP.B).



Figure 33. Front view of farmhouse

MCWAP Site 7

GPS Coordinates

S 24.385215

E 27.397481

Site Description

The site comprises two unmarked stillborn graves located at the Dibyane residence on the farm Tarantaalpan 132 KQ. The positions of both unmarked stillborn graves were indicated by Mr. David Dibyane, who identified the two stillborn babies as Ellie and Liesbet Dibyane and who indicated that they passed away approximately 20 to 30 years ago. Both stillborn graves are associated with the same rectangular mud-brick dwelling and appear to have been buried either underneath this dwelling or along its foundations walls. One of the stillborn graves was indicated to be located near the northern end of the structure, with the second stillborn grave located near the south-eastern corner of the structure.

Site Extent

The site extends over an area approximately 20m x 20m.

Position of Site relative to Proposed Development

The site is located approximately 2.3km from the approved pipeline route and will therefore not be affected.

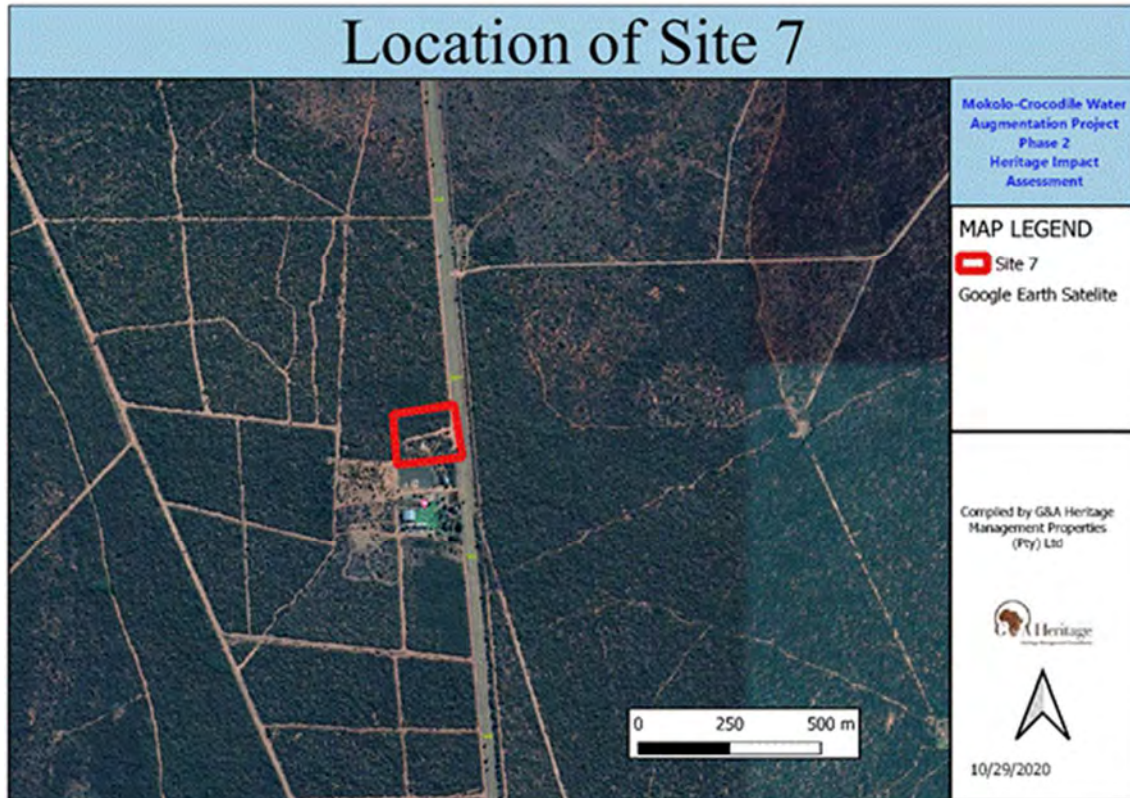


Figure 34. Location of MCWAP Site 7

Site Significance

It is important to understand that graves and cemeteries have significant heritage value. Such graves and cemeteries also have significant value to the relevant families. As a result, the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way.



Figure 35. Stillborn graves located within the hut foundations

MCWAP Site 8

GPS Coordinates

S 24.384822

E 27.448700

Site Description

A low density surface scatter of Middle Stone Age lithics were identified along the eastern bank of an existing borrow pit immediately west of the railway line.

The lithics observed on the surface of the site include three broken blades as well as two Middle Stone Age cores. No hammerstones could be observed at the site. The highest density observed at the site is two lithics per / m².

With the lithics found on the side of a borrow pit, it seems evident that the cultural material from the site are for the most part in secondary context.

Site Extent

The site extends over an area approximately 120m in length all along the eastern side of the borrow pit and is approximately 50m wide.

Position of Site relative to Proposed Development

The site is located less than 1m west of the Pipeline alignment, within the DEFF approved 100m corridor.

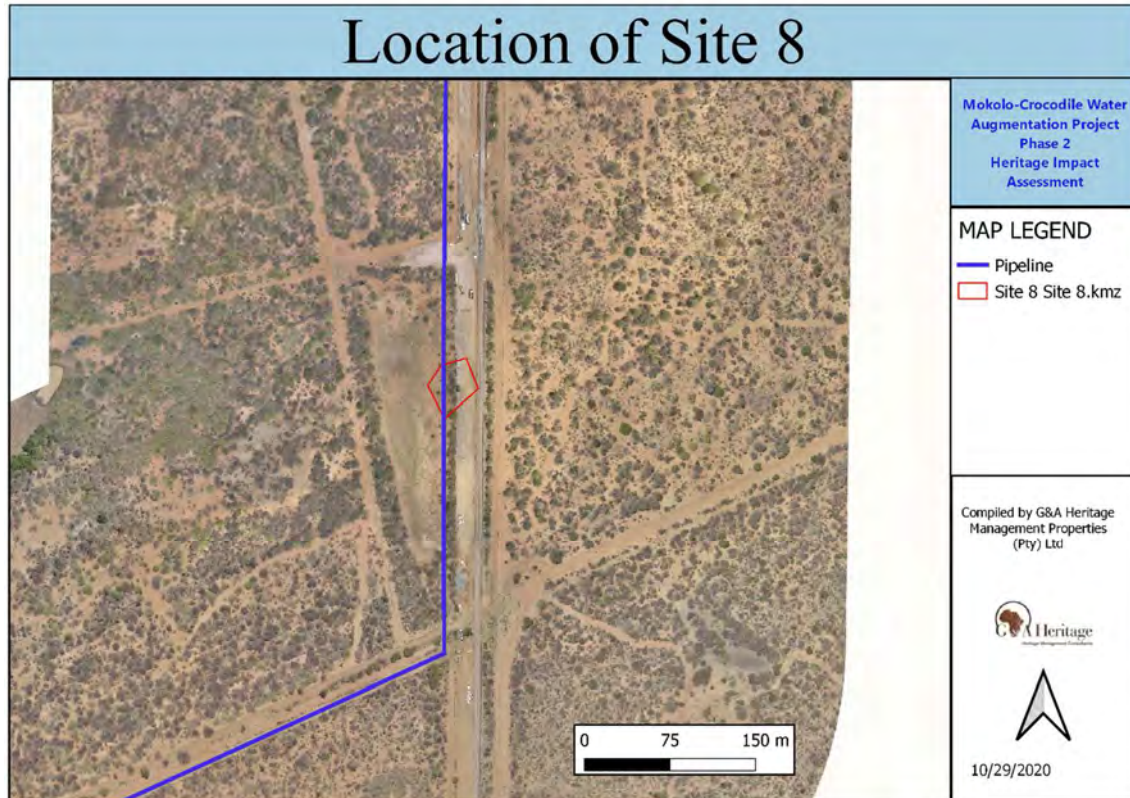


Figure 36. Location of MCWAP Site 8 relative to the pipeline route indicated in blue

Site Significance

The site comprises a relatively low density surface scatter of Middle Stone Age lithics. Although the site was evidently disturbed by the excavation of the borrow pit, it represents one of only a few Stone Age sites identified during the fieldwork. The possibility exists for undisturbed lithics to be exposed during the construction of the pipeline. As such, the site is of Generally Protected B (GP. B) or Medium Significance.



Figure 37. LSA Stone tools found at site

MCWAP Site 9

GPS Coordinates

S 24.348194

E 27.448361

Site Description

An Iron Age metalworking site was originally recorded by Botes (2010), who indicated that the site had been disturbed by infrastructural development. During the present fieldwork, the site was again visited. Only a small number of undecorated potsherds as well as a lump of clay could be identified on the surface of the site. This latter clay fragment may have originated from an iron smelting furnace or thick tuyère, albeit this is not certain at present.

Position of Site relative to Proposed Development

The site is located approximately 70m west of the pipeline route.

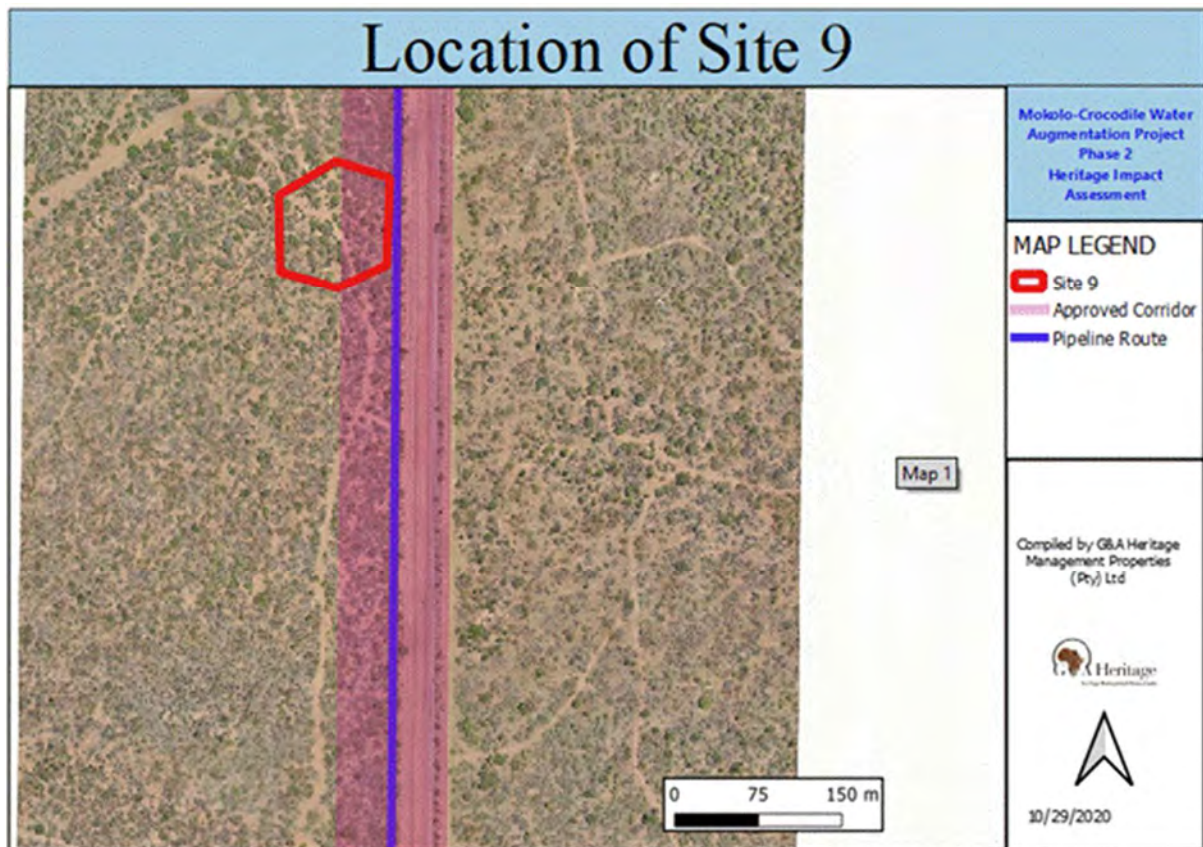


Figure 38. Location of MCWAP Site 9 relative to the pipeline route indicated in blue

Site Significance

At present only a small number of undecorated potsherds were observed on the surface of the site. However, the possibility exists for associated cultural material and features (such as furnaces) to be present as well. As such, the site is of Generally Protected B (GP. B) or Medium Significance.



Figure 39. Cultural material found at site

MCWAP Site 10

GPS Coordinates

S 23.913256

E 27.396624

Site Description

A scatter of slag was identified over a relatively small area. No associated cultural material such as potsherds or tuyères could be identified on the surface of the site.

The site is located in an area where the vegetation almost exclusively consists of juvenile Tamboti trees (*Spirostachys africana*). As a result, it seems likely for the immediate surroundings of the study area to have been disturbed. This may explain the lack of associated cultural material.

Site Extent

The site extends over an area approximately 15m by 15m in extent.

Position of Site relative to Proposed Development

The site is located within the proposed Borrow Pit 43.

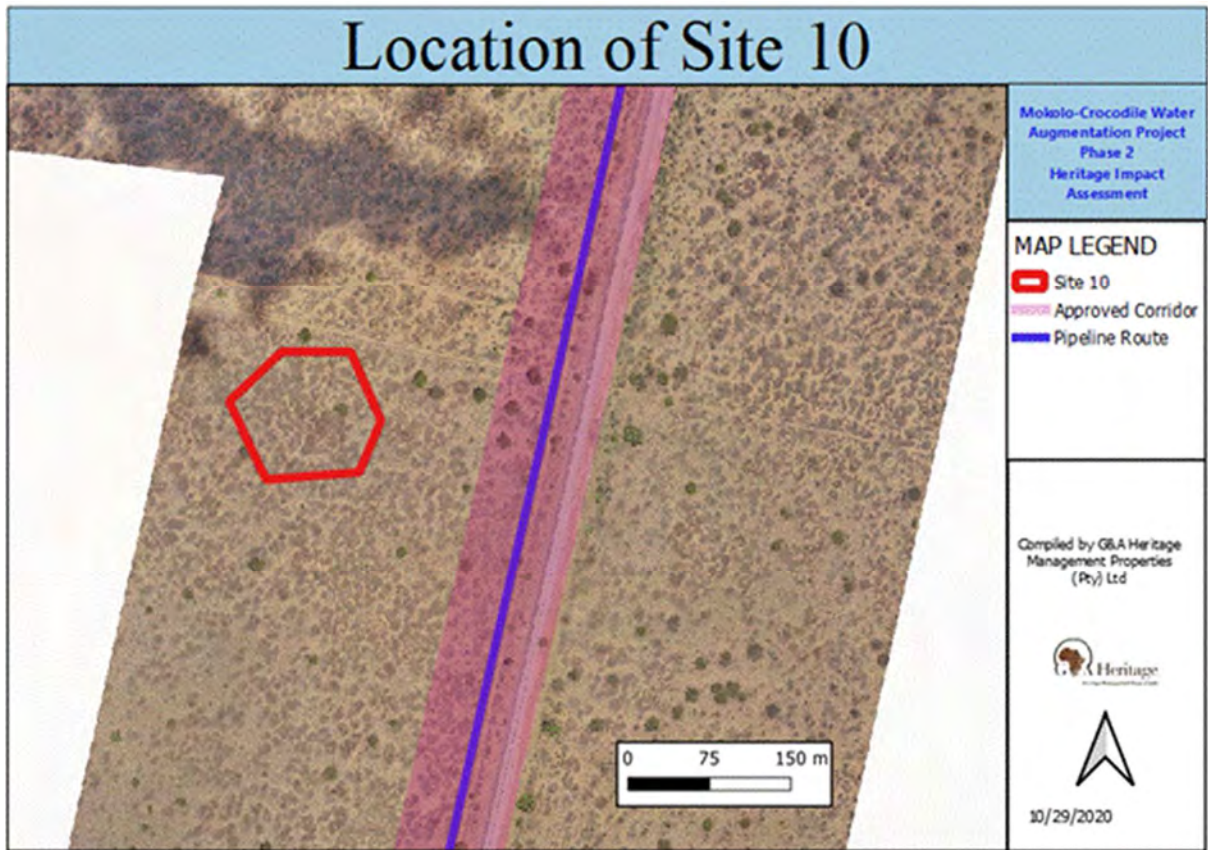


Figure 40. Location of MCWAP Site 10 relative to the pipeline route indicated in blue

Site Significance

At present only slag is visible on the surface of the site. However, the possibility exists for associated cultural material and features to be present as well. Furthermore, although large numbers of metal working sites are known from the Southern Waterberg, such sites are not so well documented from the wider surroundings of Steenbokpan. As such, the site is of Generally Protected B (GP. B) or Medium Significance.



Figure 41. Surface scatter of slag

MCWAP Site 11

GPS Coordinates

S 23.873112

E 27.391921

Site Description

The poorly preserved remains of two mud-brick structures are located here. These structures appear to have been the remains of a black homestead. The site is in a poor condition and all that remains are the rectangular mud-brick foundations of the two structures. Cultural material such as imported ceramic fragments, metal and glass objects and bone were observed on the surface of the site. An ash midden was also identified a short distance east of the structures.

Neither the First nor Second Editions of the 2327CD Topographical Sheets depict any homesteads or structures in proximity to this site.

Based on the information that is presently available, it seems highly likely that the site was built and used by black people, possibly black farm workers. Past experience has shown that in some cases stillborn babies were buried in close proximity to the homes of their parents and especially along the

sides of the parents' dwelling. This seems to be especially true for older sites. As this site is no longer occupied, no direct information regarding the presence (or not) of stillborn graves is known.

Site Extent

The site extends over an area approximately 50m by 50m in extent.

Position of Site relative to Proposed Development

The site is located 1,7km from the proposed pipeline route and will not be affected.

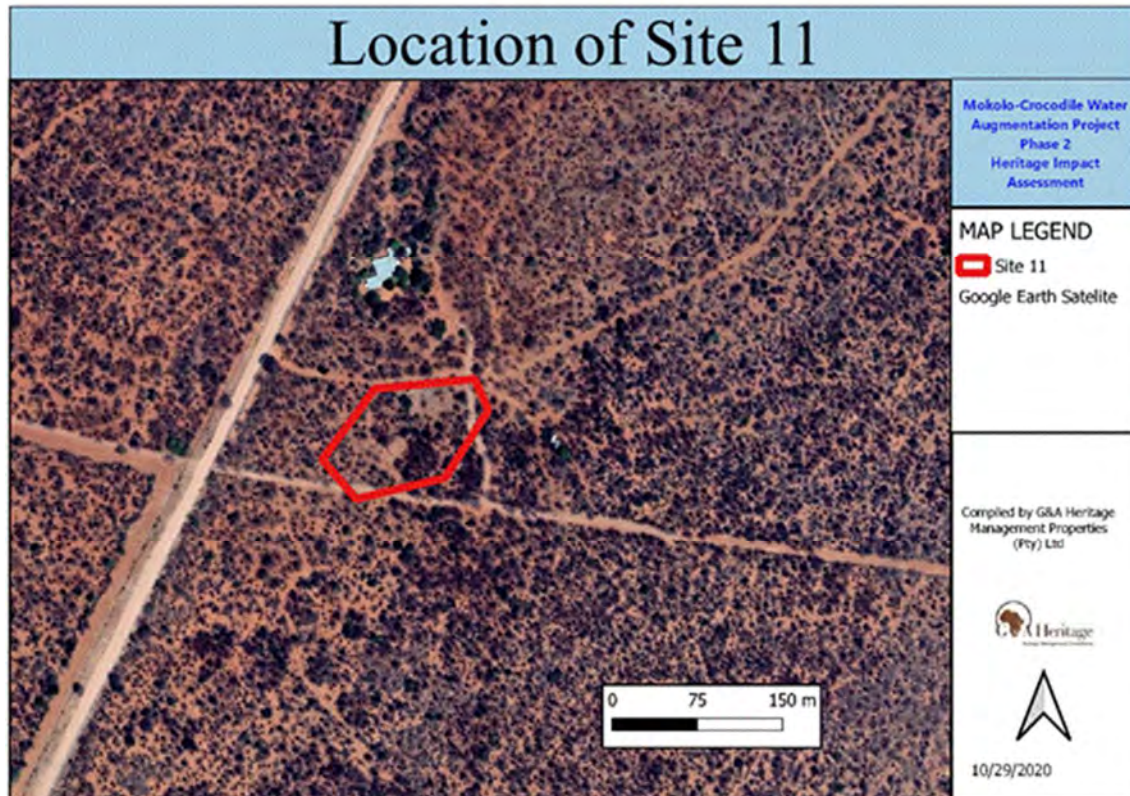


Figure 42. Location of MCWAP Site 11

Site Significance

Until such time that the presence of graves at this site has been confirmed or disproved, the site must be viewed as containing graves. All graves have high levels of emotional, religious and in some cases historical significance. As such, the site is of Generally Protected A (GP. A) or High/Medium Significance. This indicates that the site may not be impacted upon without prior mitigation.



Figure 43. Remains of mud-brick structures

MCWAP Site 12

GPS Coordinates

S 23.778520

E 27.298500

Site Description

The site comprises a number of features and objects which all suggest that a black homestead(s) used to be located here.

Evidence for the presence of a former homestead(s) include an ash midden as well as cultural material in the form of metal and glass fragments. Examples of these artefacts observed on the surface of the site include a metal handle, tins and glass bottle fragments. A hedge of trees that were evidently planted in a rectangular shape, also forms part of the site. Similar rectangular planted hedges are found in a number of other places on the same farm.

The First Edition of the 2327CD Topographical Map Sheet that was surveyed in 1969 depicts a building in close proximity to the site. This building is again depicted on the Second Edition of the same map sheet that was surveyed in 1980. It is therefore clear that the site is at least 49 years old.

Based on the information that is presently available, it seems highly likely that the site was built and used by black people, possibly black farm workers. Past experience has shown that in some cases stillborn babies were buried in close proximity to the homes of their parents and especially along the

sides of the parents' dwelling. This seems to be especially true for older sites. As this site is no longer occupied, no direct information regarding the presence (or not) of stillborn graves here is known.

Site Extent

The site extends over an area approximately 70m x 70m.

Position of Site relative to Proposed Development

The site coordinates are located 13,4km from the pipeline route and will not be affected.

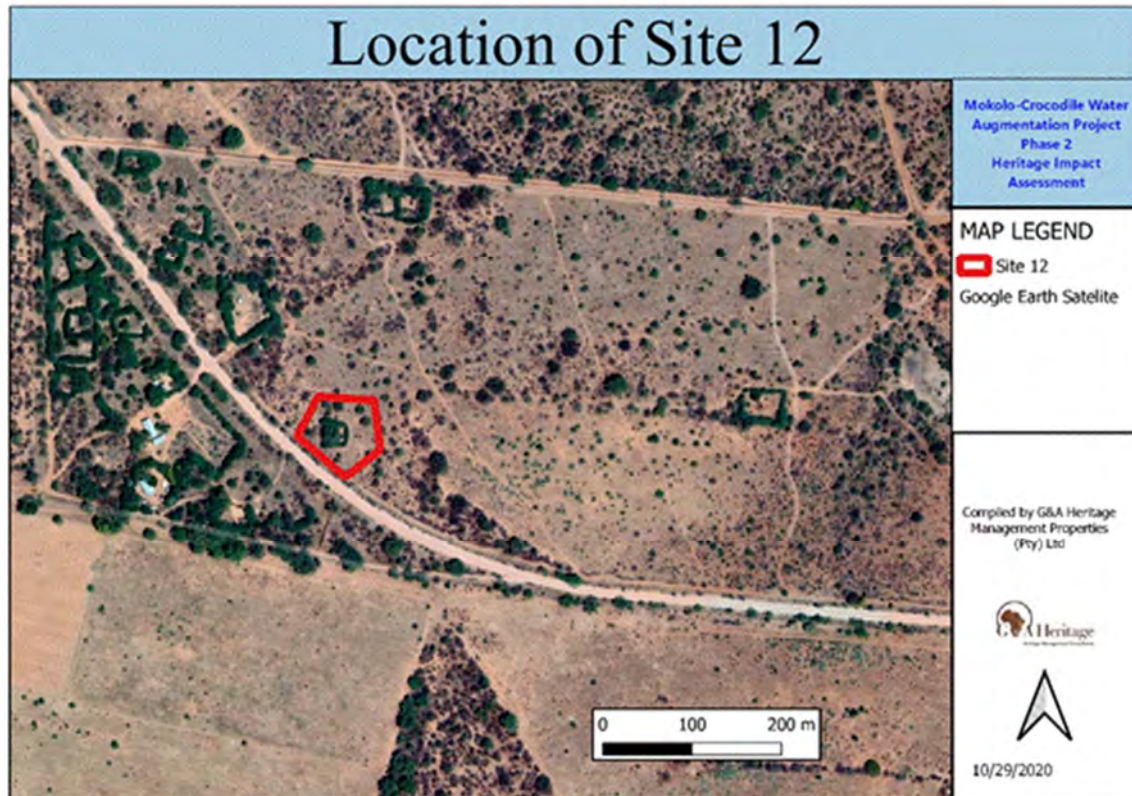


Figure 44. Location of MCWAP Site 12

Site Significance

Until such time that the presence of graves at this site has been confirmed or disproved, the site must be viewed as containing graves. All graves have high levels of emotional, religious and in some cases historical significance. As such the site is of Generally Protected A (GP. A) or High/Medium Significance. This indicates that the site may not be impacted upon without prior mitigation.



Figure 45. Ash midden located at the site

MCWAP Site 13

GPS Coordinates

S 23.777485

E 27.297290

Site Description

A cemetery is located a short distance north-east of the gravel road between Vaalwater and Lephalale. The cemetery was evidently used as a burial ground by the Moyo family, and contains two graves associated with this family. All the graves from this cemetery are orientated from west to east, with the headstones on the west. The two graves will be individually discussed below.

- The first of the two graves to be individually discussed, has na elaborate granite headstone comprising a central upright slab that is flanked by two pillars suporting a horizontal slab. The dressing itself comprises a rectangular granite slab. Grave goods observed on the grave dressing include flowers as well as bricks. The bricks are likely used to support flower vases. The inscription appearing on the granite headstone is illustrated and shown below.
- The second of the two graves to be individually discussed, has an identical granite headstone as the previous grave. The dressing on this grave is granite-lined with pebbles placed across

the grave surface. The inscription appearing on the granite headstone is illustrated and shown below.



Figure 46. Headstone of first grave

Site Extent

The site extends over an area approximately 10m x 10m.

Position of Site relative to Proposed Development

The site is located approximately 13,4km from the pipeline route and will not be affected.

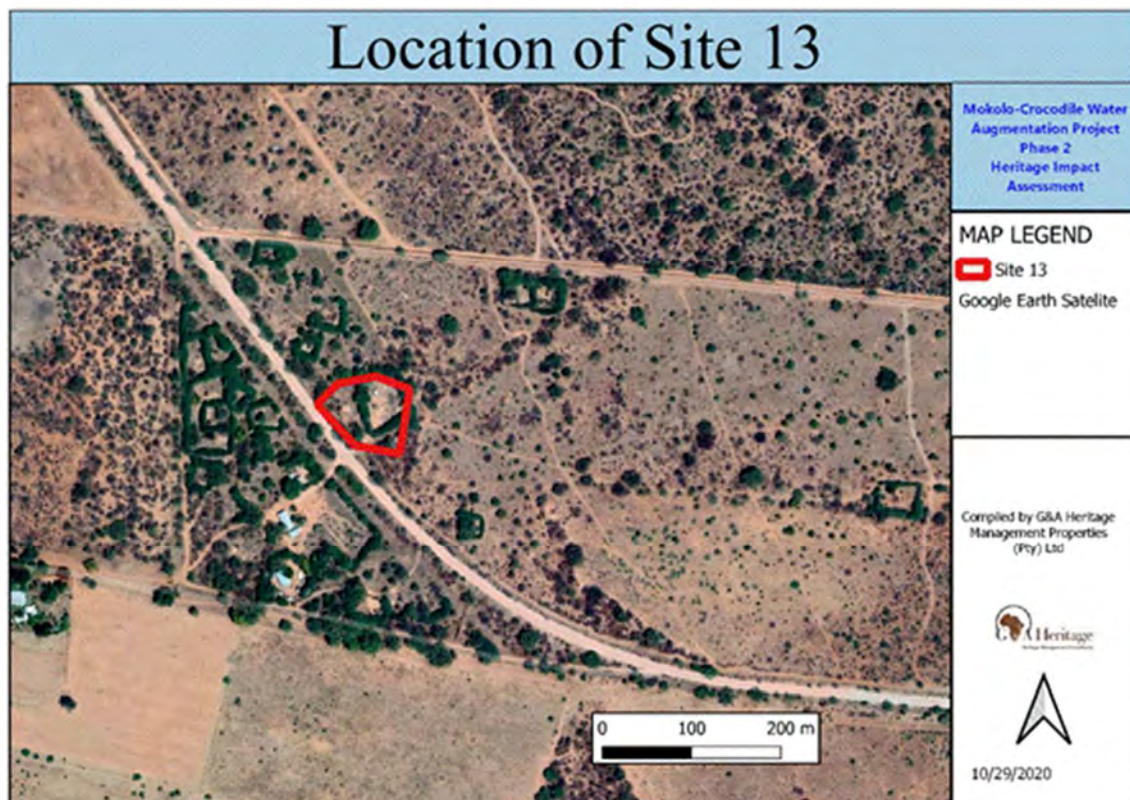


Figure 47. Location of MCWAP Site 13

Site Significance

It is important to understand that graves and cemeteries have significant heritage value. Such graves and cemeteries also have significant value to the relevant families. As a result, the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way. Please refer Section 8 of the appended 2018 HIA report for the required mitigation measures.

MCWAP Site 14

GPS Coordinates

S 23.748636

E 27.286384

Site Description

Five cement headstones were identified on the western edge of the gravel road between Vaalwater and Steenbokpan. The site is located approximately 4.5km south by south-east of Steenbokpan.

Four of the headstones were found to be lying flat on the ground with one headstone still upright, albeit this upright headstone was evidently also disturbed as it is very loose. No inscriptions could be seen on any of the headstones.

It is not presently clear whether these headstones still mark the position of a cemetery, or whether they were removed from a cemetery located somewhere else. Until such time that suitable mitigation can be undertaken, the site must be viewed as containing graves.

No graves or homesteads are depicted on the First and Second Editions of the 2327CB Topographical Map Sheets. The only associated feature depicted on both these maps is an extensive agricultural field located west of the gravel road.

Site Extent

The site extends over an area approximately 10m x 10m.

Position of Site relative to Proposed Development

The site is located 13,7km from the pipeline route and will not be affected.

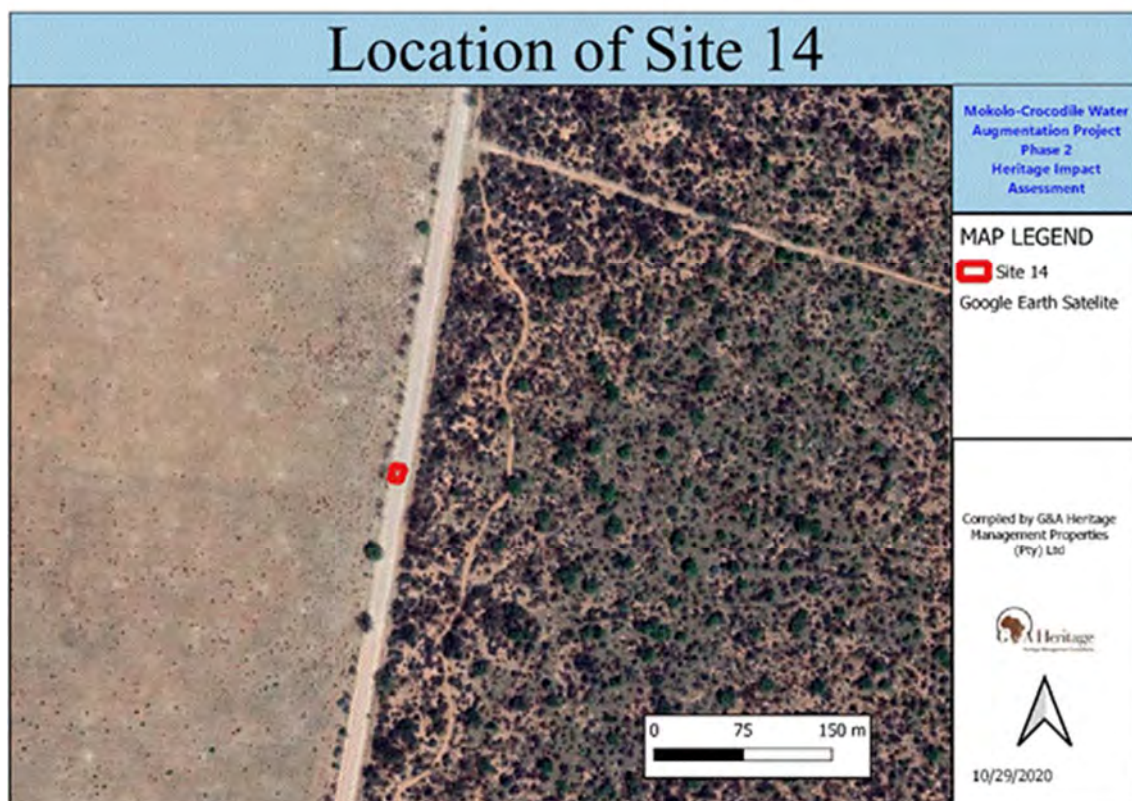


Figure 48. Location of MCWAP Site 14

Site Significance

Until such time that the presence of graves at this site has been proven or disproven, the site must be viewed as containing graves. It is important to understand that graves and cemeteries have significant heritage value and as a result the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way. Please refer Section 8 of the appended 2018 HIA report for the required mitigation measures.



Figure 49. Second set of graves

MCWAP Site 15

GPS Coordinates

S 23.743007

E 27.286116

Site Description

The site comprises one of the original farm dwellings on the farm Schuldpadfontein 328 LQ. It comprises a rectangular brick building that sits on a stone foundation. The building has a hipped corrugated iron roof. An unplastered brick verandah is located on the north-eastern façade of the building and was likely added at a later stage. A third phase in the construction of the building comprises a brick addition that was added to the north-western façade of the dwelling.

The farmhouse is associated with two brick rondavels located a short distance to the east. One of these rondavels has a thatch roof with the roof on the other rondavel completely missing.

The First Edition of the 2327CB Topographical Sheet that was surveyed in 1969 depicts a building here. The same building is again depicted on the Second Edition of the same map sheet that was surveyed in 1980. The depiction of the site on the 1969 map sheet indicates that the farmhouse is at least 49 years old. As a result, the building is can highly likely be older than 60 years.

Site Extent

The site extends over an area approximately 50m x 50m.

Position of Site relative to Proposed Development

The closest component of the site to the proposed development is one of the rondavels, which is located approximately 13,8km from the pipeline route and will not be affected.



Figure 50. Location of MCWAP Site 15

Site Significance

The farmhouse is quite likely older than 60 years. The site is relatively unique in that not many other farmsteads of a similar age were identified during the fieldwork. As a result, the site is deemed to be of Medium Significance and is rated as Generally Protected B (GP.B).



Figure 51. Abandoned homestead

MCWAP Site 16

GPS Coordinates

S 23.859948

E 27.399643

Site Description

The poorly preserved remains of a structure are located here. It is not presently certain what the original function of this structure was, however, it is possible that it was a black homestead.

The site is in a poor condition and all that remains are heaps of cement bricks. Very little evidence for cultural material could be seen. This said, a large ash midden was observed.

Neither the First or Second Editions of the 2327CD Topographical Sheets depict any homesteads or structures in proximity to this site.

Based on the information that is presently available, it seems possible that the site was used by black people, possibly black farm workers. Past experience has shown that in some cases stillborn babies were buried in close proximity to the homes of their parents and especially along the sides of the parents' dwelling. This seems to be especially true for older sites. As this site is not occupied anymore, no direct information with regards to the presence (or not) of stillborn graves is available.

Site Extent

The site extends over an area approximately 50m x 50m.

Position of Site relative to Proposed Development

The site is located 1,23km from the pipeline route and will not be affected.

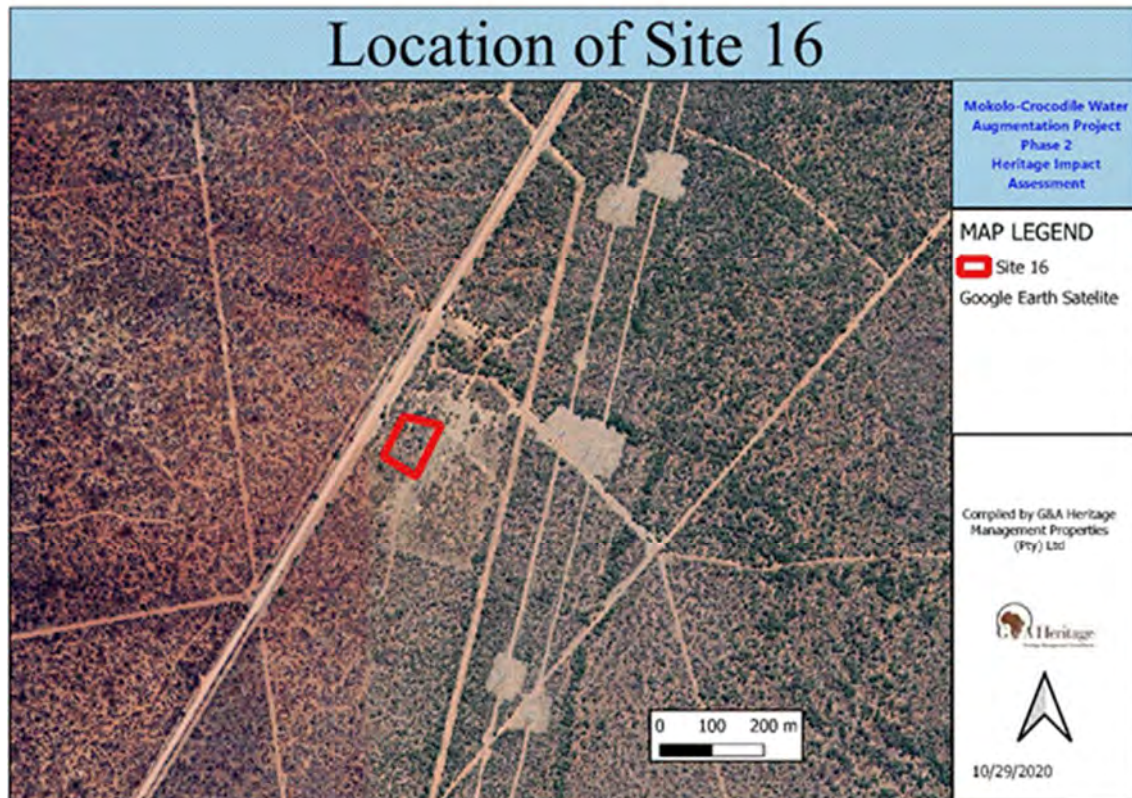


Figure 52. Location of MCWAP Site 16

Site Significance

Until such time that the presence of graves at this site has been confirmed or disproved, the site must be viewed as containing graves. All graves have high levels of emotional, religious and in some cases historical significance. As such the site is of Generally Protected A (GP. A) or High/Medium Significance. This indicates that the site may not be impacted upon without prior mitigation.



Figure 53. Foundation remains found on site

MCWAP Site 17

GPS Coordinates

S 23.852039

E 27.398706

Site Description

The site comprises a small, loosely packed stone concentration that supports a cross made from two branches bound together with wire. The site is located near a low rocky ridge and is situated approximately 42m north-east of the fenced farmhouse / hunting camp on the farm.

Although the stone concentration with wooden cross appears to be a grave, no inscriptions or grave goods could be identified.

It is not presently known if the site simply represents a memorial to a deceased loved one or if it marks the position where the ash of a deceased loved one was placed.

Site Extent

The site extends over an area approximately 5m x 5m.

Position of Site relative to Proposed Development

The site is located 1,49km from the pipeline route and will not be affected.

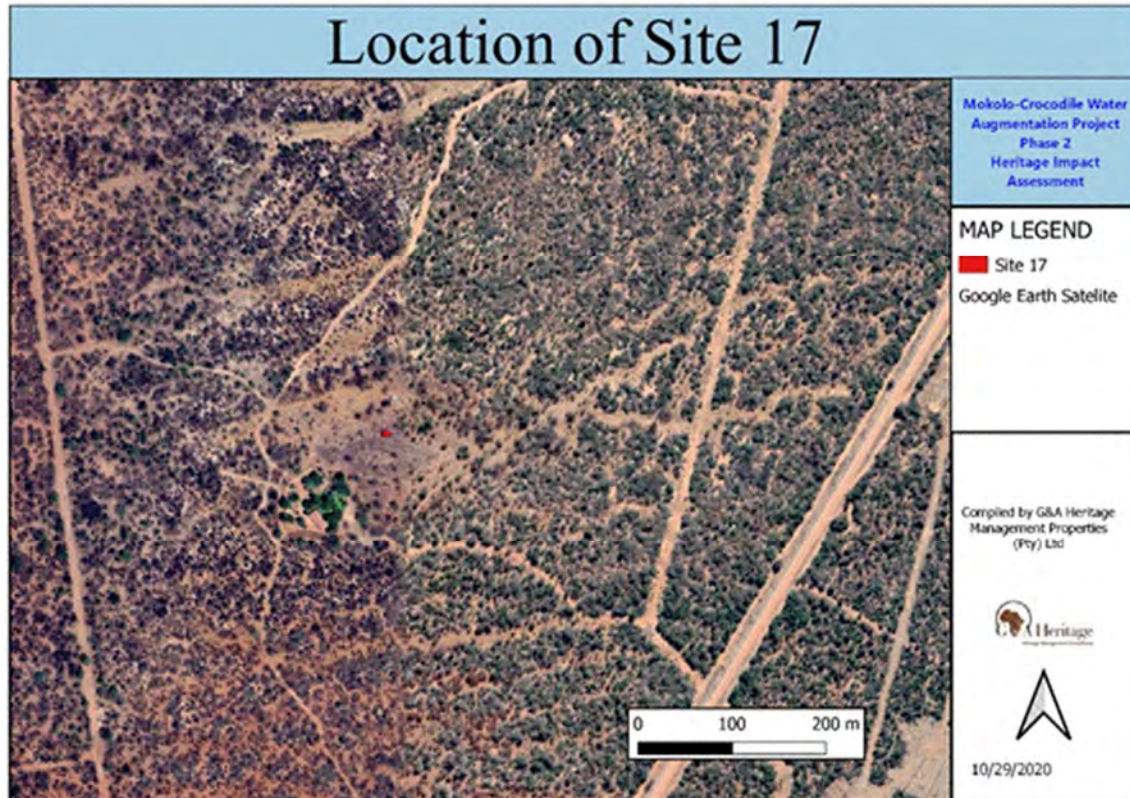


Figure 54. Location of MCWAP Site 17

Site Significance

Until such time that the exact origin and function of the site can be confirmed, the site must be viewed as of very high emotional and possibly religious significance. As a result the site is deemed to be of High/Medium Significance and is rated as Generally Protected A (GP.A). Mitigation measures and permits are therefore required before the site may be affected in any way.



Figure 55. Possible burial site

MCWAP Site 18

GPS Coordinates

S 23.774630

E 27.372313

Site Description

A very low-density surface scatter of three Stone Age lithics were identified around a small pan.

Site Extent

The site extends over an area approximately 50m x 50m.

Position of Site relative to Proposed Development

The site is located 5,78km from the pipeline route and will not be affected.

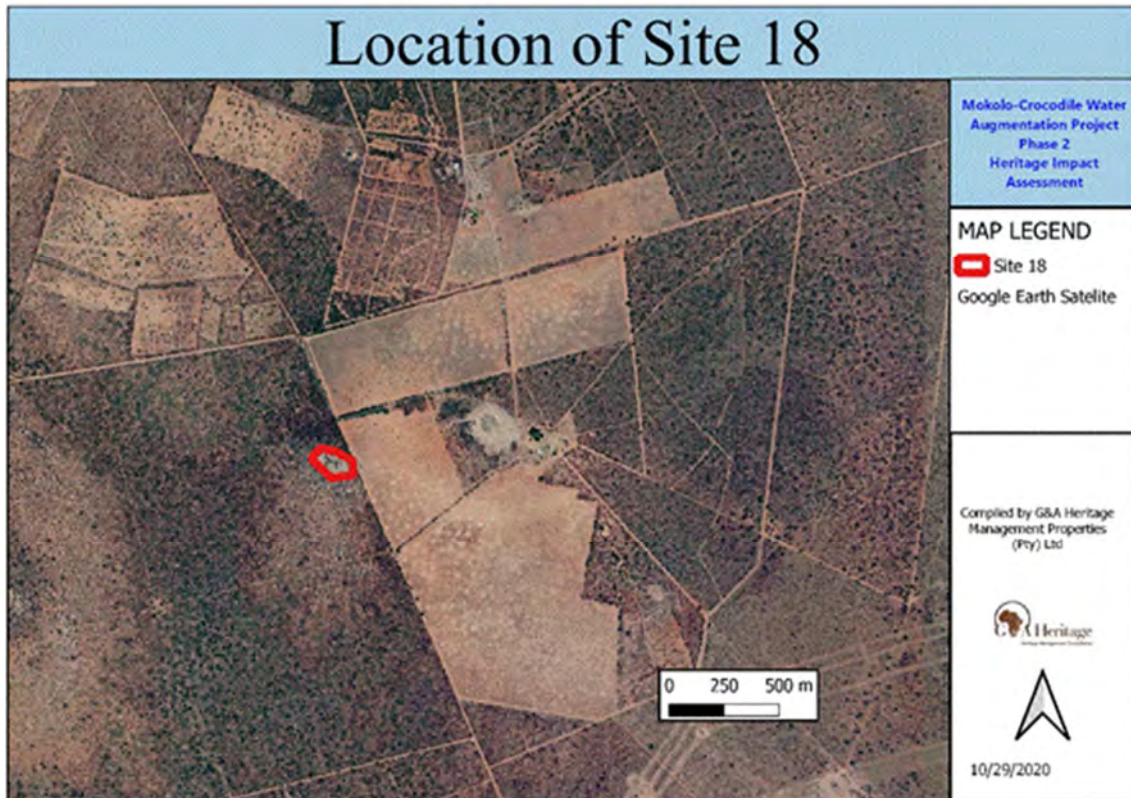


Figure 56. Location of MCWAP Site 18

Site Significance

The site comprises only a low density surface scatter of a small number of lithics. As such, the site is of Generally Protected C (GP. C) or Low Significance. This indicates that no mitigation is required.



Figure 57. Pan with possible Stone Age artifacts

Palaeontology

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Desktop Assessment Report for the proposed MCWAP-2A Project. According to the National Heritage Resources Act (No 25 of 1999, section 38), a palaeontological impact assessment is key to detect the presence of fossil material within the proposed development footprint and it is thus necessary to evaluate the impact of the construction on the palaeontological resources.

The proposed MCWAP-2A development is underlain by various geological sediments. These geological sediments are shown in the table below.

Table 1. Geological sediments underlying the project area

Era	Supergroup/Sequence	Group	Subgroup	Formation	Sensitivity
<u>Mokolien</u>		Waterberg	<u>Kransberg</u>		Low
			<u>Matlabas</u>		
			<u>Nylstroom</u>		
<u>Vaalian</u>	<u>Bushveld Complex;</u> <u>Lebowa Granite Suite</u>				Zero
	<u>Transvaal Supergroup</u>	Pretoria		Black Reef	Moderate
		<u>Chuniespoort</u>	<u>Malmani</u>		
<u>Randian</u>		<u>Buffelsfontein</u>			Moderate

But the Malmani Subgroup of the Chuniespoort Group (Transvaal Group) has a high Palaeontological sensitivity.

According to the SAHRIS PalaeoMap, it is recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required (pending the discovery of newly discovered fossils) in geological sediments with a low, very low and moderate Palaeontological Sensitivity. The majority of the proposed development is thus deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. All route alternatives were found to be in the above-mentioned geological sediments and therefore none of the routes were preferred above the other and none were a no-go option.

However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (e.g. museum or university collection) and all fieldwork and

reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

But the Malmani Subgroup of the Chuniespoort Group (Transvaal Group) has a high Palaeontological sensitivity. The proposed development of the central pipeline is underlain by the Malmani Subgroup development and thus has a high palaeontological sensitivity. It is thus recommended that an EIA level palaeontology report will be conducted to assess the value and prominence of fossils in the central pipeline development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

The impact risk is classified according to 5 classes as described in the table below.

Table 2. Impact risk classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for heritage resources above, an impact rating of 3.74 will fall in the Impact Class 4, which will be considered to be a High impact.

Table 3. Impact rating on palaeontological resources

Impact	Significance	Spatial scale	Temporal scale	Probability	Rating
	High	Study Area	Permanent	Very Likely	Moderate
Impact on Paleontology	4	5	5	4	3.74

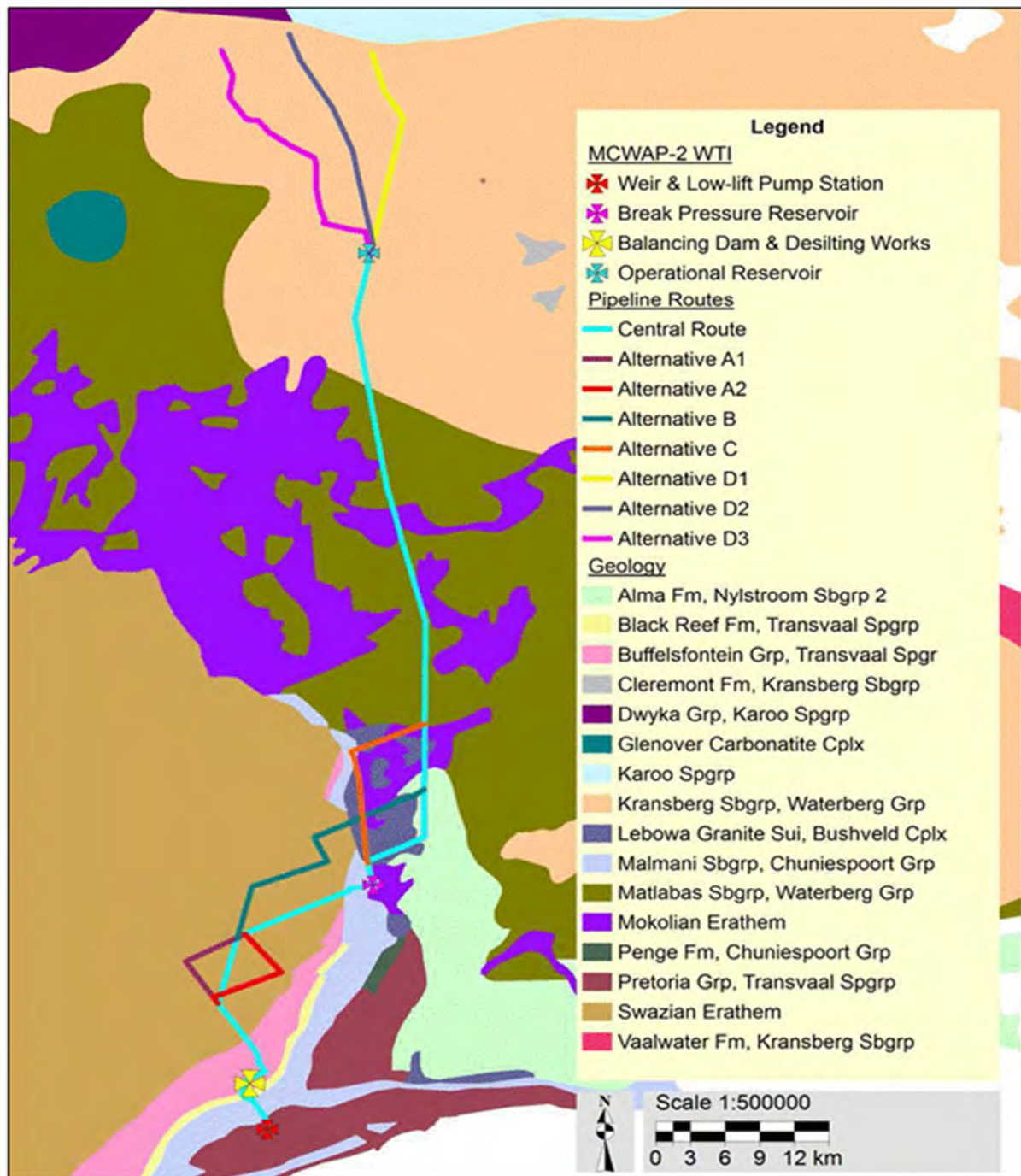


Figure 58. Geology of the study area,

Source: PGS HIA report July 2018

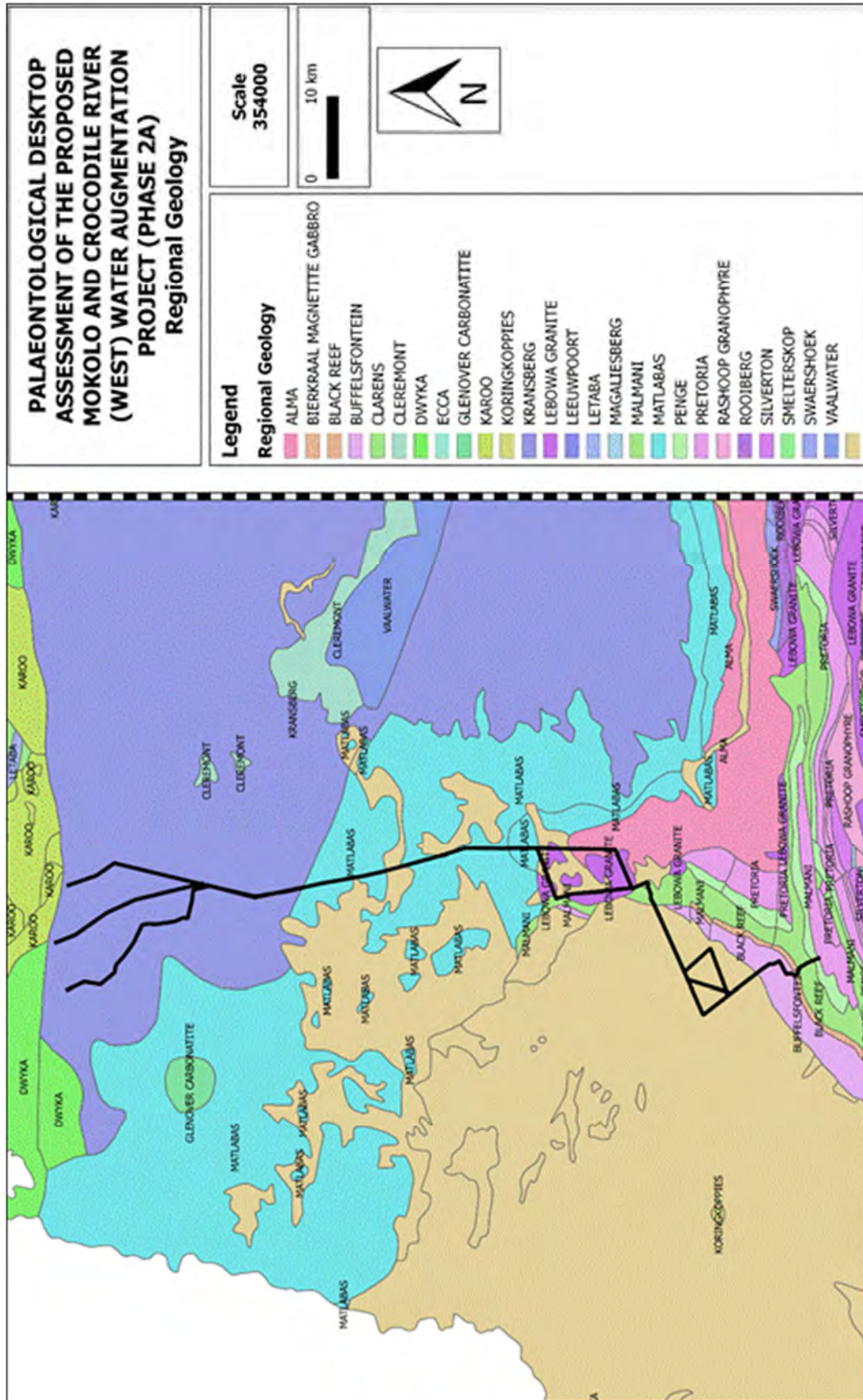


Figure 59. Geology of the development area

Source: PGS HIA report July 2018

2020 HIA Survey by G&A Heritage Properties (Pty) Ltd

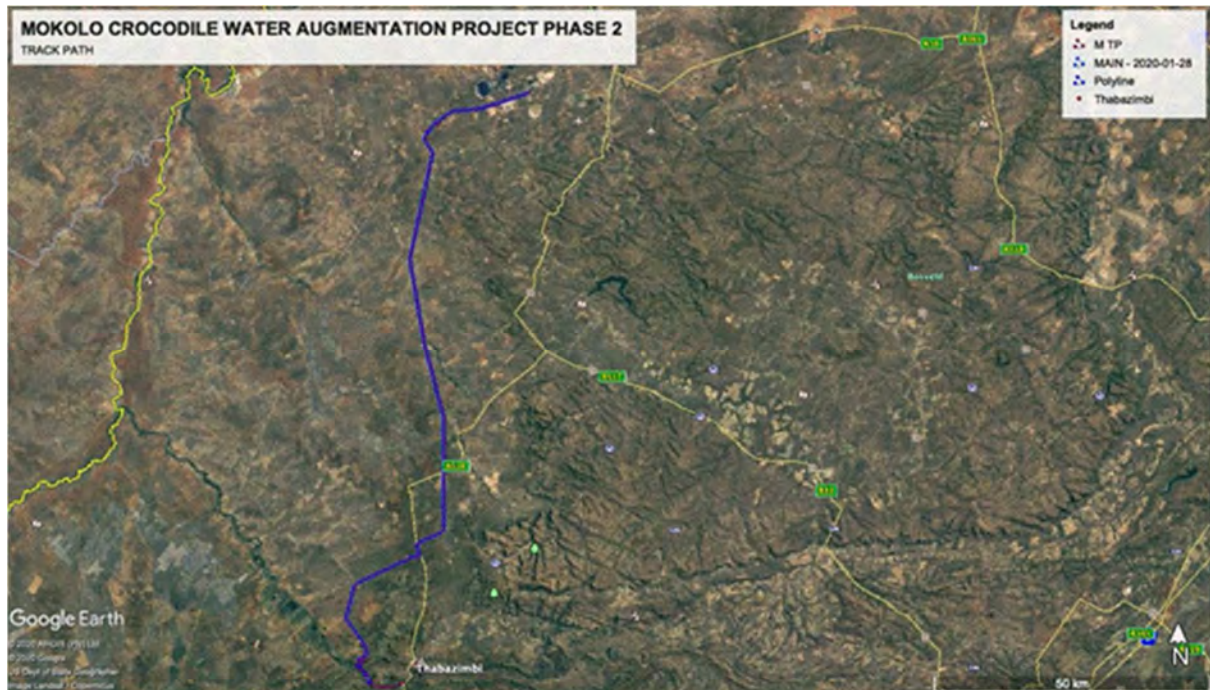


Figure 60. Overall track path

The GPS track path follows the alignment of the proposed pipeline. Due to the length of the study it is not possible to show all the close variations too the route since this would be illegible. If required, the GPX files can be obtained from G&A Heritage Properties (Pty) Ltd.

Remainder of the Farm Mooivallei 342KQ

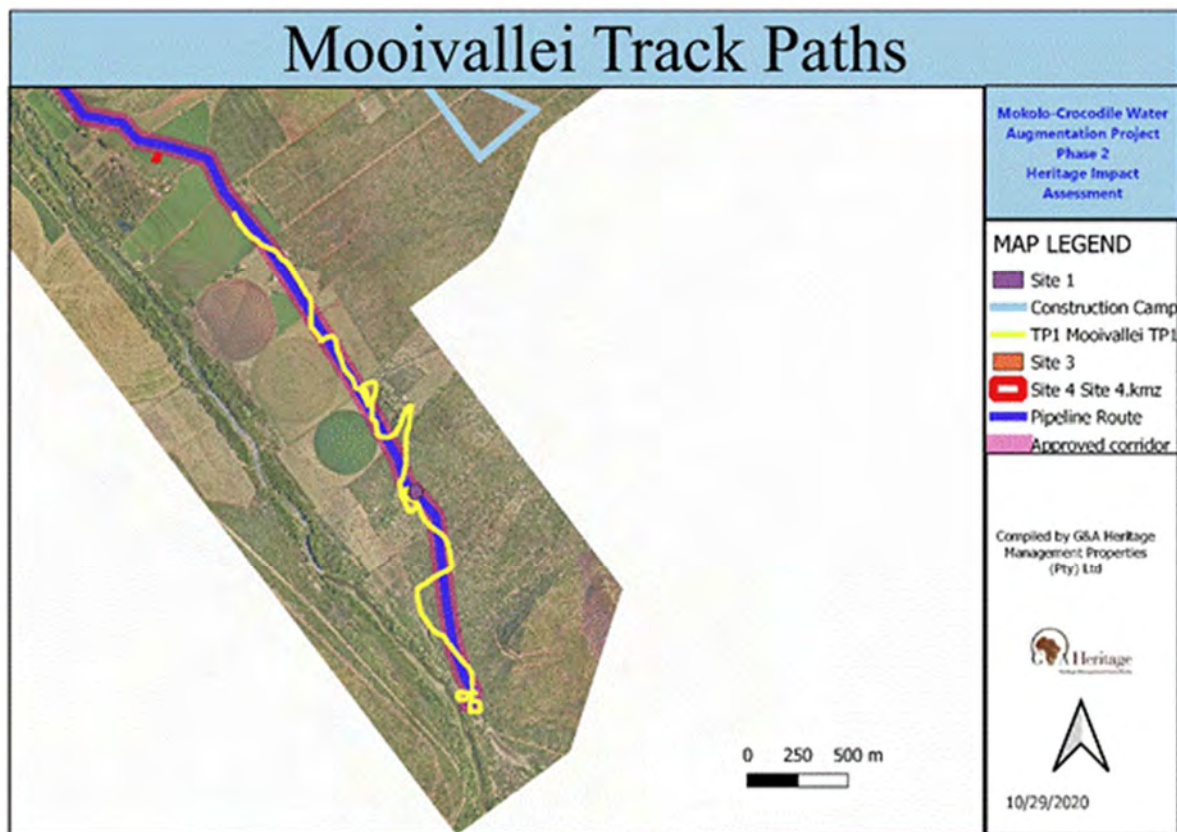


Figure 61. Mooivallei 342 KQ (track paths in yellow)

This site was investigated, and no heritage sites could be identified. The most likely areas for occurrence was in the higher lying areas of the south, close to the river. Most of the rest of the alignment corridor passed through developed agricultural fields where any possible heritage sites have most likely been destroyed in the past.

Portion 4 of the Farm Rhenosterpan 361LQ

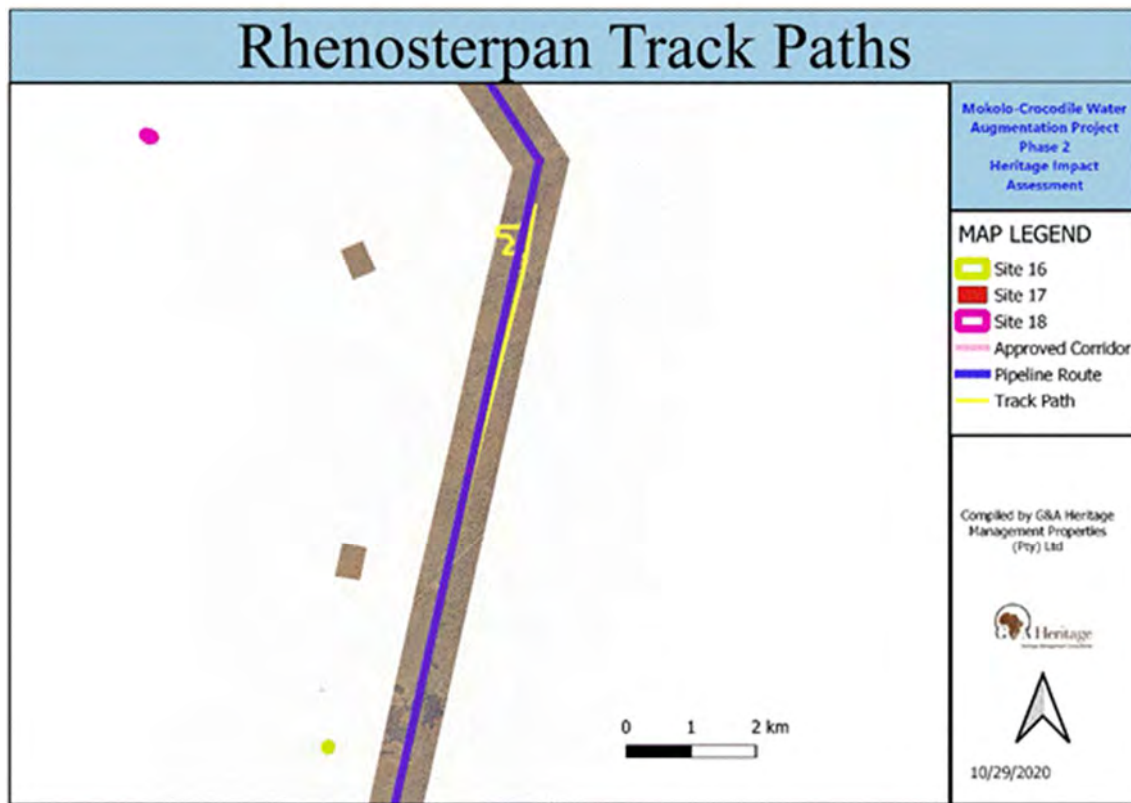


Figure 62. Rhenosterpan 361 LQ (track paths in yellow)

This property was accessed during the fieldwork survey however no sites of heritage significance could be identified along the proposed pipeline alignment. Towards the northeast of the site a few seasonal pans were observed and investigated for any Stone Age remains seeing as these are likely sites for such occurrences. None were note.

Portion 7 of the Farm Paarl 124KQ

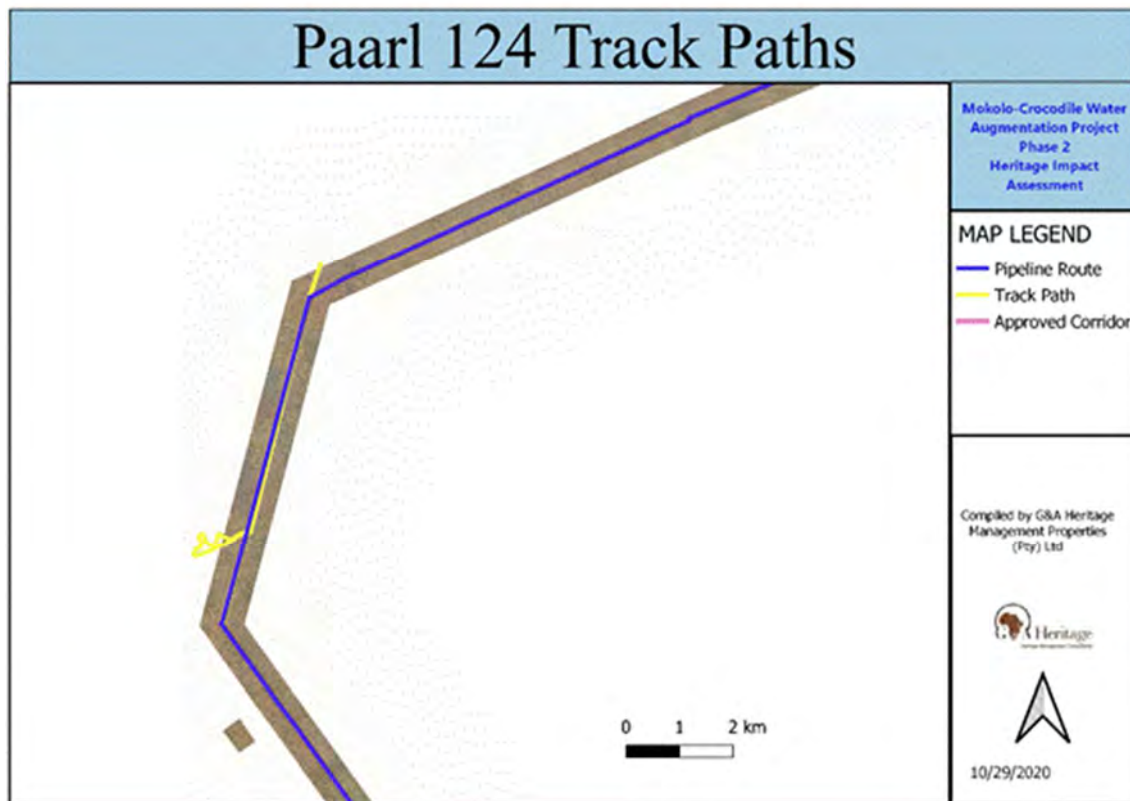


Figure 63. Paarl 124 KQ (track paths in yellow)

No sites were identified. Most of the alignment corridor overlaps the Eskom distribution lines corridor. The Paarl farm homestead is also located here; however, it was indicated by the facilitators that these structures would not be altered during the construction phase. Significant alterations have already occurred to the landscape due to the placement of the Eskom distribution lines.

Portion 6 of the Farm Paarl 124KQ

No sites could be identified here.

Remainder of the Farm Paarl 124KQ

No sites of heritage significance could be identified here.

Portion 1 of the Farm Leeuwbosch 129 KQ

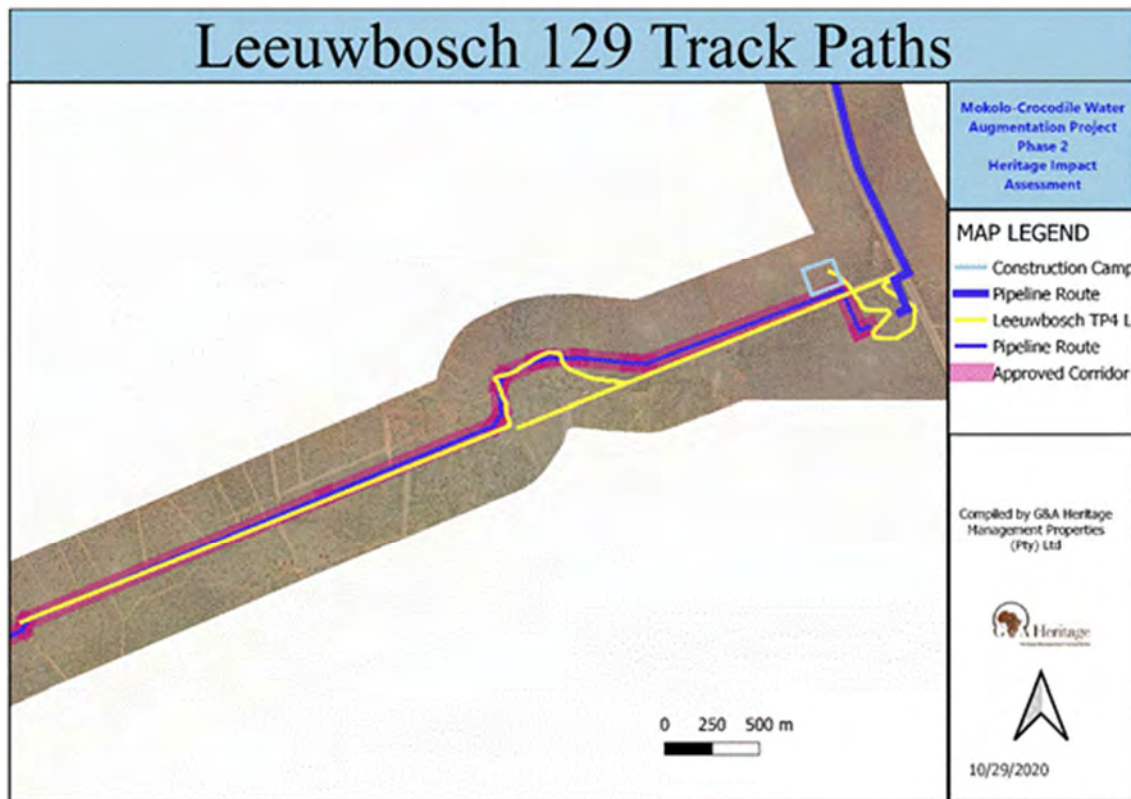


Figure 64. Leeuwbosch 129 KQ (track paths in yellow)

No sites were noted and according to current layouts the site will be minimally impacted upon.

Borrow Pit 41

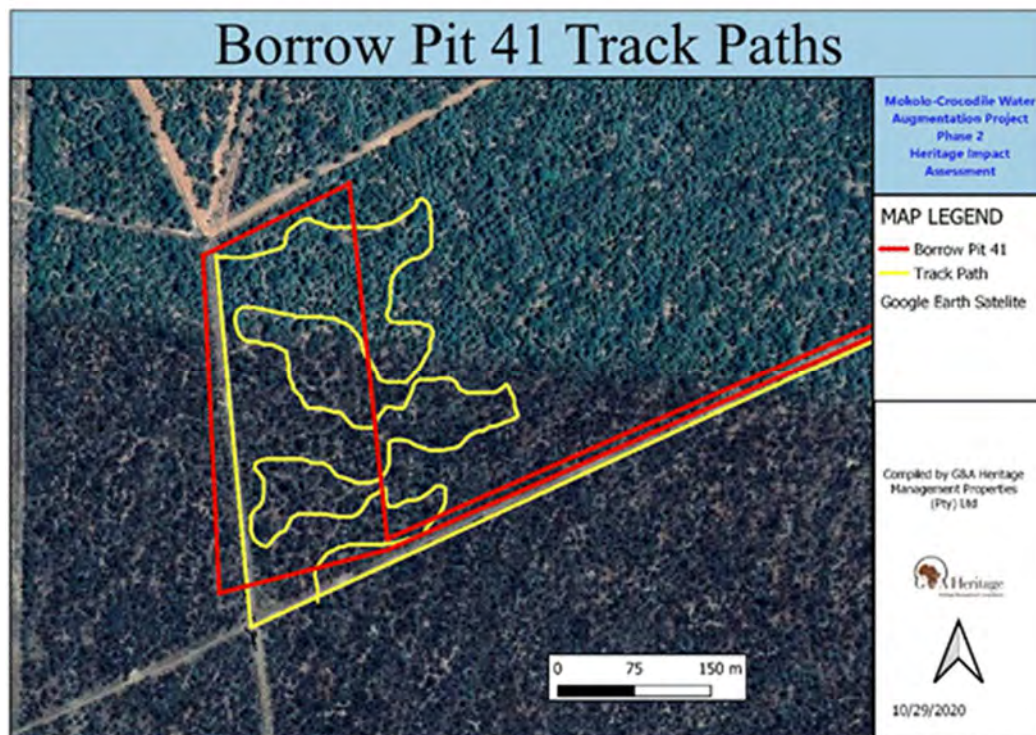


Figure 65. Borrow Pit 41 (track paths in yellow)

Investigations into this area was found to be difficult due to invader plant species such as Withaak and Sicklebush, however no indication could be found of any heritage sites. The access route will follow an existing farm road.

Remainder of the Farm Zyferbult

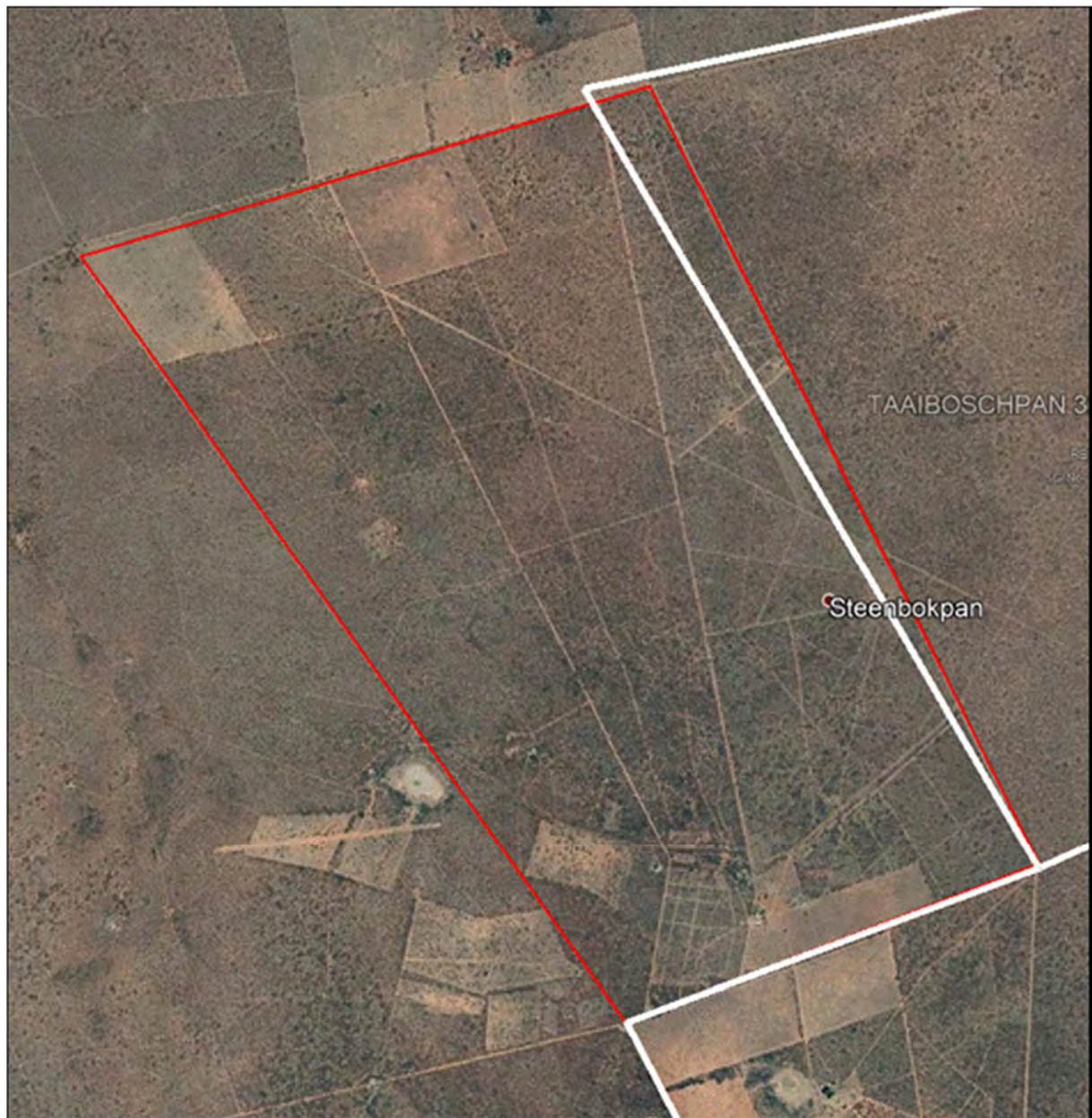


Figure 66. Farm Zyferbult indicated in red

This property was found to be well outside of the study area with no part of the pipeline crossing it and no borrow pits located on it.

Borrow Pit SS1

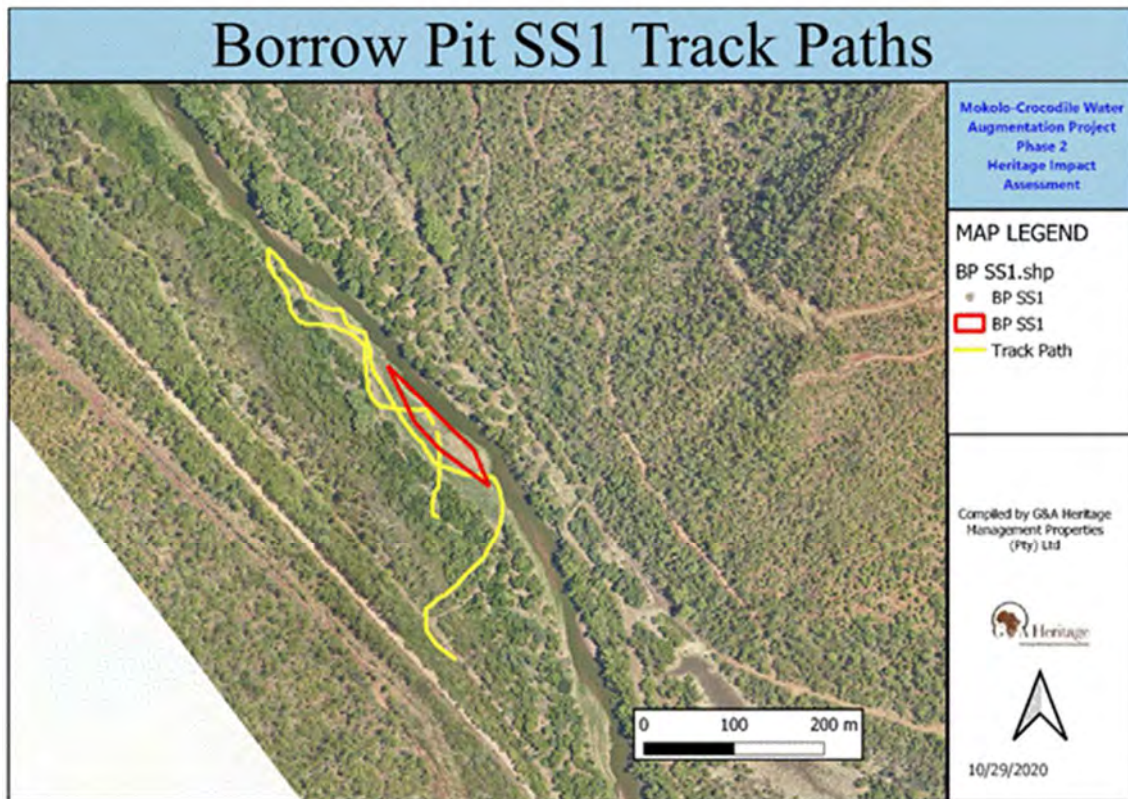


Figure 67. Borrow Pit SS1 indicated in green (track paths in yellow)

No heritage sites were anticipated for this borrow pit since it is located within the riverbed. The surrounding banks were investigated for any Stone Age deposits; however, none could be identified.

Borrow Pit 14

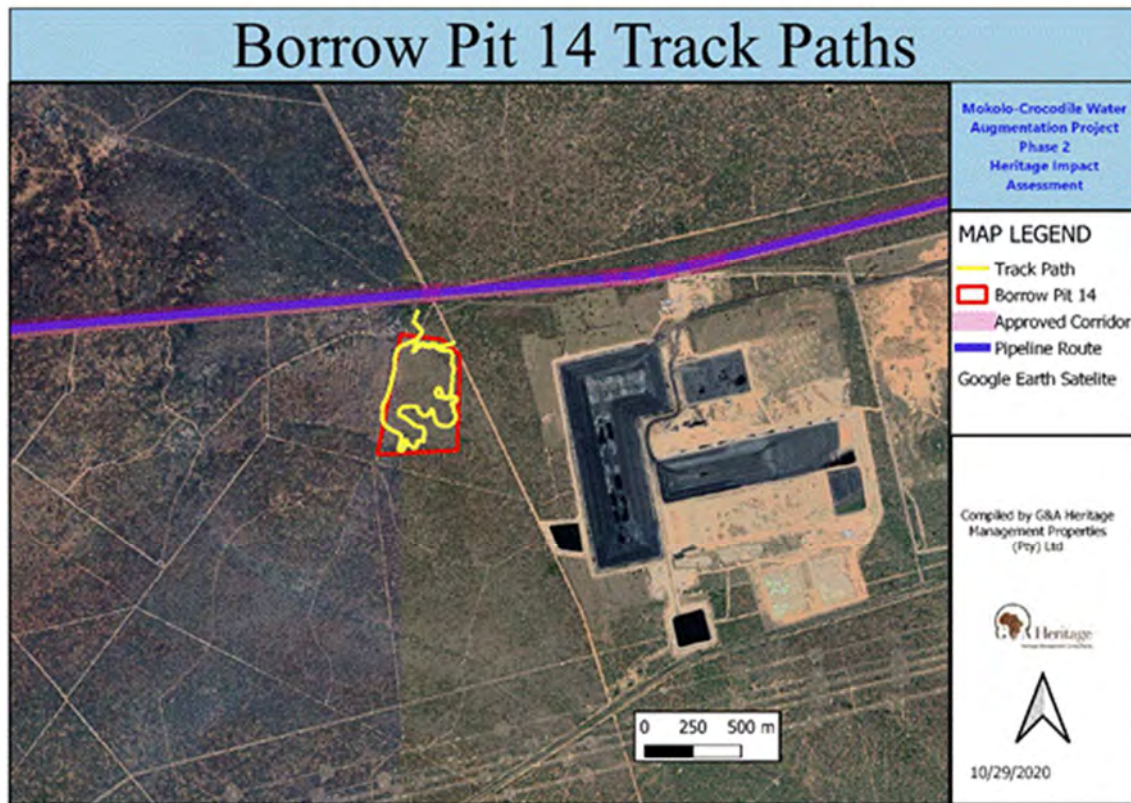


Figure 69. Borrow Pit 14

This site contained some recent buildings in the southwest and a single structure in the northwest. None of these are of heritage significance. The rest of the site is also located within an old agricultural field.

Borrow Pit 51

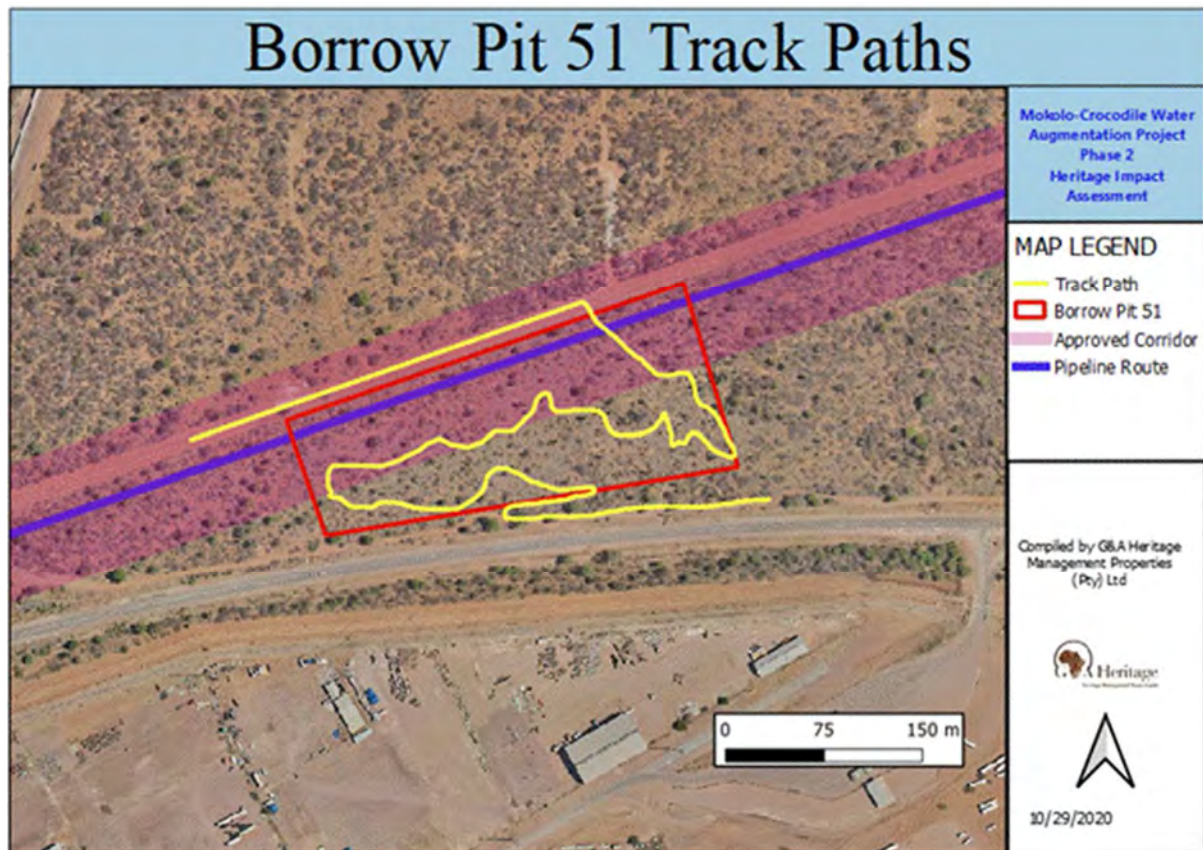


Figure 70. Borrow Pit 51 (track paths in yellow)

No sites were noted here. The proposed area is directly north of the Medupi power station and consists of large tracts of alluvial Kalahari sand tapering out into a wetland area.

Vlieëpoort weir

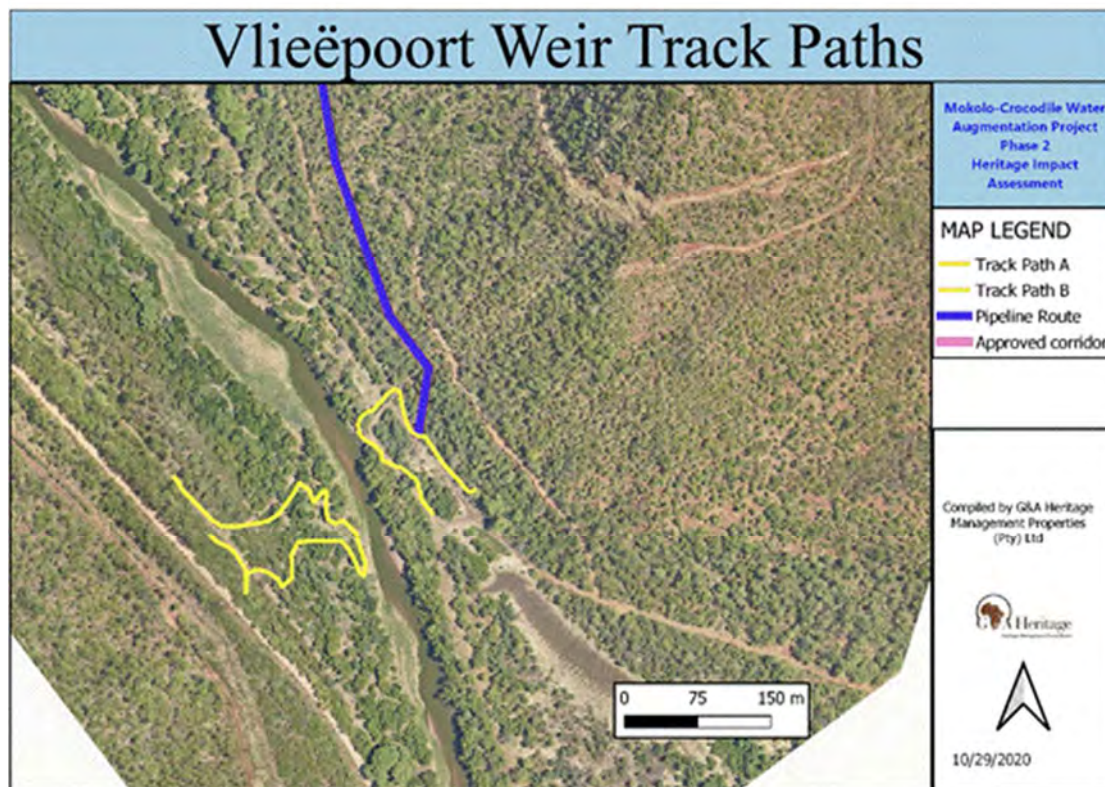


Figure 71. Vlieëpoort Weir (track paths in yellow)

Although this location seemed a likely area for occupation being next to the river, no such indicators could be found. It is likely that the location of these sites within the flood line precludes occupation or has destroyed or buried any such sites.

Existing Weir Sites

Three existing weir sites are earmarked for upgrading. These are the Paul Hugo, Sandrivier and Bierspruit Weirs. The age of these three sites were determined through analysis of the historic 1:50 000 topographic maps of the area. The oldest maps available from the Surveyor General's Office was the 1980 2427CB topographic map. The following maps will show that none of these structures are indicated on the 1980 map and therefore it can be assumed that none of them are older than 60 years and are therefore not of any heritage significance.

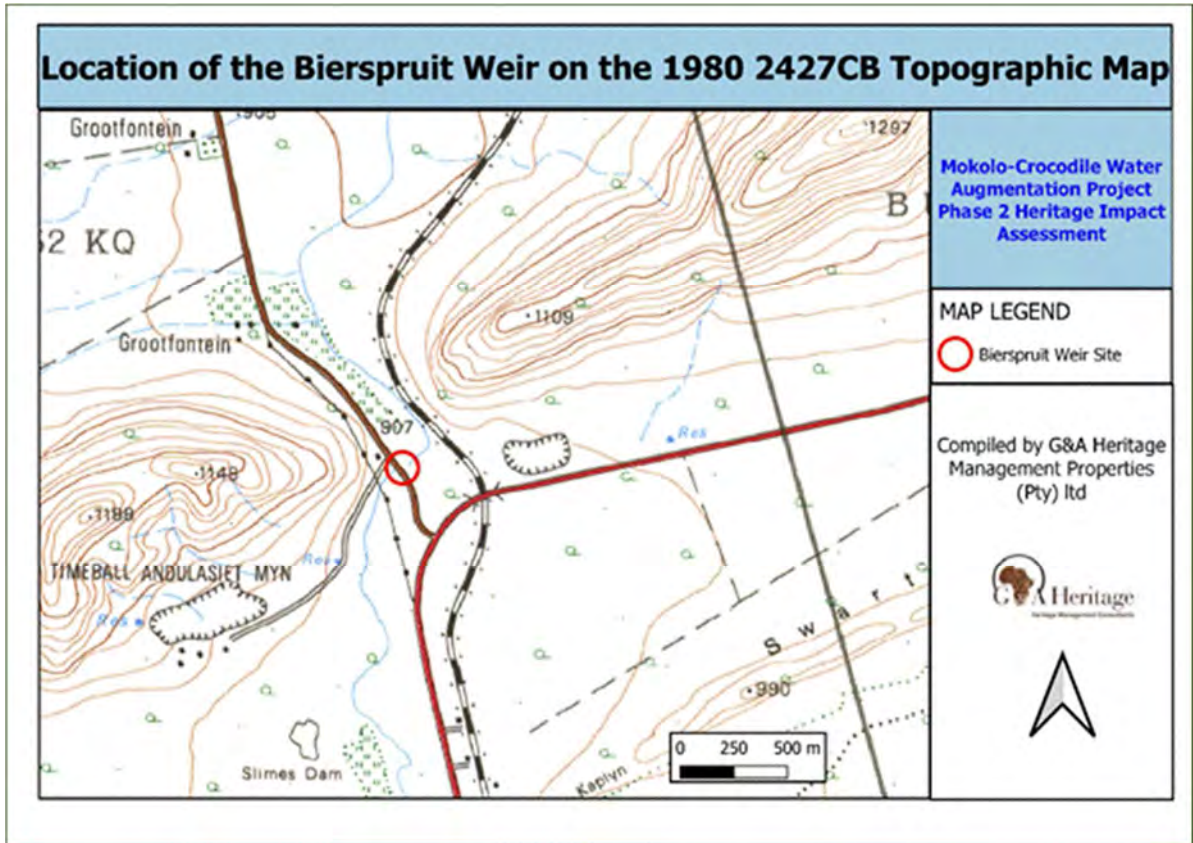


Figure 72. Location of Bierspruit Weir on 1980 Topographical Map

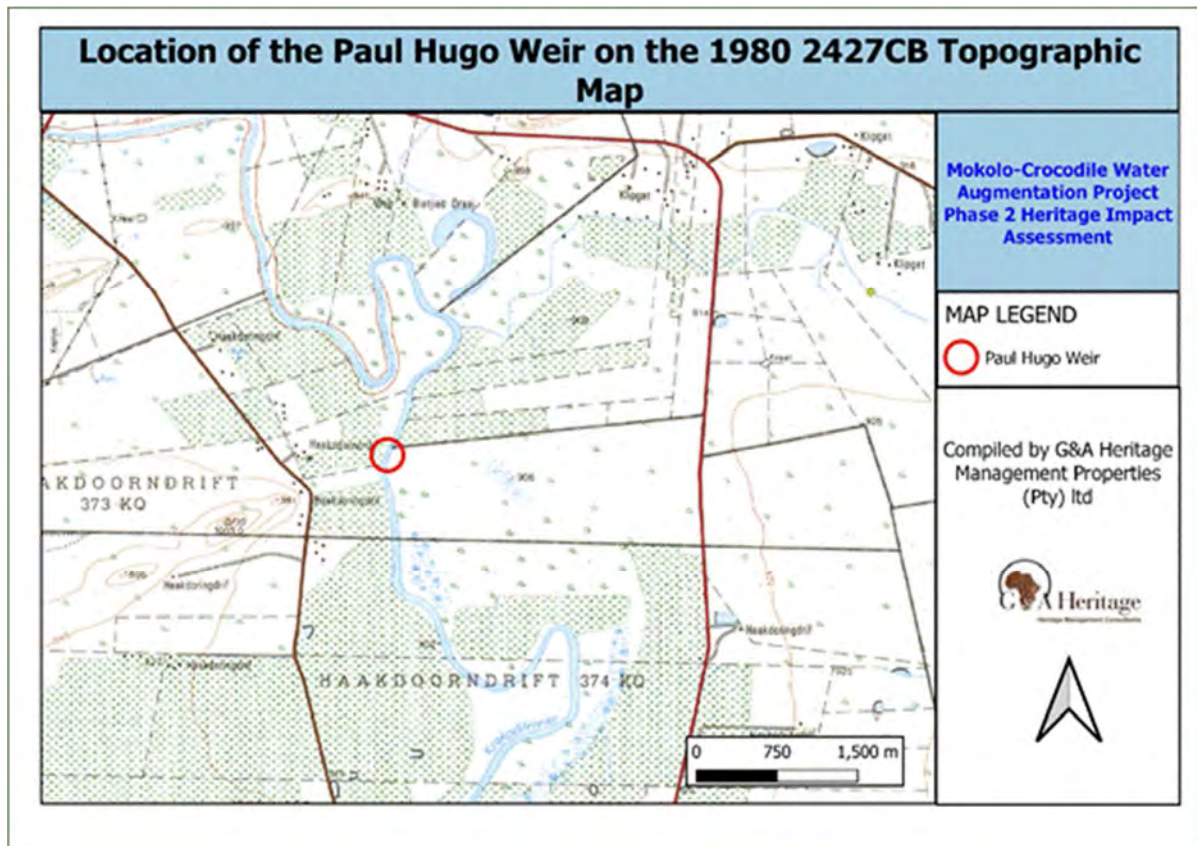


Figure 73. Location of Paul Hugo Weir on 1980 Topographical Map

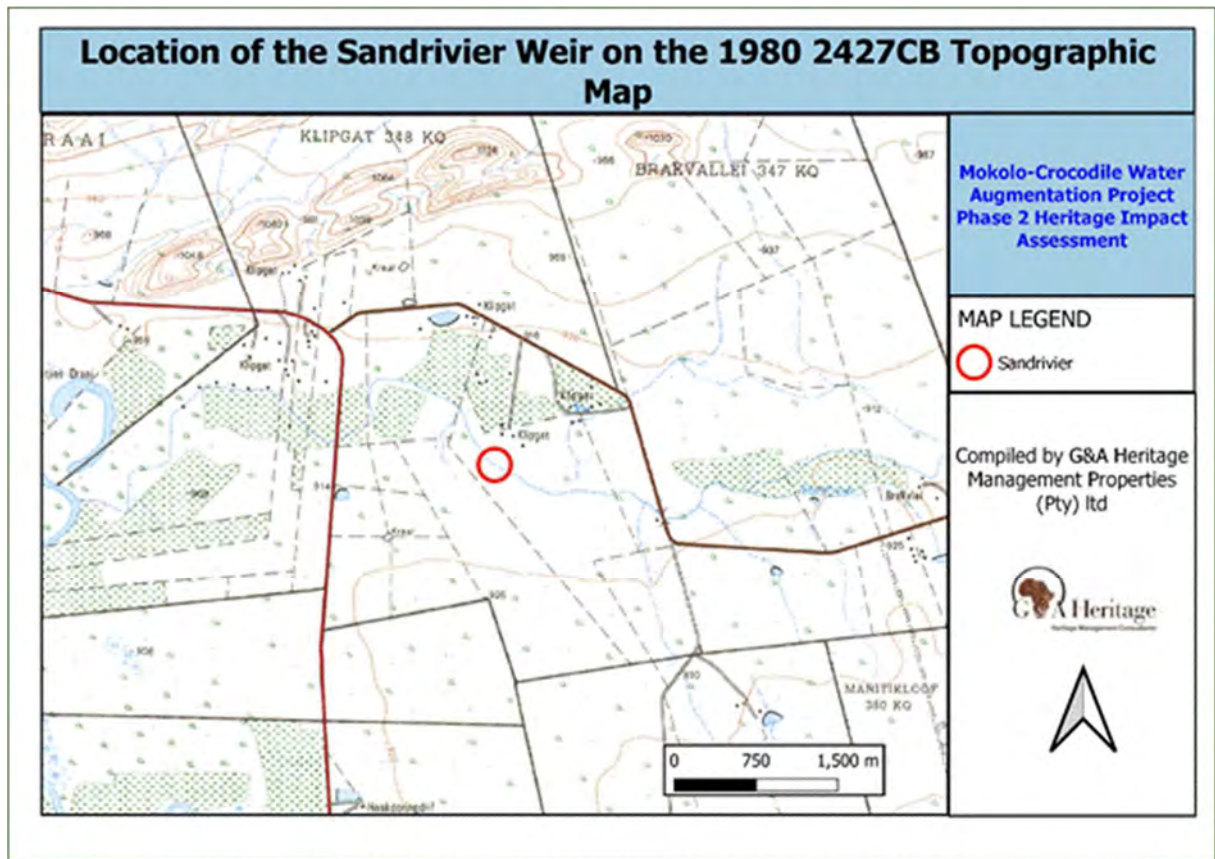


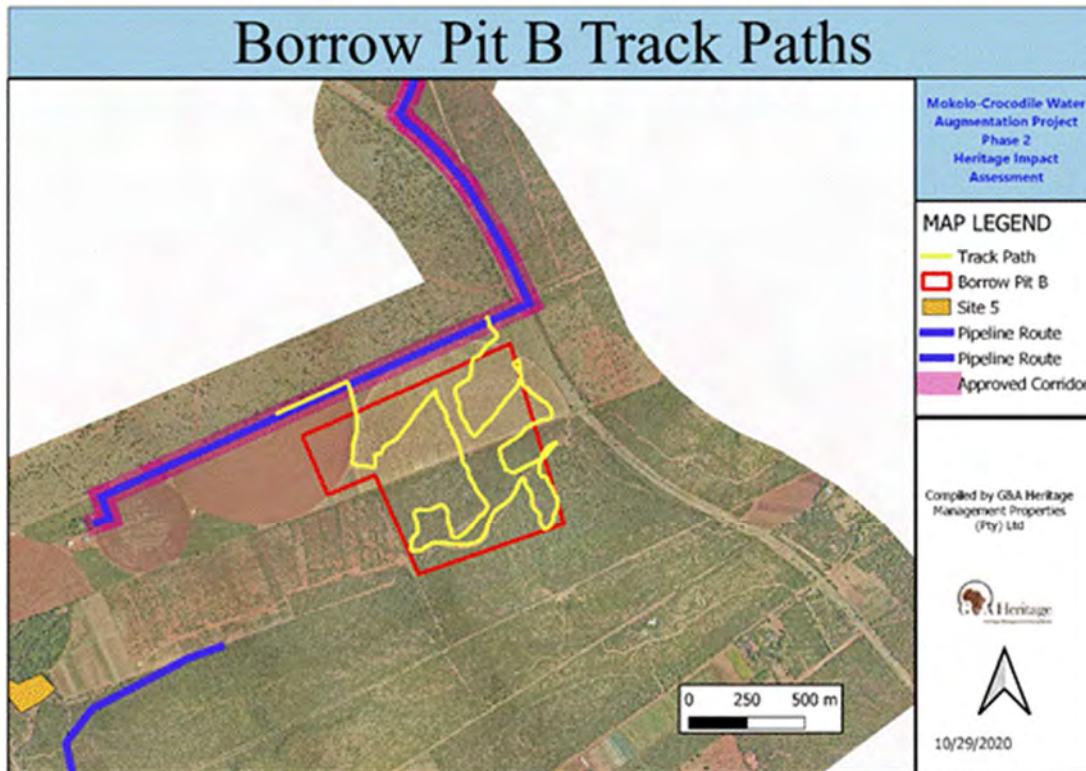
Figure 74. Location of the Sandrivier Weir on the 1980 Topographical Map

Other known sites

Sites designated Wn1 on the farm Welgevonden, Ho1 on the Farm Haarlem Oost, Gr 1 on the Farm Groenrivier and the sites associated with the Motlhabatsi basin were all found to be well outside of the impact zone of the pipeline and of no relevance for this study.

Evaluation of Extra Borrow Pits

Originally indicated as nine (9) borrow pits from the Terms of Reference (ToR) these were reduced to seven (7). Each of these were investigated during the fieldwork and the following were the results of this survey.



Borrow Pit B (GPS 24° 35' 26"S, 27° 18' 42"E)

Figure 75. Borrow Pit B (track paths in yellow)

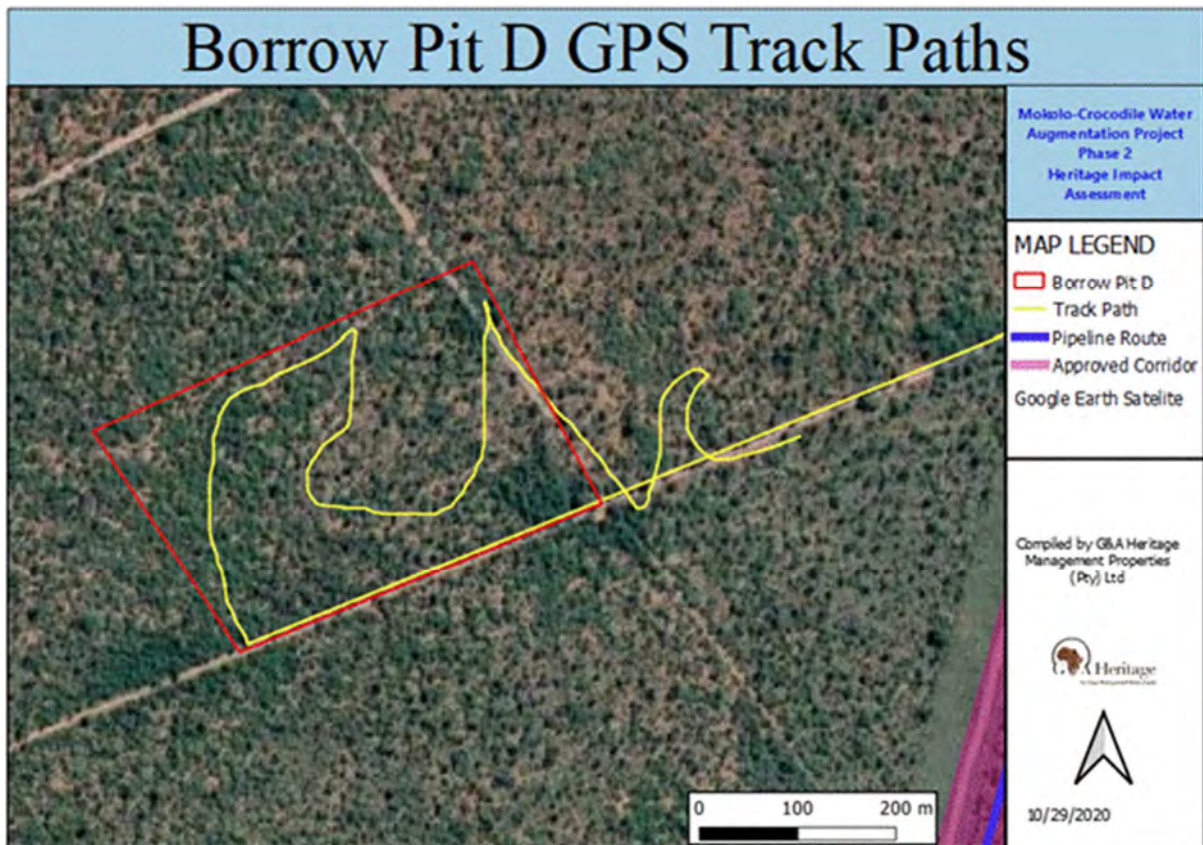




Figure 76. Landscape around Borrow Pit B

Findings

No sites of heritage significance were identified within the proposed footprint. A large part of the proposed site falls within an existing agricultural field.



Borrow Pit D (GPS 24° 35' 26"S, 27° 18' 42"E)

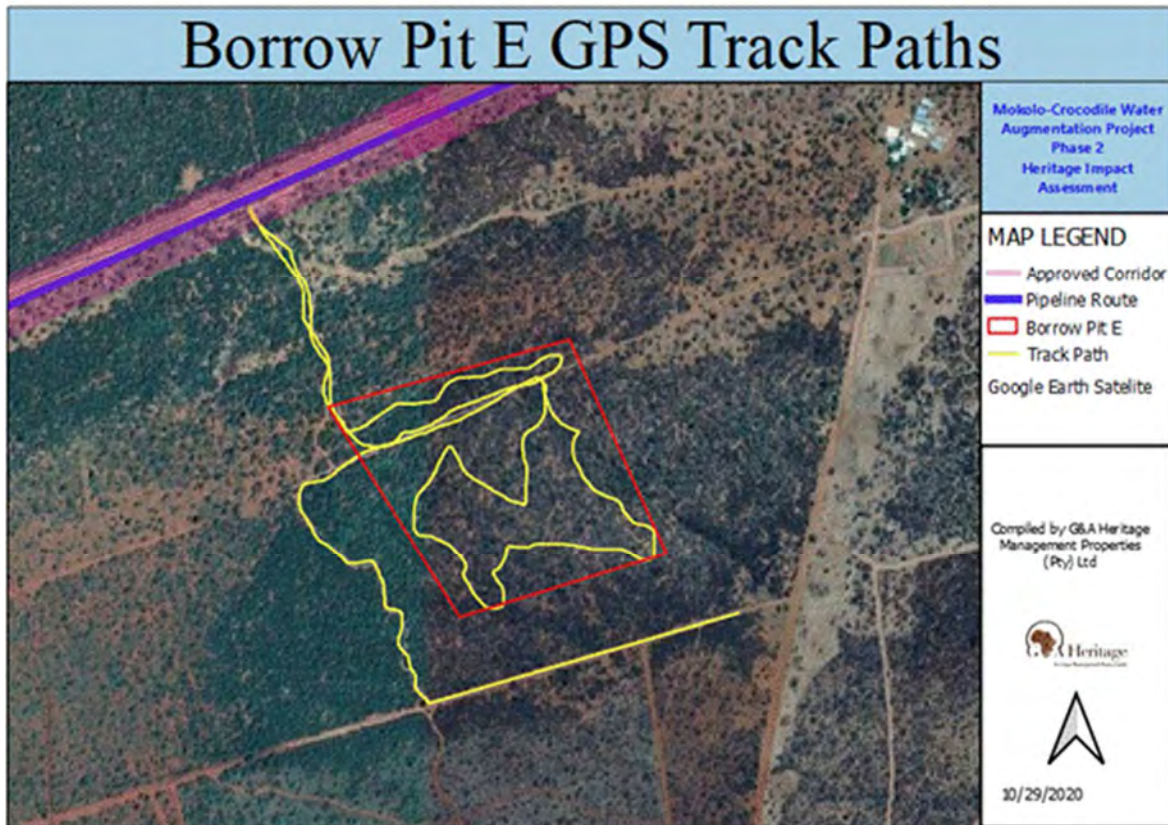
Figure 77. Footprint for Borrow Pit D (track paths in yellow)



Figure 78. Borrow Pit D

Findings

No sites of heritage significance were identified within the proposed footprint. Access was in some places difficult due to the abundance of invader species of plants. Most of the site is covered in red alluvial Kalahari type sand that quickly obliterates any evidence of occupation.



Borrow Pit E (GPS 24° 24' 24"S, 27° 24' 56"E)

Figure 79. Footprint for BP E

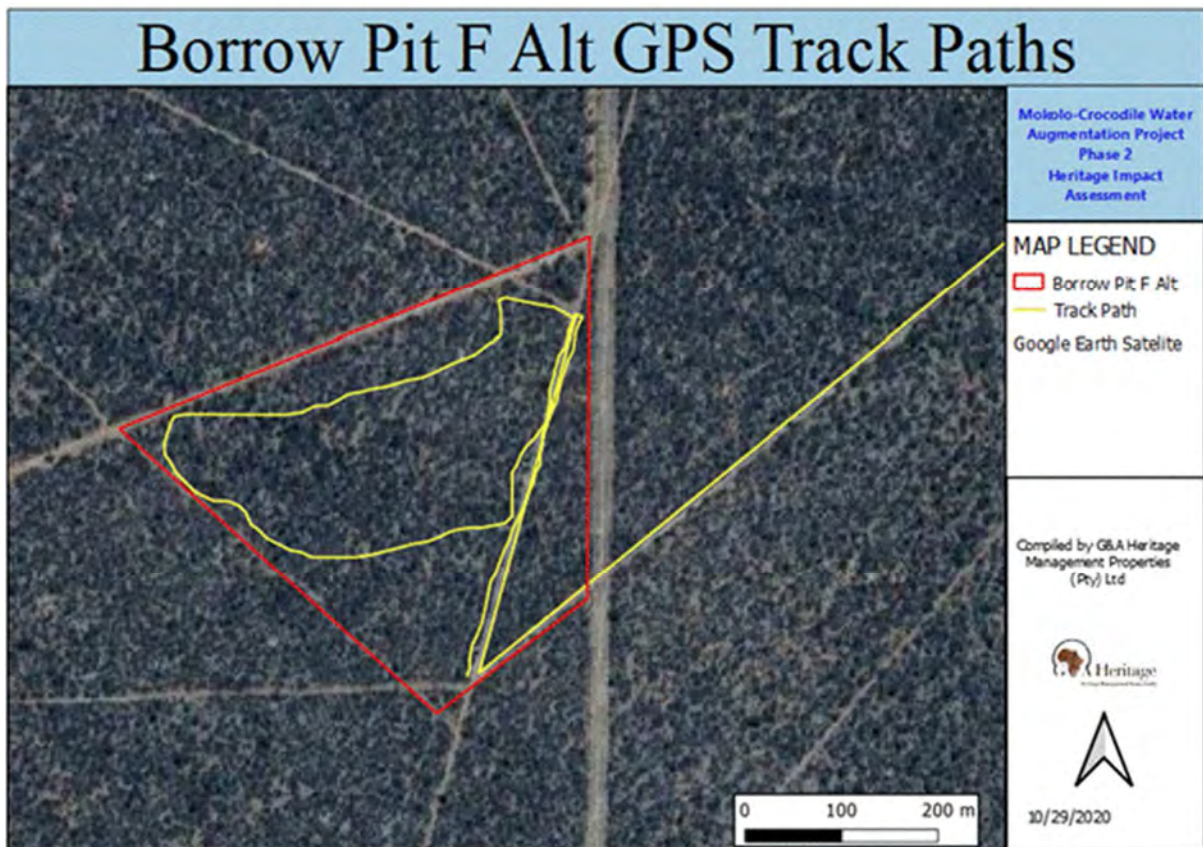




Figure 80. Borrow Pit E

Findings

No sites of heritage significance were identified within the proposed footprint.



Borrow Pit F-alt (GPS 24° 20' 28"S, 27° 26' 26"E)

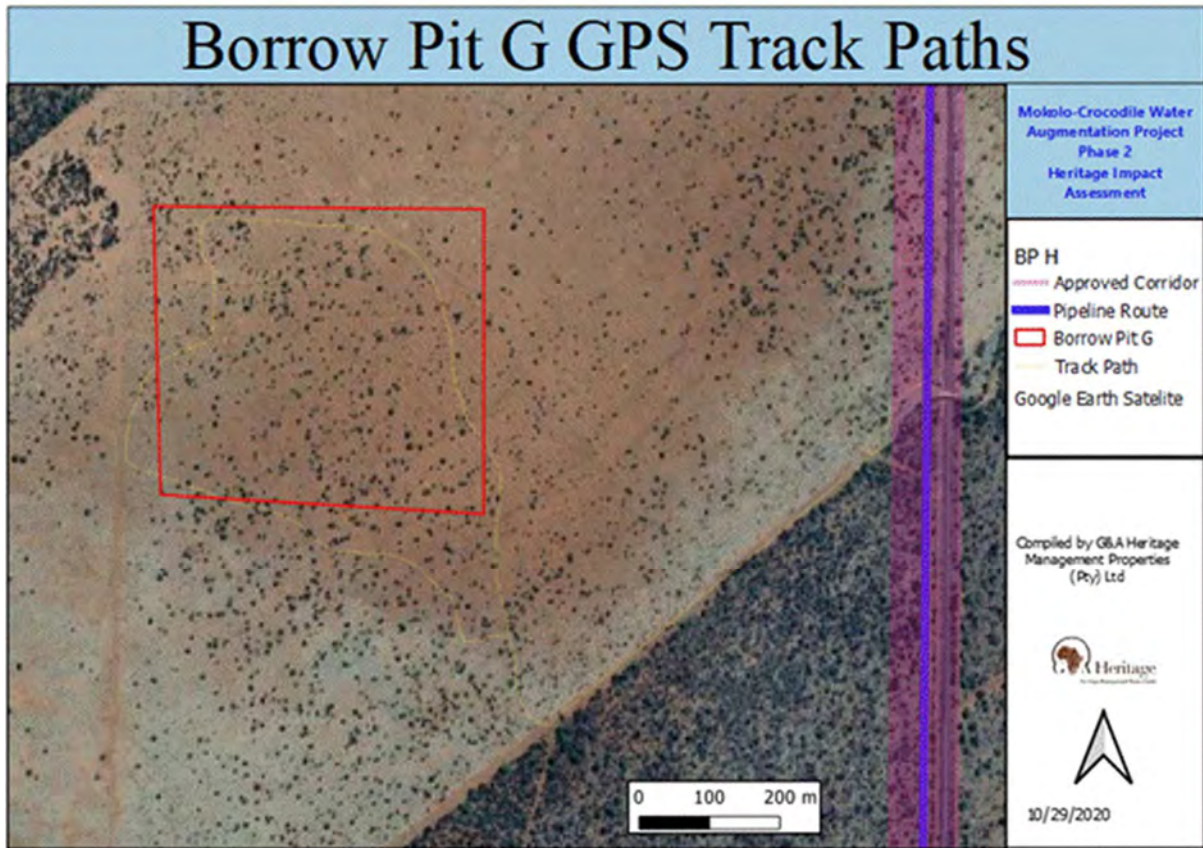
Figure 81. Footprint of Borrow Pit F-alt (track paths in yellow)



Figure 82. Borrow Pit F

Findings

No sites of heritage significance were identified within the proposed footprint. Much of the area is still natural bush with sandy soil.



Borrow Pit G (GPS 24° 18' 48"S, 27° 26' 29"E)

Figure 83. Footprint of Borrow Pit G (track paths in yellow)

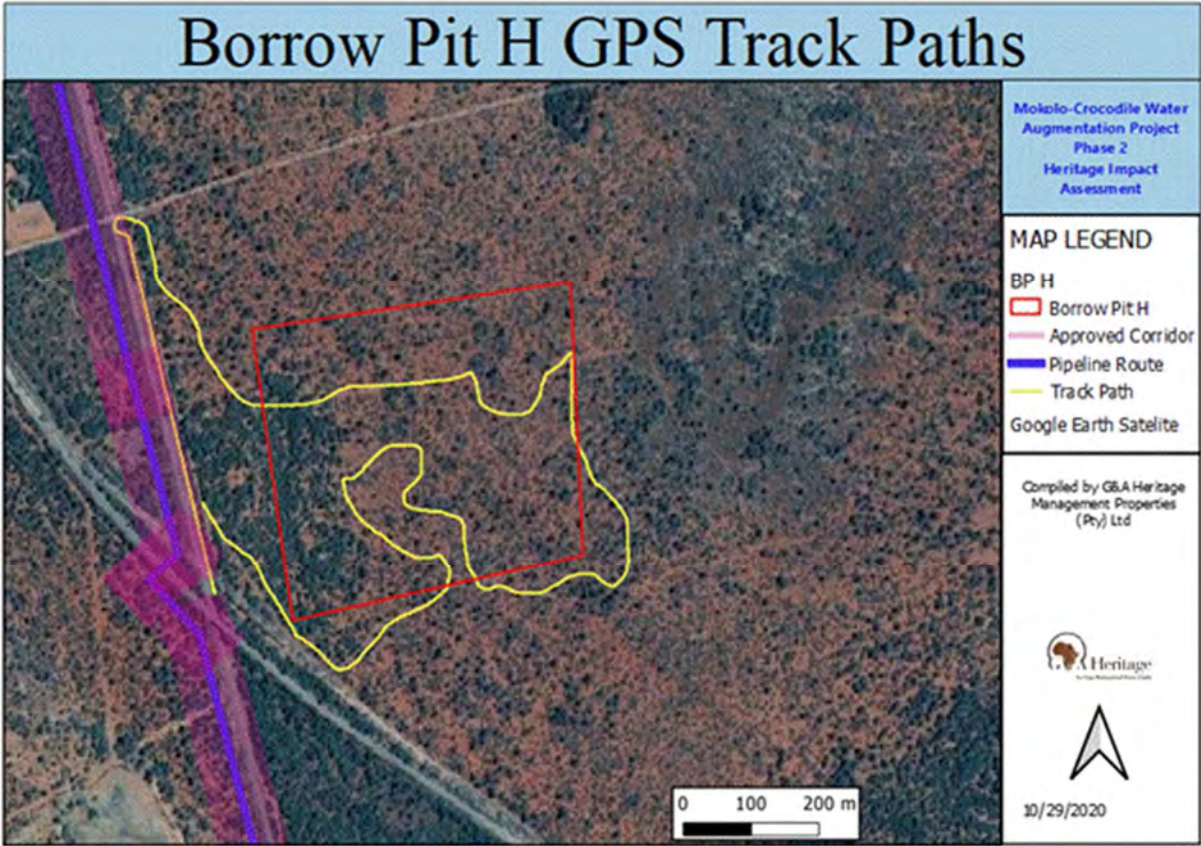




Figure 84. Borrow Pit G

Findings

No sites of heritage significance were identified within the proposed footprint. The site lies wholly within an old agricultural field that has severely altered the landscape in the recent past.



Borrow Pit H (GPS 24° 10' 43"S, 27° 26' 44"E)

Figure 85. Footprint of Borrow Pit H (track paths in yellow)

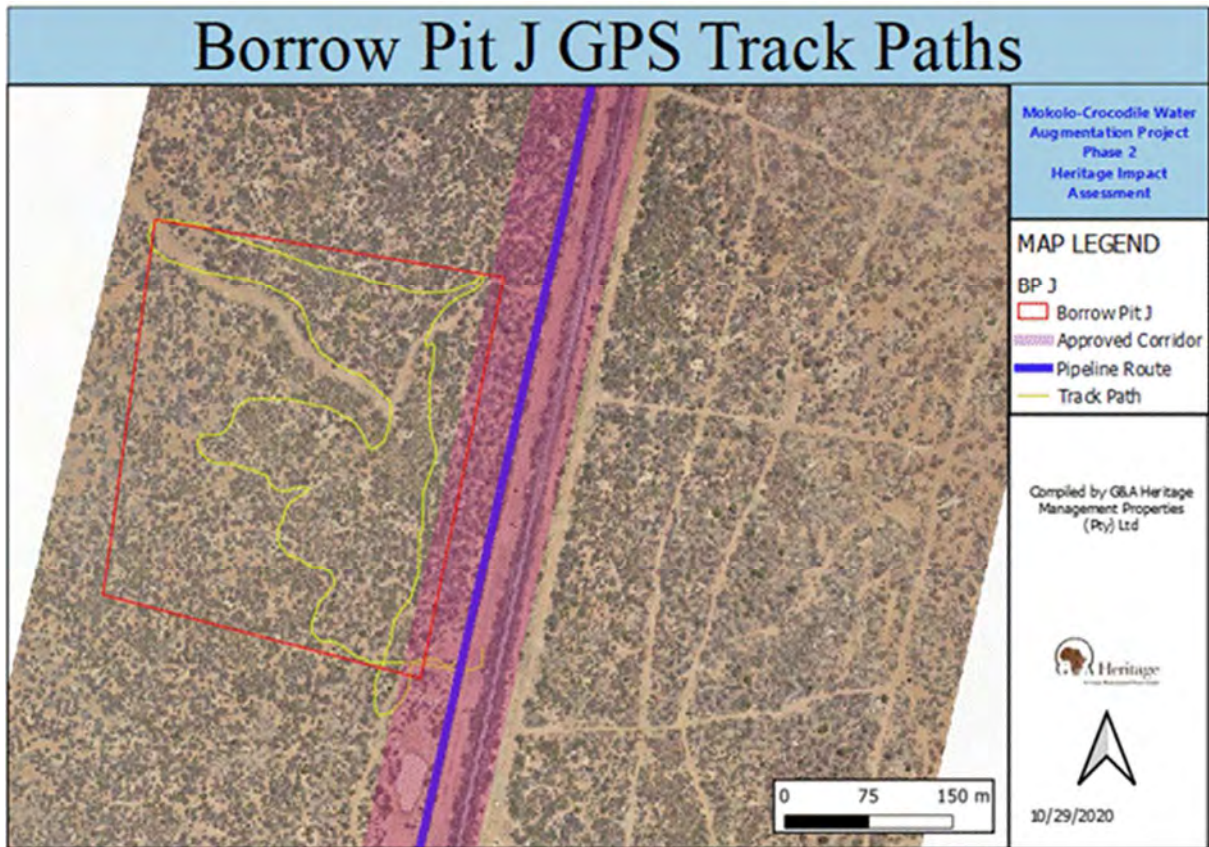




Figure 86. Borrow Pit H

Findings

No sites of heritage significance were identified within the proposed footprint.



Borrow Pit J (GPS 23° 47' 22"S, 27° 25' 36"E)

Figure 87. Footprint for BP J



Figure 88. Borrow Pit J

Findings

No sites of heritage significance were identified within the proposed footprint.

Mooivlei Farm house

GPS 24° 35' 37.5"S, 27° 17' 43.6"E

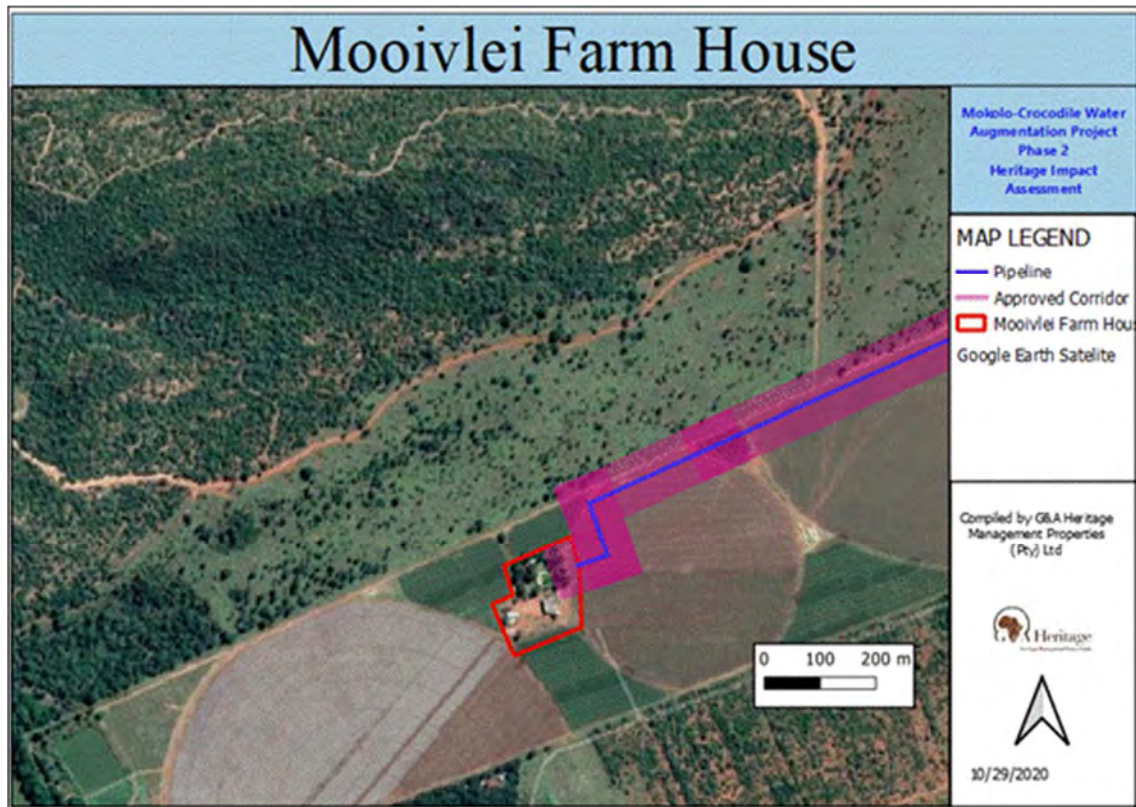


Figure 89. Mooivlei Farm House location

Findings

This is a relatively modern homestead, however it does seem to be older than 60 years giving it protection under the NHRA 25 of 1999. According to the project layout the site will not be impacted upon. If this changes a permit for destruction needs to be applied for.



Figure 90. Mooivlei Homestead

Three Grave Sites

GPS 24° 27' 23.9"S, 27° 24' 40.3"E

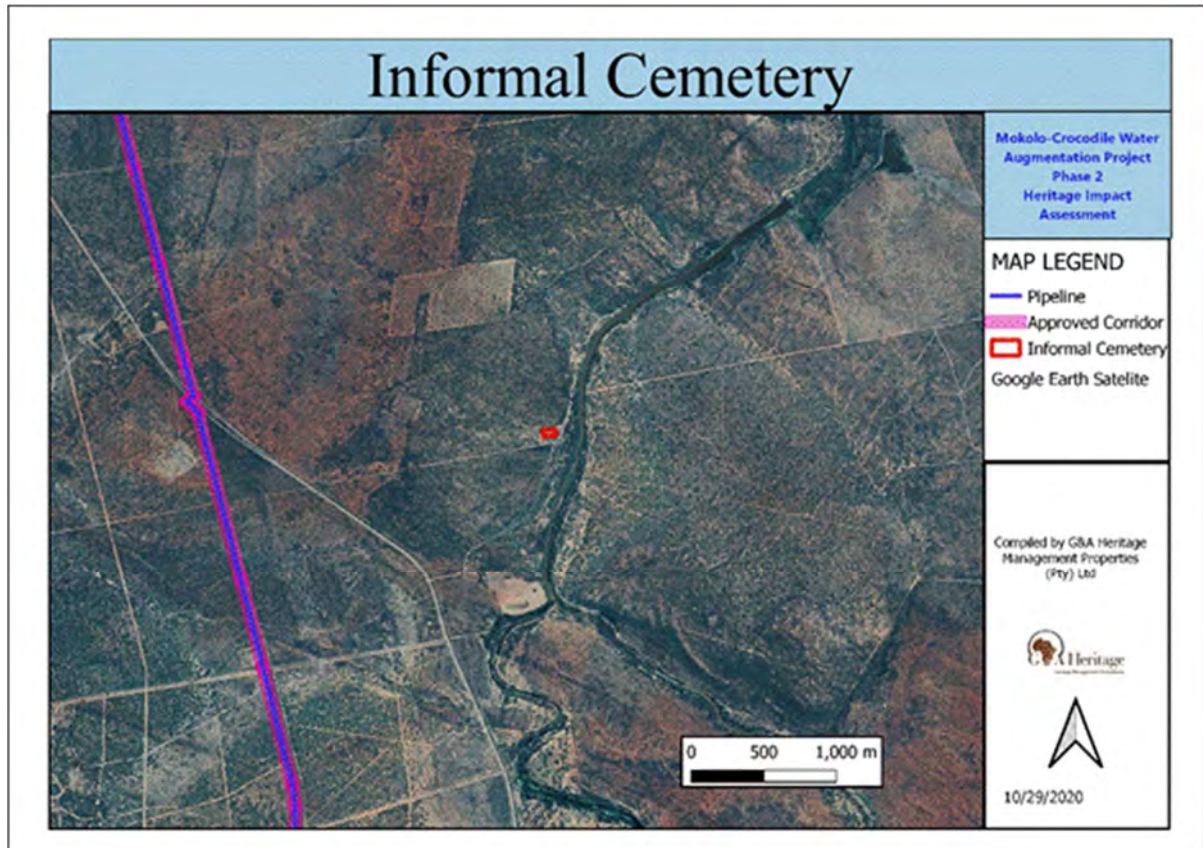


Figure 93. Location of three grave sites.

Three grave sites with formal granite dressings. These graves are not within the development corridor and will not be affected.



Figure 94. Three grave sites

Late Iron Age Stone Walling

GPS 24° 27' 24.9"S, 27° 24' 41.4"E

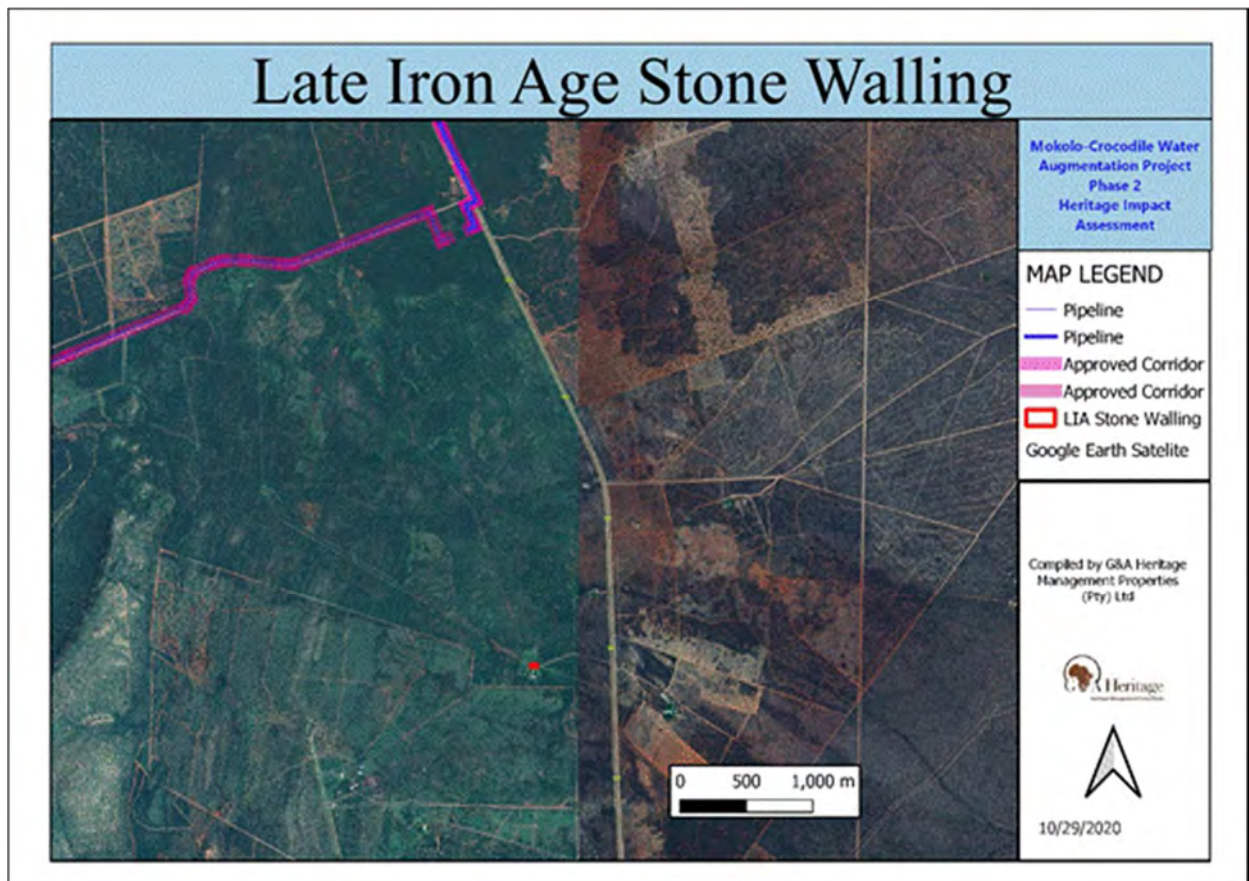


Figure 91. Late Iron Age Walling.

An occupational site associated with the Moloko Tradition (Sotho-Tswana) is located here. It is spread over roughly ½ hectare. It will not be impacted upon by the proposed development.



Figure 96. LIA Stone Walling

Iron Slag Deposits

GPS 24° 12' 36.2"S, 27° 26' 24.2"E

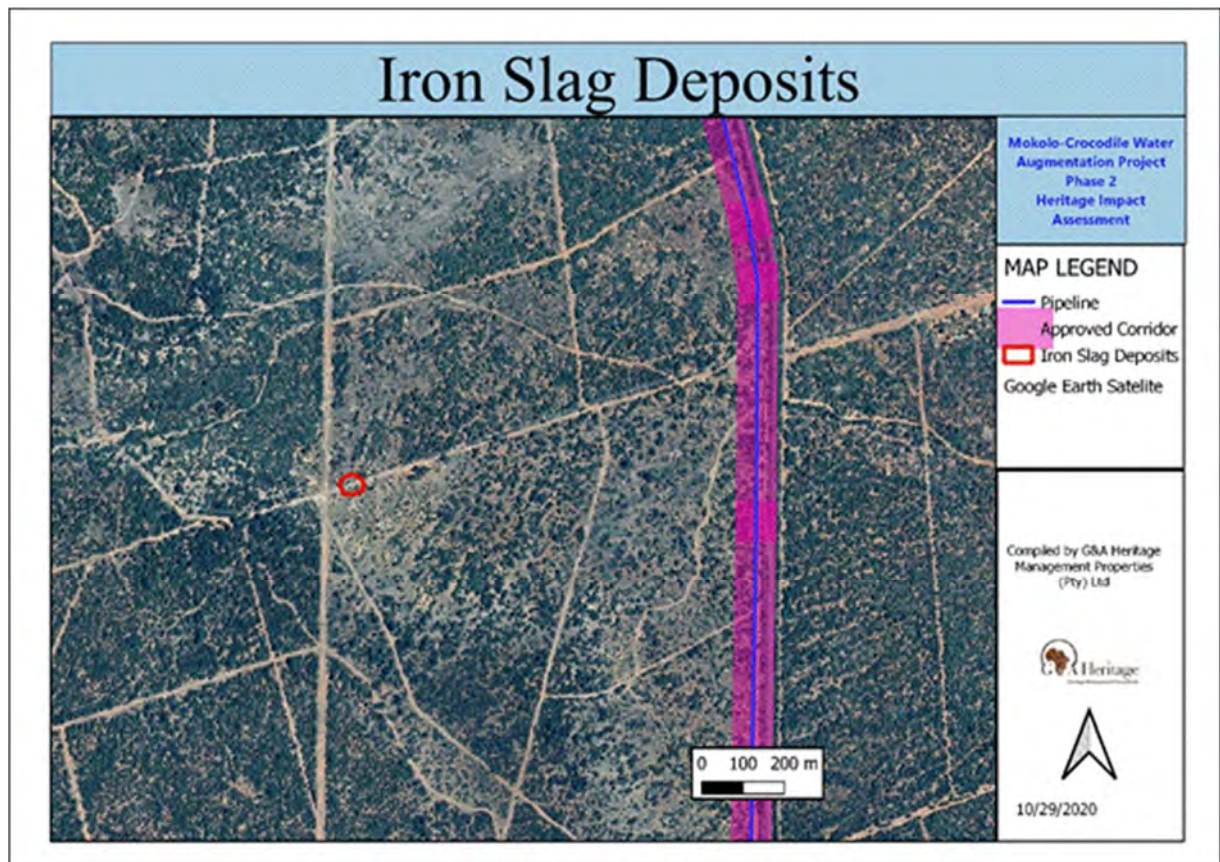


Figure 97. Iron slag deposits.

Some Iron Slag remains were noted at the farm Matlabas. This is the by-product of iron smelting and is usually found close to smelting ovens of the Iron Age. The site will not be impacted but is worthy of mention for future research.



Figure 98. Iron Slag

2020 Palaeontological Impact Assessment – Gideon Groenewald (full report appended)

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews, as well as information gathered during the field investigation.

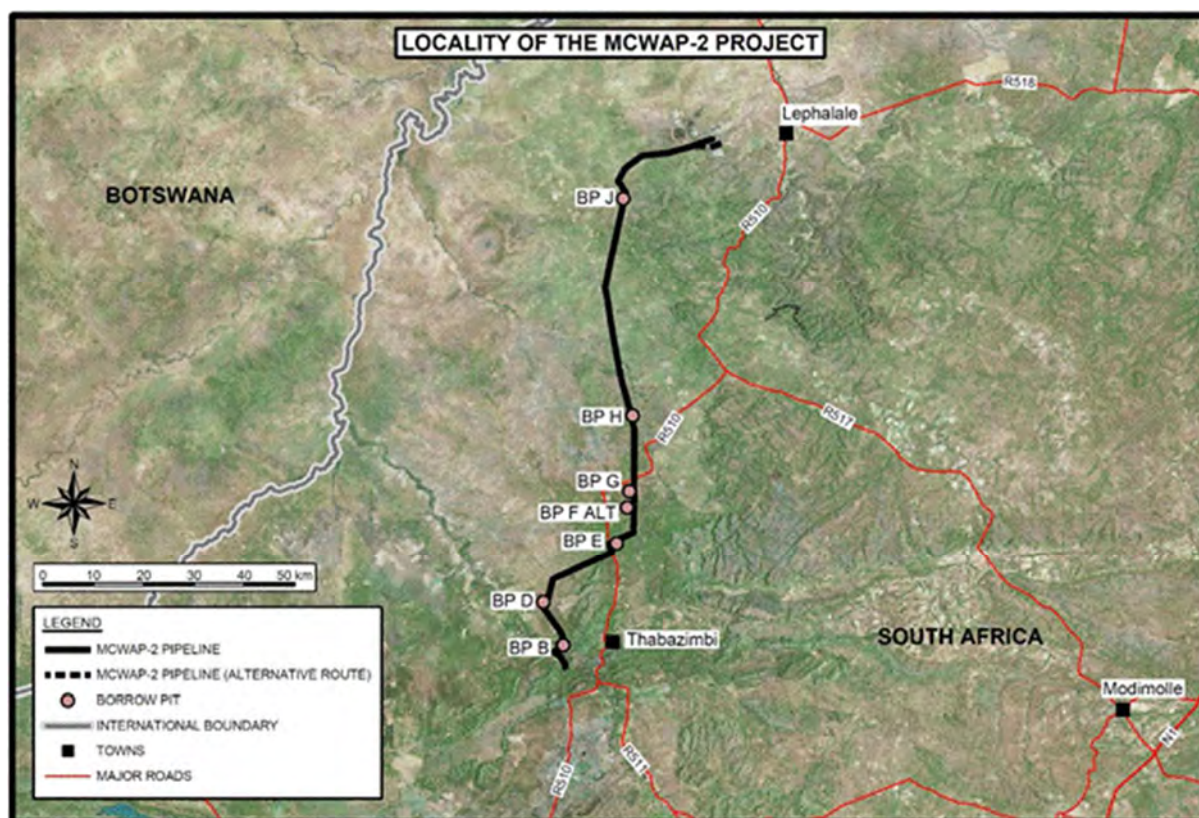


Figure 99. Palaeontological sensitivity of the pipeline

Dr Gideon Groenewald an experienced fieldworker, visited the site of the proposed MCWAP-2 development on Monday 20th July 2020 to Friday 24th July 2020.

The topography of the area varies from very mountainous in the southern part where the Crocodile Rivers cuts through the dolomites and shale units of the Chuniespoort Group, to very gently undulating topographic features, albeit having some rugged river valleys with diabase batholiths and thick diabase sills or extensive outcrops of flat lying quartzitic sandstone of the Waterberg Group dominating the higher ground. The general landscape is dominated by extensive, deeply weathered middle slopes and extensive foot slopes ending in a poorly defined, albeit limited, valley floors, of the local streams and the main river (Matlabas River) of the area. The study area comprises a linear construction and development site that cuts the topography and cuts the contours where the proposed pipeline constructions will cut the hills, mainly along the existing route of the railway line between Thabazimbi and Lephalele. The area is mostly open bushveld and in places overgrown with remains of fire-climax grass species but a very high percentage of increasers indicating extensive grazing by cattle after regular burning of the veld to try and increase the palatability of the grass during the beginning of the growing season.

Field investigation confirmed that excavations for the new developments will expose stromatolitic dolomite of the Malmani Subgroup, quartzitic sandstone and shale of the Waterberg Group, sandstone and shale of the Eccca Group and in many areas deep excavation into Quaternary sand and alluvium. It is envisaged that the development of borrow pits will cause extensive removal of topsoil and possible termitaria in the footprint of the borrow pit. The presence of termitaria must be noted to ensure that no accidental damage is done to possible ancient burial sites associated with termite activity.

Detailed observations were recorded in the area that will be developed and observations were recorded photographically at GPS points (Figure 13).

All recorded Photographic Recordings of coins associated with termitaria as well as imprints of fossils, including trace fossils, will be provided as a formal record of observation. Significant observations included well-defined stromatolites in the Malmani Subgroup, one termitaria with coins washing from the termite mound and some poorly defined, but significant trace fossils in shale beds associated with the Waterberg Group. The Palaeontologist recommend that the ECO be vigilant in areas where deep excavations are still planned for construction of the pipeline. No fossils are expected in areas underlain by diabase and dolerite and no fossils were observed during this field investigation. It is however important to note the association of termitaria with diabase and dolerite dykes, where the termite mounds can be associated with burial sites of Mankind.

Photographic recordings of geological information and fossils occurring in the outcrops are presented in table 2 below. These Photographic recordings might be the only records of palaeontological heritage for this project. Due to very deep weathering of the sedimentary rocks the author expects that the chance find of well-preserved fossils in this environment is not very high.

Poorly defined trace fossils are present but these fossils did not warrant collection or a request for standing time and collection of fossils (Table 2). It is however very likely that significant fossils will be exposed as deep excavation and possible blasting continues to open more material during the lifetime of the excavation.

Field Observations South

Field observations followed the route of the pipeline and photographic observations were recorded at specific GPS points to give an overall picture of the most important palaeontological heritage objects and landscapes recorded. Observation points are presented for each observation section from south to north, starting from the south.

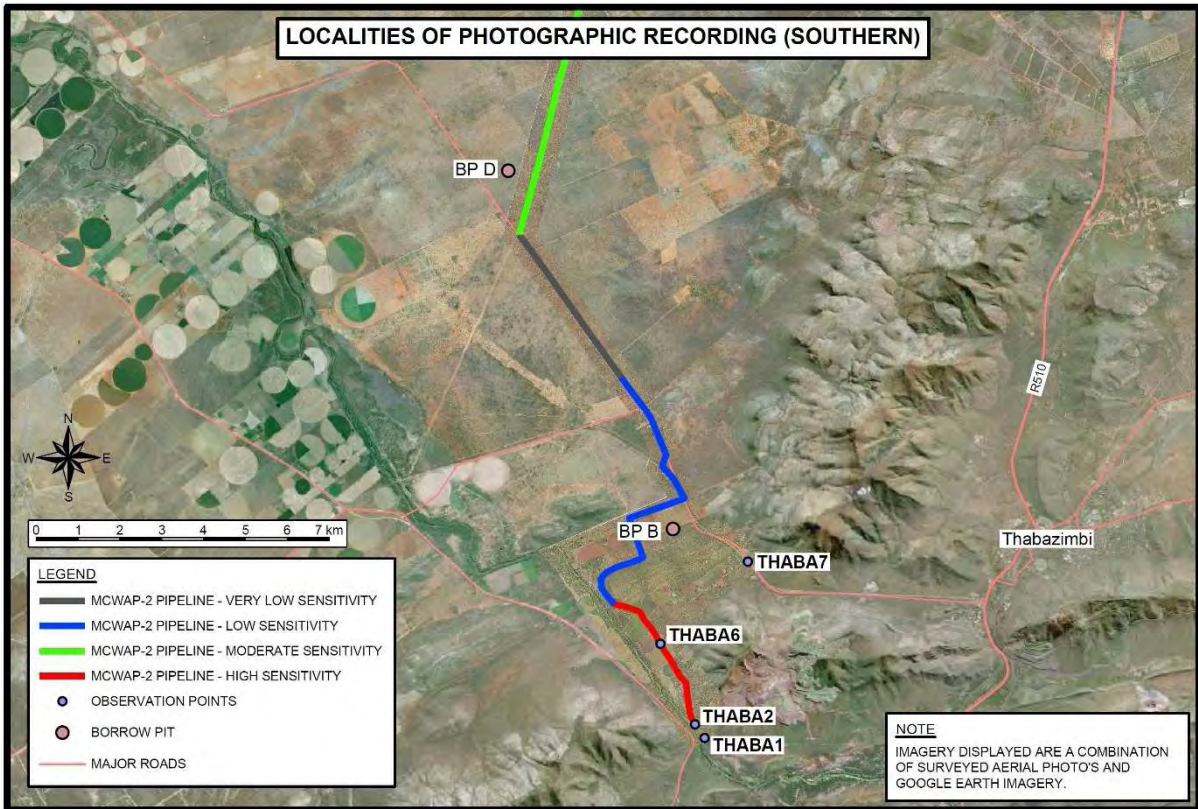


Figure 100. Palaeontological observation on the southern section

Observations in the southern section of the project area confirmed the presence of very defined stromatolite structures in the Malmani Subgroup.

Field Observations Southern 1

To be able to print maps that give the localities of observations, the observation points are provided in a set of several Google images, to assist with identification of each observation point. The observations made in section South 1 is in fact to the north of Thabazimbi and the Photographic observations are also included.

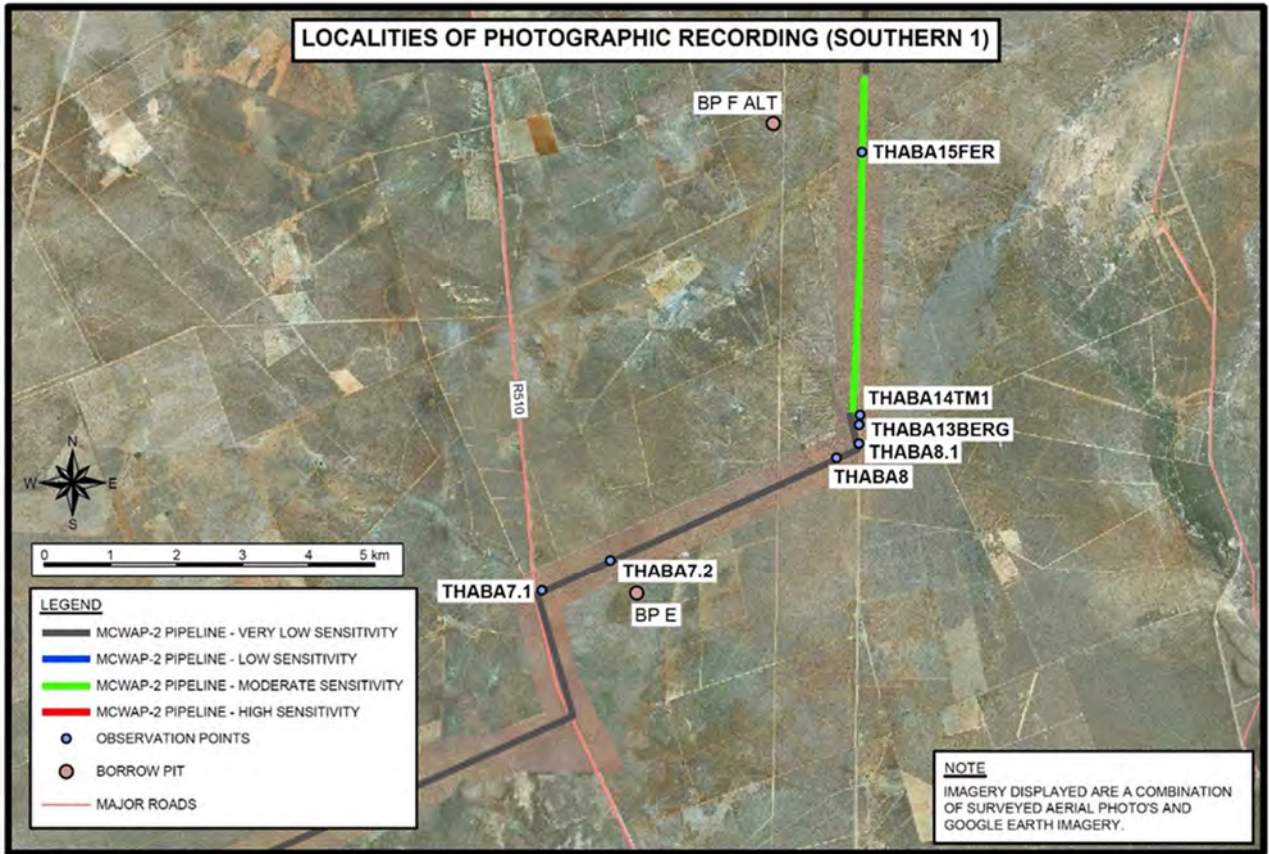













Figure 101. Palaeontological observations in the south





Table 4. Photographic observations



Photo	GPS	Description	Photographic Observation
Thaba 1	24.636183° S 27.319173° E	Deep alluvium, sensitive for fossils during excavation. Quaternary aged fossils and remains of vertebrates that might have been caught during flooding of the Crocodile River.	

Thaba 2	24.633237° S 27.316933° E	Stromatolitic dolomite of the Malmani Subgroup observed along the route of the pipeline. No samples were collected during this field investigation.	
Thaba 2	24.633237° S 27.316933° E	Stromatolitic dolomite of the Malmani Subgroup observed along the route of the pipeline. No samples were collected during this field investigation.	
Thaba 2	24.633237° S 27.316933° E	Stromatolitic dolomite of the Malmani Subgroup observed along the route of the pipeline. No samples were collected during this field investigation.	

Thaba 6	24.615878° S 27.308679° E	Typical dome-like growth structures of cyanobacteria (blue-green algae) that was preserved to form these characteristic stromatolite structures in dolomite of the Malmani Subgroup.	
Thaba 6	24.615878° S 27.308679° E	Typical dome-like growth structures of cyanobacteria (blue-green algae) that was preserved to form these characteristic stromatolite structures in dolomite of the Malmani Subgroup.	
Thaba 7	24.598132° S 27.329289° E	Rugged mountain landscape in the southern part of the study area with iron enriched shale of the Pench Formation exposed by historic mining.	

Thaba 7.1	24.406418° S 27.401620° E	Typical bushveld vegetation along the Southern Route with sandy soils overlying diabase and granite of the Bushveld Igneous Complex. No fossils were expected in the residual material from granite and no fossils were observed along this route.	
Thaba 7.2	24.402202° S 27.411826° E	Typical bushveld vegetation along the Southern Route with sandy soils overlying diabase and granite of the Bushveld Igneous Complex. No fossils were expected in the residual material from granite and no fossils were observed along this route. This site is also identified as the locality for borrow pit E and it is important to ensure that termitaria in this region do not have signs of possible burial sites as is evident in the termite mound at site Thaba 14TM.	
Thaba 8	24.388117° S 27.445540° E	Typical bushveld vegetation along the Southern Route with sandy soils overlying diabase and granite of the Bushveld Igneous Complex. No fossils were expected in the residual material from granite and no fossils were observed along this route. This site is also identified as the locality for borrow pit E and it is important to ensure that termitaria in this region do not have signs of possible burial sites as is evident in the termite mound at site Thaba 14TM.	
Thaba 8.1	24.386148° S 27.448872° E	The route of the pipeline follows the railway servitude for most of this section of the South 1 section (Figure 15) and although this servitude has been extensively disturbed by human activity, it is important to be vigilant and inspect the numerous termitaria for possible Heritage objects as will be seen at Thaba 14TM.	

Thaba 13	24.383597° S 27.448889° E	General view of the mountainous terrain towards the east of the pipeline route. The Waterberg Group builds an impressive escarpment in this part of the Limpopo Province.	
Thaba 14MT	24.382241° S 27.449045° E	Termite mound are distributes over the entire study area and vary in size from small, inconspicuous structures to large mound that can in some cases encircle the stems of large trees.	
Thaba 14MT	24.382241° S 27.449045° E	This specific termetaria is of interest to Heritage Conservation since it clearly have some coins washing from the side of the mound. Literature surveys indicate that Humans are known to use the termite mounds as burial sites, but the most important observation is that termites can prefer colonizing a grave site for the fact that the remains of bones contain rich supplies of Nitrogen that is lacking in the natural environment at these sites.	
Thaba 14MT	24.382241° S 27.449045° E	The coins observed in this termite mound has been left at the site, either on purpose or by accident. The most obvious reason for the presence of these coins is the possibility that the termite mound is associated with a grave site that descendants of the people who as buried at the site visit the site for historical rituals to honor the dead. The specific termite mound is accessible from the road and it does fall on secure private property.	

Thaba 15FER	24.346310° S 27.449184° E	Large scale termitaria in the servitude of the railway line must be inspected before clearance for construction is done. The termite mounds might contain valuable information that can contribute towards our understanding of the history of this region.	
Thaba 15FER	24.346310° S 27.449184° E	Ferricrete on granite and diabase. No fossils were expected and no fossils were observed. This scenario will also be found at borrow pit F (Alternative) and it is important to ensure that no termitaria is destroyed before ensuring that the termite mounds are not associated with a burial site.	

Field Observations Southern 2

Field observations and photographic recording was done along the railway servitude towards the north (Figure 14) and several termite mounds were recorded (Table 3) but no obvious presence of any burial sites was recorded in this section of the survey. The most important observations are the outcrops of quartzitic sandstone and mica-rich shales of the Waterberg Group. No trace fossils were recorded in this section of the survey.

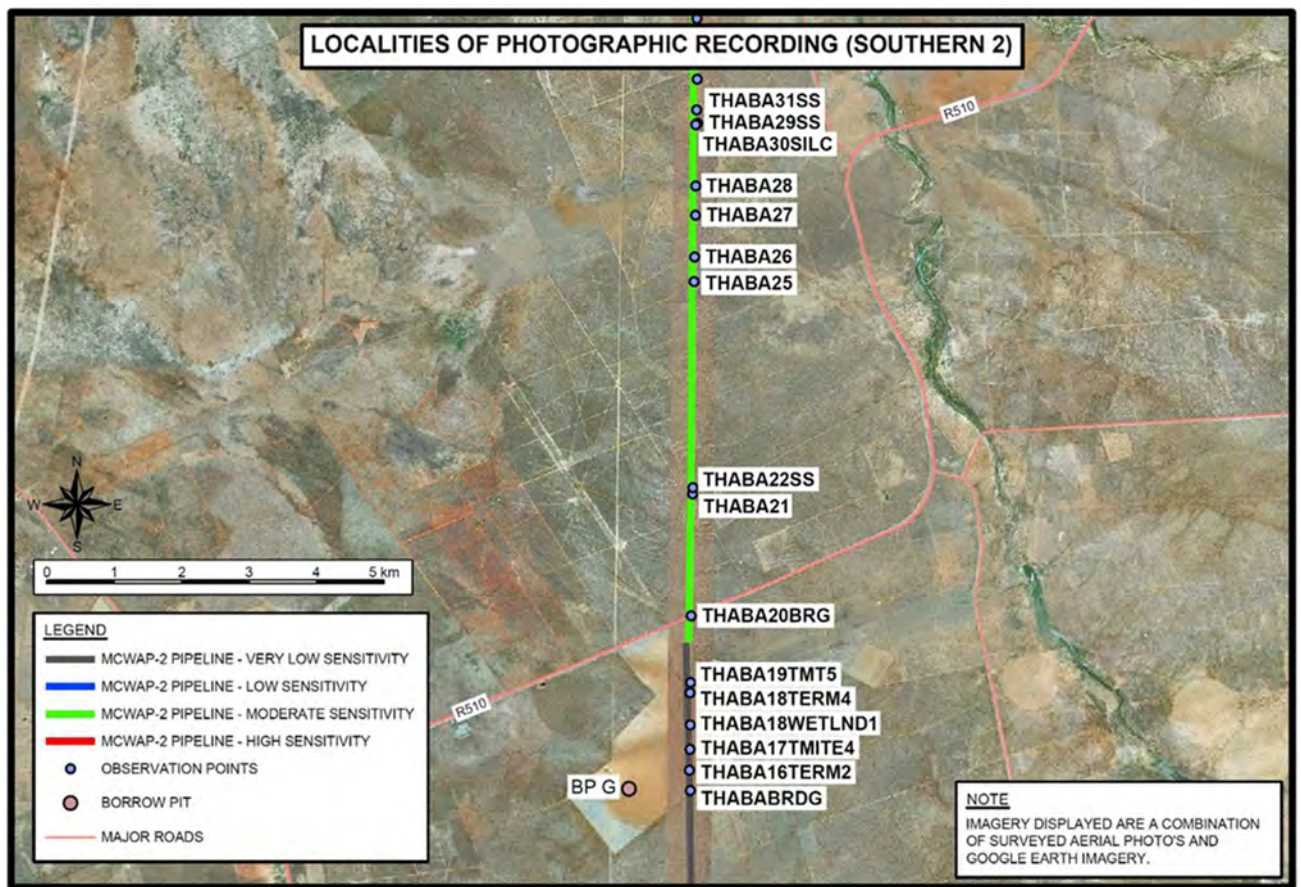


Figure 92. Photographic observations along the southern section

Field observations Central Section

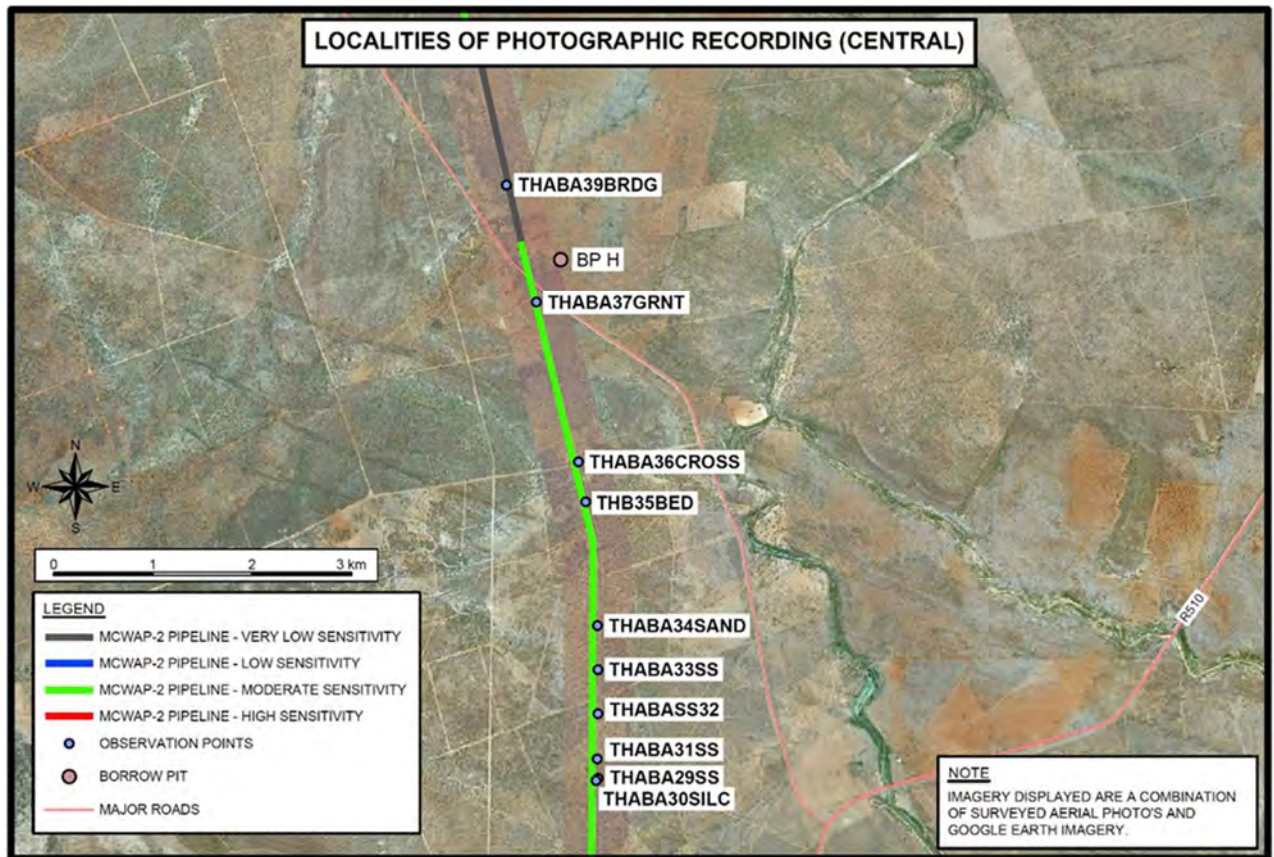














Figure 102. Field observations for the Central Section





Table 5. Photographic record of observations for the Central Section





Photo	GPS	Description	Photographic Observation
Thaba Brdg	24.313841° S 27.449432° E	Deep sandy soils on diabase and granite. Quaternary aged fossils and remains of vertebrates, rhizomes and ostrich egg shell have been recovered from these sands. The presence of termitaria in this region is important and the EM must inspect termite mounds at the locality of burrow pit G for possible remains of Human origin.	


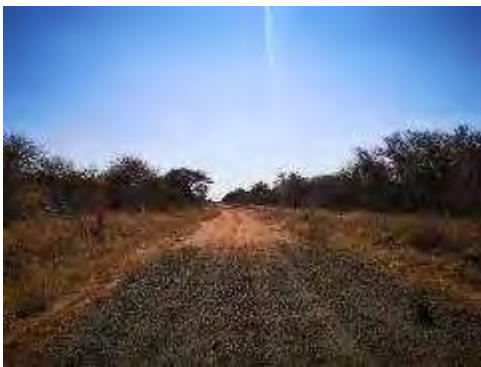


Thaba 16 Term	24.311169° S 27.449300° E	Abundant termite activity was found in areas underlain by diabase and granite. Termitaria must be inspected for artifacts, bone remains and coins or gemstones before destruction.	
Thaba 17 Term	24.308412° S 27.449371° E	Typical termitaria associated with the presence of bigger trees. The association of these structures with larger trees will assist the ECO in identifying these potential burial sites in areas that will be opened up, for example the site of borrow pit G in this region.	
Thaba 18 WetInd	24.305209° S 27.449406° E	Seepage areas with deep clay-rich soils, indicative of wetland environments. Excavation for trenching can expose fossils of animals that occurred in this region over thousands of years.	
Thaba 18 Term	24.300977° S 27.449355° E	Typical termitaria with large open corridors that can provide suitable habitat for smaller organism to hide. Termitaria can also indicate possible burial sites in the bushveld regions of Southern Africa.	



Thaba 19	24.299609° S 27.449413° E	Termite mounds can be partly destroyed by human activities and it is important to inspect these sites for possible fossil remains. No fossils were observed at this locality.	
Thaba 19 Term	24.299609° S 27.449413° E	Termite mounds can be partly destroyed by human activities and it is important to inspect these sites for possible fossil remains. No fossils were observed at this locality.	
Thaba 20 Brg	24.290822° S 27.449494° E	Bridge site as a marker along the route.	
Thaba 21	24.274593° S 27.449654° E	Outcrop of Waterberg Group quartzitic sandstone and micaceous shale in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	

Thaba 21	24.274593° S 27.449654° E	Outcrop of Waterberg Group quartzitic sandstone and micaceous shale in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	
Thaba 22	24.273751° S 27.449688° E	Outcrop of Waterberg Group quartzitic sandstone with cross-bedding in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	
Thaba 22	24.273751° S 27.449688° E	Outcrop of Waterberg Group quartzitic sandstone with cross-bedding in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	
Thaba 22	24.273751° S 27.449688° E	Outcrop of Waterberg Group quartzitic sandstone in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	

Thaba 25 Brdg	24.246447° S 27.449767° E	Deep sandy soils on Waterberg Group sediments. Bridge as a marker along the route of the pipeline.	
Thaba 26 Gen no outcrop	24.243209° S 27.449798° E	The Southern 2 section crosses vast open plains, underlain by deep sand that was allocated a moderate sensitivity for palaeontological Heritage. No fossils were recorded during this site visit.	
Thaba 27	24.237696° S 27.449941° E	The Southern 2 section is allocated a moderate sensitivity for palaeontological heritage. Recent reports of trace fossils from the bedding plane of the quartzitic sandstones are the first indication of advanced life in some of the oldest sedimentary sequences in South Africa.	
Thaba 28	23.3841° S 27.449947° E	Waterberg Group sandstone with very thin shale bands. Bedding planes are not well enough exposed to look for trace fossils.	

Thaba 29	24.225665° S 27.450164° E	Ferricrete on Waterberg Group sandstone. No fossils were expected and no fossils were observed.	
Thaba 30	24.225847° S 27.449918° E	Ferricrete on Waterberg Group sandstone. No fossils were expected and no fossils were observed.	
Thaba 31	24.223905° S 27.450040° E	Outcrop of Waterberg Group quartzitic sandstone and micaceous shale in the railway servitude in the Central survey section Figure 17. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from these rocks.	
Thaba 32	24.219833° S 27.450110° E	Outcrop of Waterberg Group quartzitic sandstone and cobbles in the railway servitude. A moderate palaeontological sensitivity is allocated to these rocks and important trace fossils as well as some of the earliest life forms, including algal mats, have been recorded from bedding planes associated with these rocks.	

Thaba 33	24.215849° S 27.450092° E	Waterberg Group Quartzitic sandstone exposed in the excavations for the railway line. Bedding planes not well-defined, no fossils observed.	
Thaba 34	24.211852° S 27.450034° E	Deep sand overlying all geology. The importance of termitaria in this environment must be noted when removal of topsoil is planned in this part of the Southern 2 section.	
Thaba 35	24.200520° S 27.448803° E	Waterberg Group Quartzitic sandstone exposed in the excavations for the railway line. Bedding planes not well-defined, no fossils observed.	
Thaba 36	24.196899° S 27.448075° E	Waterberg Group sediments are in most cases covered in deep sandy soils and no fossils were expected and no fossils observed. All the sections of the route indicated as moderate sensitive where access was impossible due to overgrown roads and access routes can be compared to this general observation where the environmental control officer must only record significant outcrops of rock. Such chance finds are highly unlikely in this environment.	

Thaba 37	24.182452° S 27.443858° E	Diabase outcrop in railroad cuttings. No fossils expected except in the termite mounds associated with these rocks. It is important to note that borrow pit H is planned into the diabase. The EM must ensure that all termitaria are inspected before topsoil is removed during preparation to start the quarry.	
Thaba 39	24.171764° S 27.440861° E	Bridge over the railroad as a marker for the end of the central section of the survey.	

Field Observations North 1 & 2

Further to the north in the study area the pipeline route crosses the important graben fault zones that lead to the accumulation of Karoo Supergroup rock sequences of Carboniferous and Permian to Triassic and Jurassic aged rocks in this part of South Africa (Figure 21).

Field observations (Table 5) confirmed that there are very few outcrops of these rock formations and most of the pipeline route is underlain by thick accumulation of Kalahari sands and other Cenozoic aged material. Most of the mapping was done following extensive drilling of boreholes and geophysical work in planning for the mining of coal at the mines that supplies coal to Medupi and Matimba Power Stations.

The chance find of plant fossils in the Permian and Triassic rocks in this region is very high. Some of the first fossils of the relatively large *Massospondylus* dinosaur from this area was described in the 1920's. The ECO must be vigilant and if any fossils are exposed the palaeontologist must be informed and appropriate procedures, discussed in the "Chance Find Protocol", and the EMP, must be followed.

Borrow Pit J is underlain by moderately sensitive quartzitic sandstone of the Waterberg Group.

The field observations along the North 2 section confirmed the absence of significant outcrop of bedrock and most of the route is underlain by deep sand of Cenozoic age. The most important sites where significant palaeontological heritage can be expected is at sites where termite activity might be associated with burial sites.

The entire North 2 section has been allocated a moderate sensitivity for palaeontological heritage.

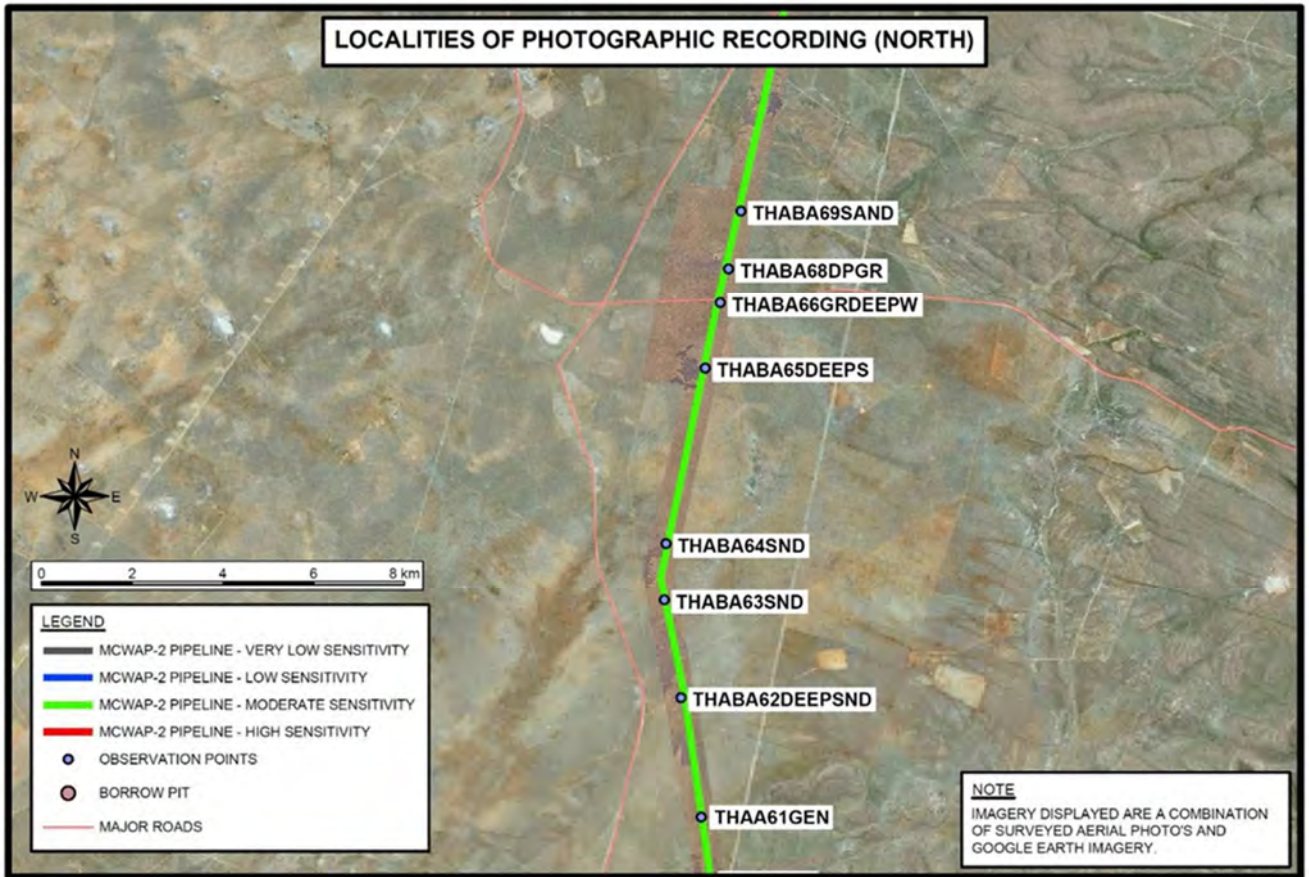


Figure 103. Section North 2

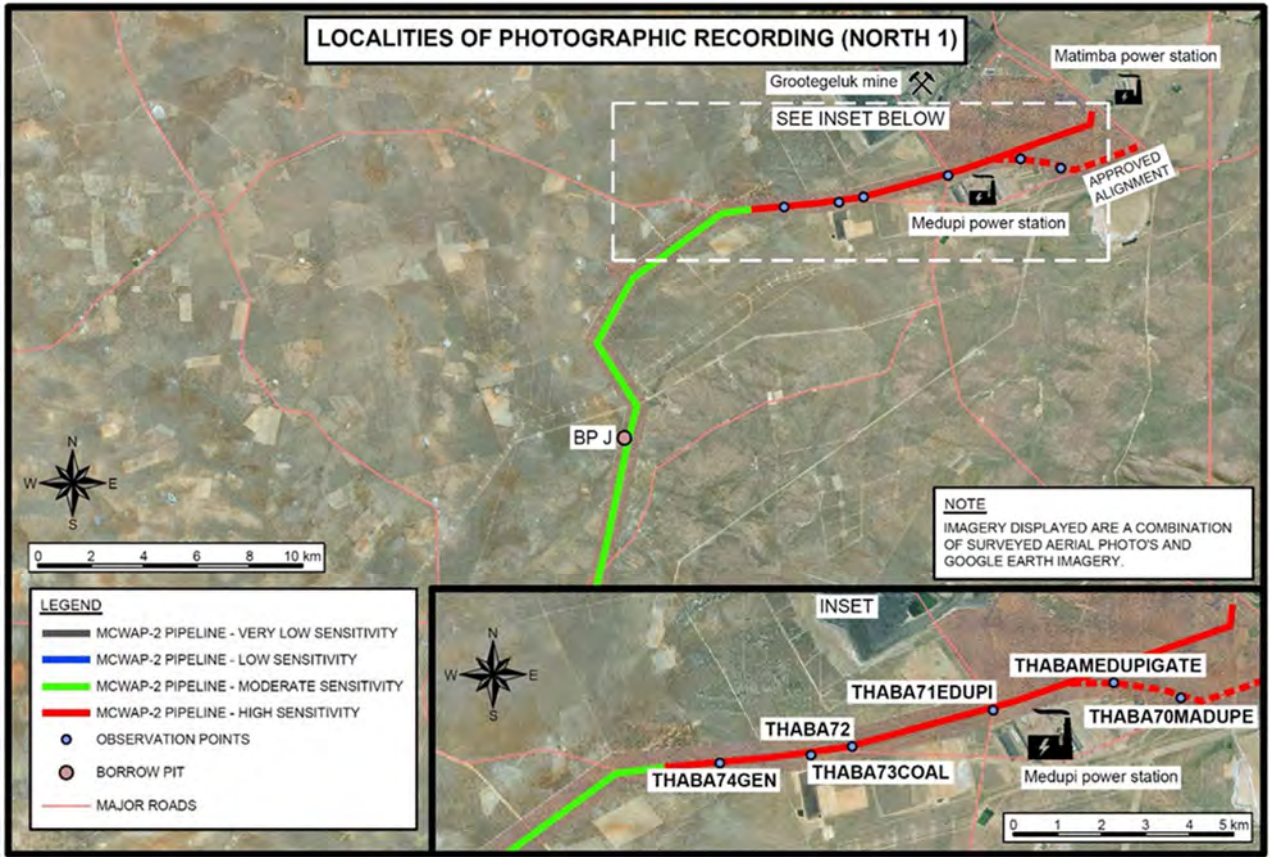















Figure 934. Section North 1



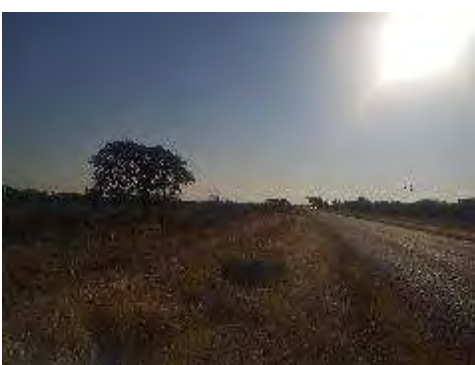

Table 6. Photographic observations for North 1&2 Sections



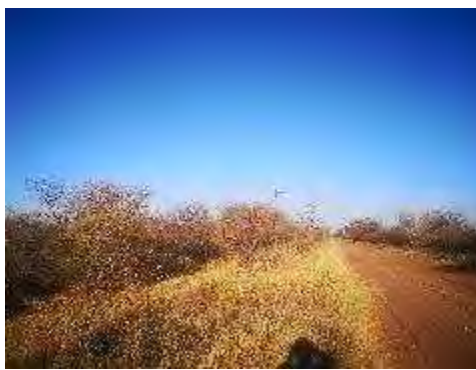

Photo	GPS	Description	Photographic Observation
Thaba 62 Deep sand	23.973543° S 27.395559° E	Waterberg Group sediments covered in thick deposits of Ceanozoic aged sand, mostly referred to as Kalahari sand. The most important palaeontological heritage will be associated with termitaria. The route of the pipeline falls in highly disturbed servitude of the railway line and it is unlikely that significant finds will be made during the construction phase of the development.	





Thaba 63 Deep sand	23.954081° S 27.391915° E	Waterberg Group sediments covered in thick deposits of Ceanozoic aged sand, mostly referred to as Kalahari sand. The most important palaeontological heritage will be associated with termitaria. The route of the pipeline falls in highly disturbed servitude of the railway line and it is unlikely that significant finds will be made during the construction phase of the development.	
Thaba 64 Deep sand	23.942746° S 27.392219° E	Waterberg Group sediments covered in thick deposits of Ceanozoic aged sand, mostly referred to as Kalahari sand. The most important palaeontological heritage will be associated with termitaria. The route of the pipeline falls in highly disturbed servitude of the railway line and it is unlikely that significant finds will be made during the construction phase of the development.	
Thaba 65 Deep sand	23.907832° S 27.400639° E	Waterberg Group sediments covered in thick deposits of Ceanozoic aged sand, mostly referred to as Kalahari sand. The most important palaeontological heritage will be associated with termitaria. The route of the pipeline falls in highly disturbed servitude of the railway line and it is unlikely that significant finds will be made during the construction phase of the development.	
Thaba 66 Bridge	23.894834° S 27.403821° E	The bridge on the Pipeline route as a marker.	


Thaba 68	27.403821°S 27.405595°E	The route of the pipeline follows the railway line servitude towards the north of section North and field observation confirms that the route is underlain by deep sand with high disturbance of the natural environment. No fossils were expected and no fossils were observed.	
Thaba 69	23.876383° S 27.408242° E	The northern part of section North is underlain by quartzitic sandstone with deep sand of Caenozoic age and no outcrop. Most of the geology shown on the maps has been interpreted from borehole data and geophysical surveys. This photographic observation is a good example of how vegetation has made it impossible for the access to the sections in the report where a general moderate sensitivity is allocated and the palaeontologist do not expect any significant chance finds on these sections. Since representative samples were recorded it was deemed a waste of time and finding to put more constraints on the contractor.	
Thaba 70 Matimba	23.696519° S 27.588351° E	In the northern section of North 1 fossil rich deposits of the Permian and Triassic aged Karoo Supergroup is covered in deep sand of Caenozoic age. Chance find of fossils in the disturbed areas in road reserves will be low, but in all areas where excavation for the pipeline reach into Permian aged shale the chance find of plant fossils and even vertebrate fossil in Triassic aged rocks is very high.	
Thaba 71	23.699162° S 27.546543° E	In the northern section of North 1 fossil rich deposits of the Permian and Triassic aged Karoo Supergroup is covered in deep sand of Caenozoic age. The Medupi Power Sration is a coal fired power plant in this part of South Africa and plant fossils are by definition the source of the fossil fuel mined at local mines. For an understanding of the Palaeontological Heritage of the area it is recommended that the EM studies reports on the plant fossils at these facilities.	

Thaba 72	23.708489° S 27.506017° E	Outcrop of Permian aged rocks are very sparse and most of the route of the pipeline is covered in Caenozoic sand with extreme disturbance in the road reserve. The chance find of fossils during deep excavation, if the rocks of the Karoo Supergroup are exposed is very high.	
Thaba 73	24.094914° S 27.419020° E	Outcrop of Permian aged rocks are very sparse and most of the route of the pipeline is covered in Caenozoic sand with extreme disturbance in the road reserve. The chance find of fossils during deep excavation, if the rocks of the Karoo Supergroup are exposed is very high. The photo shows large storage heaps of carbonaceous shale and coal.	
Thaba 74	23.710163° S 27.485734° E	Outcrop of Permian aged rocks are very sparse and most of the route of the pipeline is covered in Caenozoic sand with extreme disturbance in the road reserve. The chance find of fossils during deep excavation, if the rocks of the Karoo Supergroup are exposed is very high	
Thaba 75	23.708729° S 27.440629° E	Route of the pipeline follows the road reserve and also an existing pipeline route. The natural environment is totally disturbed and the chance find of fossils is moderate to low.	

Thaba 76 Works	23.709536° S 27.435282° E	Deep sandy soils of Caenozoic age on sediments of Karoo Supergroup age. The mining of coal in this region indicates the presence of significant plant fossils, but the collection of these fossils is best left to the geologists at the mines in this area. The chance of finding fossils in the highly disturbed geology along the pipeline route is low.	
Thaba 76.1 Bridge to nowhere	24.071087° S 27.414131° E	Planned route of the pipeline and possibly a new railway line towards the west? The bridge to nowhere is used as a marker along the North 1 section of the survey.	
Thaba 77	23.686769° S 27.367923° E	The North 1 section follows the servitude of the road and no outcrops were found during the field survey. The chance of finding fossils in the highly disturbed environment is low.	
Thaba 78	23.685520° S 27.321915° E	The Eskom substation on the North 1 section is used as a marker.	

Thaba 78.1 NGK	23.699143° S 27.287961° E	The North 1 section is allocated a moderate sensitivity for palaeontological heritage. Recent reports on the role that termitaria can play in the preservation of and even use as burial sites, or the association of termites with burial sites where the termites choose to digest bone for the Nitrogen in the bone, makes these deep sandy deposits in this area an important potential site for the discovery of new fossils, including the remains of Human ancestors in South Africa	
Thaba 80	23.754193° S 27.285469° E	The most western part of the survey Section North 1 (Figure 21) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	
Thaba 81	23.783622° S 27.311655° E	The most western part of the survey Section North 1 (Figure 21) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	
Thaba 81.1	23.795085° S 27.324851° E	The most western part of the survey Section North 1 (Figure 21) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	

Thaba 82 Wetland	23.812056° S 27.355510° E	The route of the pipeline crosses an extensive wetland at GPS 82 on the North 2 section (Figure 22).	
Thaba 85	23.833244° S 27.357744° E	Most of the remaining part of the survey Section North 2 (Figure 22) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	
Thaba 86	23.847365° S 27.359500° E	Most of the remaining part of the survey Section North 2 (Figure 22) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	
Thaba 87	23.863511° S 27.358591° E	Most of the remaining part of the survey Section North 2 (Figure 22) confirmed that the thick Caenozoic soils are a dominant geological feature and a moderate sensitivity for palaeontological heritage is allocated to this part of the project area. It is important to note that termitaria can be places with significant palaeontological and heritage value.	

Thaba 88	23.895061° S 27.378353° E	<p>Final marker on western route and filed survey section North 2 (Figure 22) is the road signs.</p> <p>This section of the pipeline is underlain by sedimentary rocks of the Waterberg Group, covered in deep sand. Fossils will most probably only be associated with termitaria.</p>	
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Potential Heritage Impacts and Proposed Mitigation

Each site will be discussed individually. Attention will be given to the Development (Construction) and Operational Phases. No specific decommissioning phase has yet been identified for any of the developments and will therefore not be discussed. Where impacts are anticipated relevant mitigation measures are given. A short discussion will also be given as to how the specific development relates to the given legislative measures and the overall IPMP.

Assessment Matrix (Determining Archaeological Significance)

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 7 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Table 7: Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3

Class	Landform	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Table 8: Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

Assessing site value by attribute

Table 8 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Impact Statement (Assessment of Impacts)

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions, which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

- (a) destruction or alteration of all or part of a heritage site;

- (b) isolation of a site from its natural setting; and
- (c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined below:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

Indicators of Impact Severity

Magnitude

The amount of physical alteration or destruction, which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity

The irreversibility of an impact. Adverse impacts, which result in a totally irreversible and irretrievable loss of heritage value, are of the highest severity.

Duration

The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range

The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency

The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

Diversity

The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect

A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change

The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. (*Zubrow, Ezra B.A., 1984*).

Impact Evaluation

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics, which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the heritage environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Impact Identification and Assessment Methodology

GIBB, subsequent to the assessment conducted by the specialist team, reviewed the impacts identified and assessed the inherent and residual risk posed to the receiving environment pre and post the application of mitigation measures. The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise as a result of the proposed development implementation and place the consequences of the proposed development before the Decision Maker.

For each of the main project phases the existing and potential future impacts and benefits (associated only with the proposed development) were described using the criteria listed in **Table 9** below. This was done in accordance with Government Notice R.326, promulgated in terms of Section 24 of the NEMA and the criteria drawn from the Integrated Environmental Management (IEM) Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts, published by the Department of Environmental Affairs (DEAT) (April 1998).

The assignment of significance ratings has been undertaken based on experience of the EIA team, as well as through research. Subsequently, mitigation measures have been identified and considered for each impact and the assessment repeated in order to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented).

Table 9: Criteria and rating Scales which were used in the Assessment of the Potential Impacts

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the effect of the impact related to the proposed development.
	Negative	
Extent	Footprint	The impact only affects the area in which the proposed activity will occur.
	Site	The impact will affect only the development area.
	Local	The impact affects the development area and adjacent properties.
	Regional	The effect of the impact extends beyond municipal boundaries.
	National	The effect of the impact extends beyond more than 2 regional/ provincial boundaries.
	International	The effect of the impact extends beyond country borders.
Duration	Temporary	The duration of the activity associated with the impact will last 0-6 months.
	Short term	The duration of the activity associated with the impact will last 6-18 months.
	Medium term	The duration of the activity associated with the impact will last 18 months-5 years.
	Long term	The duration of the activity associated with the impact will last more than 5 years.
Severity	High negative	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.
	Moderate negative	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected.
	Low negative	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected
	Low positive	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved.
	Moderate positive	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued,

Criteria	Rating Scales	Notes
		important, sensitive or vulnerable systems or communities are positively affected.
	High positive	The severity of the impact is rated as High positive as the natural, cultural or social functions and processes are altered to the extent that valued, important, sensitive or vulnerable systems or communities are substantially positively affected.
Potential for impact on irreplaceable resources	No	No irreplaceable resources will be impacted.
	Yes	Irreplaceable resources will be impacted.
Consequence	Extremely detrimental	A combination of extent, duration, intensity and the potential for impact on irreplaceable resources.
	Highly detrimental	
	Moderately detrimental	
	Slightly detrimental	
	Negligible	
	Slightly beneficial	
	Moderately beneficial	
	Highly beneficial	
Extremely beneficial		
Probability (the likelihood of the impact occurring)	Unlikely	It is highly unlikely or less than 50 % likely that an impact will occur.
	Likely	It is between 50 and 75 % certain that the impact will occur.
	Definite	It is more than 75 % certain that the impact will occur or it is definite that the impact will occur.
Significance	Very high - negative	A function of Consequence and Probability.
	High - negative	
	Moderate - negative	
	Low - negative	
	Very low	
	Low - positive	
	Moderate - positive	
	High - positive	
Very high - positive		

Table 10: Explanation of Assessment Criteria

Criteria	Explanation
Nature	This is an evaluation of the type of effect (change) the construction, operation and management of the proposed development would have on the affected environment. Will the impact change in the environment be positive, negative or neutral?

Criteria	Explanation
Extent or Scale	This refers to the spatial scale at which the impact will occur. Extent of the impact is described as: footprint (affecting only the footprint of the development), site (limited to the site) and regional (limited to the immediate surroundings and closest towns to the site). Extent or scale refers to the actual physical footprint of the impact, not to the spatial significance. It is acknowledged that some impacts, even though they may be of small extent, are of very high importance, e.g. impacts on species of very restricted range. In order to avoid “double counting, specialists have been requested to indicate spatial significance under “intensity” or “impact on irreplaceable resources” but not under “extent” as well.
Duration	The lifespan of the impact is indicated as temporary, short, medium and long term.
Severity	This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered?
Impact on irreplaceable resources	This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could possibly be replaced by natural processes (e.g. by natural colonisation from surrounding areas), through artificial means (e.g. by reseeded disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems substitutes are often possible (e.g. by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g. red data species that are restricted to a particular site or habitat of very limited extent.
Consequence	The consequence of the potential impacts is a summation of above criteria, namely the extent, duration, intensity and impact on irreplaceable resources.
Probability of occurrence	The probability of the impact actually occurring based on professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. It is important to distinguish between probability of the impact occurring and probability that the activity causing a potential impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact.
Significance	<p>Impact significance is defined to be a combination of the consequence (as described below) and probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact actually occurring.</p> <p>In simple terms, if the consequence and probability of an impact is high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.</p>

Criteria	Explanation
Degree of confidence in predictions	Specialists and the EAP team were required to provide an indication of the degree of confidence (low, medium or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. Degree of confidence is not taken into account in the determination of consequence or probability.
Mitigation measures	Mitigation measures are designed to reduce the consequence or probability of an impact, or to reduce both consequence and probability. The significance of impacts has been assessed both with mitigation and without mitigation.

Table 11: Impact Assessment Criteria and Rating Scales

Duration		Extent		Irreplaceable Resources		Severity		Consequence = (Duration+Extent+Irr) x Severity		Likelihood		Significance		Confidence
1	Temporary	1	Footprint	1	Yes	-3	High - negative	-25 to -33	Extremely detrimental	1	Unlikely	-73 to -99	Very high - negative	Low
2	Short term	2	Site	0	No	-2	Moderate - negative	-19 to -24	Highly detrimental	2	Likely	-55 to -72	High - negative	Medium
3	Medium term	3	Local			-1	Low - negative	-13 to -18	Moderately detrimental	3	Definite	-37 to -54	Moderate - negative	High
4	Long term	4	Regional					-7 to -12	Slightly detrimental			-19 to -36	Low - negative	
		5	National			1	Low -positive	0 to -6	Negligible			0 to -18	Very low - negative	
		6	International			2	Moderate - positive							
						3	High - positive	0 to 6	Negligible			0 to 18	Very Low - positive	
								7 to 12	Slightly beneficial			19 to 36	Low - positive	
								13 to 18	Moderately beneficial			37 to 54	Moderate - positive	
								19 to 24	Highly beneficial			55 to 72	High - positive	
								25 to 33	Extremely beneficial			73 to 99	Very high - positive	

Ascribing Significance for Decision-Making

The best way of expressing the environmental costs/impacts and the inherent benefit implications for decision-making is to present them as risks. Risk is defined as the consequence (implication) of an event multiplied by the probability (likelihood)¹ of that event. Many risks are accepted or tolerated daily because even if the consequence of the event is serious, the likelihood that the event will occur is low. A practical example is the consequence of a parachute not opening, is potentially death but the likelihood of such an event happening is so low that parachutists are prepared to take that risk and hurl themselves out of an airplane. The risk is low because the likelihood of the consequence is low even if the consequence is potentially severe.

It is also necessary to distinguish between the event itself (as the cause) and the consequence. Again, using the parachute example, the consequence of concern in the event that the parachute does not open is serious injury or death, but it does not necessarily follow that if a parachute does not open that the parachutist will die.

Various contingencies are provided to minimise the likelihood of the consequence (serious injury or death) in the event of the parachute not opening, such as a reserve parachute. In risk terms this means distinguishing between the inherent risk (the risk that a parachutist will die if the parachute does not open) and the residual risk (the risk that the parachutist will die if the parachute does not open but with the contingency of a reserve parachute) i.e. the risk before and after mitigation.

Consequence

The ascription of significance for decision-making becomes then relatively simple. It requires the consequences to be ranked and likelihood to be defined of that consequence. In **Table 12**, a scoring system for consequence ranking is shown. Two important features should be noted in the table, namely that the scoring doubles as the risk increases and that there is no equivalent 'high' score in respect of benefits as there is for the costs. This high negative score serves to give expression to the potential for a fatal flaw where a fatal flaw would be defined as an impact that cannot be mitigated effectively and where the associated risk is accordingly untenable. Stated differently, the high score on the costs, which is not matched on the benefits side, highlights that such a fatal flaw cannot be 'traded off' by a benefit and would render the proposed project to be unacceptable.

¹ Because 'probability' has a specific mathematical/empirical connotation the term 'likelihood' is preferred in a qualitative application and is accordingly the term used in this document.

Table 12: Ranking of Consequence

Environmental Cost	Inherent risk
Human health – morbidity / mortality, loss of species	High
Material reductions in faunal populations, loss of livelihoods, individual economic loss	Moderate – high
Material reductions in environmental quality – air, soil, water. Loss of habitat, loss of heritage, amenity	Moderate
Nuisance	Moderate – low
Negative change – with no other consequences	Low
Environmental Benefits	Inherent benefit
Net improvement in human welfare	Moderate – high
Improved environmental quality – air, soil, water. Improved individual livelihoods	Moderate
Economic Development	Moderate – Low
Positive change – with no other consequences	Low

Likelihood

Although the principle is one of probability, the term 'likelihood' is used to give expression to a qualitative rather than quantitative assessment, because the term 'probability' tends to denote a mathematical/empirical expression. A set of likelihood descriptors that can be used to characterise the likelihood of the costs and benefits occurring, is presented in Table 13.

Table 13: Likelihood categories and definitions

Likelihood Descriptors	Definitions
Highly unlikely	The possibility of the consequence occurring is negligible
Unlikely but possible	The possibility of the consequence occurring is low but cannot be discounted entirely
Likely	The consequence may not occur but a balance of probability suggests it will
Highly likely	The consequence may still not occur but it is most likely that it will
Definite	The consequence will definitely occur

It is very important to recognise that the likelihood question is asked twice. The first time the question is asked is the likelihood of the cause and the second as to the likelihood of the consequence. In the tables that follow the likelihood is presented of the cause and then the likelihood of the consequence is presented. A high likelihood of a cause does not necessarily translate into a high likelihood of the consequence. As such the likelihood of the consequence is not a mathematical or statistical 'average' of the causes but rather a qualitative estimate.

Residual Risk

The residual risk is then determined by the consequence and the likelihood of that consequence. The residual risk categories are shown in **Table 6** where consequence scoring is shown in the rows and likelihood in the columns. The implications for decision-making of the different residual risk categories are shown in **Table 15**.

Table 14: Residual risk categories

		Residual risk				
Consequence	High	Moderate	High	High	Fatally flawed	
	Moderate – high	Low	Moderate	High	High	High
	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Moderate – low	Low	Low	Low	Low	Moderate
	Low	Low	Low	Low	Low	Low
		Highly unlikely	Unlikely but possible	Likely	Highly likely	Definite
		Likelihood				

Table 15: Implications for decision-making of the different residual risk categories

Rating	Nature of implication for Decision – Making
Low	Project can be authorised with low risk of environmental degradation
Moderate	Project can be authorised but with conditions and routine inspections
High	Project can be authorised but with strict conditions and high levels of compliance and enforcement
Fatally Flawed	The project cannot be authorised

Anticipated Impact of the Development on Heritage Sites as Described in the 2020 HIA

Table 16: Subterranean or Unmarked/Unidentified Sites

IMPACT TABLE FORMAT		
Issue/Impact/Heritage Impact/Nature	<i>Negative Impact on unmarked/unidentified or buried heritage sites.</i>	
<i>Extent</i>	<i>Local (3)</i>	
<i>Likelihood</i>	<i>Unlikely (1)</i>	
<i>Consequence</i>	<i>-14 (Moderately Detrimental)</i>	
<i>Irreplaceable loss of resources</i>	<i>Yes (1)</i>	
<i>Duration</i>	<i>Medium term (3)</i>	
<i>Cumulative effect</i>	<i>Medium cumulative effect (3)</i>	
<i>Severity</i>	<i>Moderately negative (-2)</i>	
<i>Significance Rating of Potential Impact</i>	<i>37 points. The impact will have a moderate negative impact rating.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	2
Probability	1	1
Consequence	-14	-6
Irreplaceable loss	1	1
Duration	3	2
Severity	-2	-1
Significance rating	-44 (moderately negative)	-12 (very low negative)
Mitigation measure	<i>A suitably qualified heritage practitioner should monitor any earthmoving activities. Should any unmarked sites or subterranean sites be encountered, the chance finds protocol contained in this report should be followed.</i>	

Table 17: Anticipated Impacts as Described in the 2018 HIA

(See appended report for risk calculation explanation)

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on MCWAP 1	4	4	3	3	2.2 Moderate
Impact on MCWAP 2	4	4	4	4	3.2 High
Impact on MCWAP 3	4	4	4	3	2.4 Moderate
Impact on MCWAP 4	4	4	3	2	1.5 Low

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on MCWAP 5	3	3	3	3	1.8 Low
Impact on MCWAP 6	3	3	3	3	1.8 Low
Impact on MCWAP 7	4	4	3	2	1.5 Low
Impact on MCWAP 8	3	3	4	4	2.7 Moderate
Impact on MCWAP 9	3	3	3	3	1.2 Low
Impact on MCWAP 10	3	3	4	4	2.7 Moderate
Impact on MCWAP 11	4	3	3	3	2.0 Moderate
Impact on MCWAP 12	4	3	4	3	2.2 Moderate
Impact on MCWAP 13	4	4	3	3	2.2 Moderate
Impact on MCWAP 14	4	4	4	3	2.4 Moderate
Impact on MCWAP 15	3	4	3	2	1.3 Low
Impact on MCWAP 16	4	3	3	3	2.0 Moderate
Impact on MCWAP 17	4	3	3	2	1.3 Low

Impacts as Described in the 2020 PIA

(No quantitatively orientated evaluation of risk or impact was provided in this PIA)

The development site applicable to the application for the proposed Mokolo Crocodile Water Augmentation Project Phase 2 (MCWAP-2), Lephale and Thabazimbi Local Municipalities, Waterberg District Municipality in the Limpopo Province is underlain by Vaalian Aged stromatolitic dolomite, Mokolian aged quartzitic sandstone and shale, Carboniferous and Permian to Permo-Triassic aged sandstone and mudstones and Quaternary aged surface deposits which varies in palaeontological sensitivity from very Low to very high (Table 1). No significant fossils are expected from the Mokolian aged diabase or the Jurassic aged dolerite dyke areas, but the association of termitaria with these rock types are significant in terms of possible Human burial sites.

Significant fossils are expected in areas with deep exposure, and more fossils are expected during excavation for trenching in areas indicated in red and orange on the Palaeontological sensitivity map (Figure 12). It is important that a suitably qualified Palaeontologist be appointed to visit the site of the development to identify potential fossils in areas indicated as High or Very Highly significant during the first week of excavations. If any fossils are exposed during the lifetime of the project, the finds must be reported as soon as possible to the relevant authority (SAHRA) for collection and safe keeping of Palaeontological Heritage.

In areas underlain by the Malmani Subgroup the field investigation confirmed the presence of stromatolites (Table 2), and it will be very important that a suitably qualified Palaeontological Specialist be appointed to do a Phase 2 PIA and to upgrade the "Chance Find Protocol" document. The CFP document must then be included as part of the EMP of this project, to record all unexpected fossils associated with the geological formations on site.

It is recommended that:

- The EAP and ECO must be informed of the fact that a high and very high Palaeontological Sensitivity is allocated to the parts of study area underlain by Transvaal Supergroup and Karoo Supergroup sedimentary rocks and a moderate sensitivity over the rest of the site underlain by Waterberg Group Quartzitic sandstone and shale. A moderate sensitivity is allocated to areas covered in Quaternary aged sand. Diabase and dolerite will not contain fossils but can be associated with important termitaria.
- Further mitigation for Palaeontological Heritage is recommended for this project before excavation of deeper than 1.5m is done. Collection of a representative sample (1 m³) of stromatolitic dolomite must be done during the first week of excavation into these rocks and the sample must be transported to the ESI at WITS University for further studies.
- A suitably qualified palaeontologist must do a Phase 2 PIA and upgrade the "Chance Find Protocol" (CFP) when fossils are recorded from any formation in this area during excavations.
- Recommendations contained in this Phase 1 PIA must be approved by SAHRA.
- These recommendations must be included in the EMP of this project.

Combined Impact and Mitigation Table

Part of the purpose of this report is to standardise the findings of the three phases of investigation. There are several challenges associated with this, mainly that all three reports use different formats for the evaluation of site significance.

Challenges and Shortcomings

2018 PGS HIA Report - PGS

Shortcomings

- The evaluation of sites does not seem to follow a standardised format.
- The evaluation criteria are limited and seems outdated.
- There seems to be significant duplication in the evaluation process.
- Recorded sites seem to occur in clusters suggesting that the survey time was not evenly distributed between different areas.
- Seven of the eighteen identified sites were attributed a score of 'Low'. According to the evaluation methodology provided no further mitigation work is required for such sites, however full second phase mitigation is proposed for all these sites in the subsequent sections of the report.
- Eleven of the eighteen sites identified were found to be outside of the proposed development corridor. In some cases, as much as 16km away from the core alignment.

Challenges

- The impact evaluation process used in this report attributes arbitrary classes to the significance of identified sites. Although this is on a scale from 'Low' to 'High', no explanation or clarification is offered for the attributes that signify such classification. This makes standardisation and comparative analysis difficult.
- As a result of the first point there seems to be widely varying recommendations which bears no relevance to the significance criteria provided. Sites designated as 'Medium' significance are attributed variously mitigation from full second phase investigation to monitoring.
- Some of the development areas has been altered since 2018 and therefore the provided recommendations are not relevant anymore.

Resolution

Since there are only 18 sites identified during this phase of investigation and since only 9 are deemed of Moderate value and only one site is designated as of High significance, it will be possible to proceed with site specific recommendations as outlined in the report. The results of the Walks down survey indicated that very few of the sites designated for mitigation will in fact be in harm's way. New mitigation measures will be provided in the following section.

2020 PIA Report – G Groenewald

Shortcomings

- The report resembles a photographic record of the alignment and although informative overall it provides extraordinarily little in terms of actual palaeontological findings.
- There seems to be few differences in the findings of the field-based PIA compared to the desktop PIA.
- No specific paleontological finds were noted or evaluated.

- The report seems to focus inordinately on the occurrence of termitaria. There are no fewer than 43 references to termitaria in the report. These are of little relevance to palaeontology and their conceived association with burial practises are both unrecorded in this area and not within the scope of the palaeontological investigation. Although the author indicates that termitaria are important in terms of palaeontology, a literature search could not find any reference to this.

Challenges

- The fact that no specific sites were evaluated makes attributing an evaluation matrix to the results difficult.
- There seems to be conflicting findings between the 2020 study and the 2018 study (although the 2018 study seemed to be very rudimentary.)

2020 HIA Report – G&A Heritage Practitioners (Pty) Ltd

The main shortcoming of this report is the lack of identified sites. Neither the walk-down survey nor further investigations could identify any heritage sites of significance within the proposed alignment corridor. The survey coverage was found to be sufficient and this lack of sites can be attributed to a scarcity of heritage sites within the study area and not due to a low-resolution survey. This finding is in line with the findings of the 2018 survey that found the area distinctly lacking in heritage sites.

Table 18: Combined 2018/2020 HIA & PIA Findings and Mitigations

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
2018 HIA (PGS)	1	Grave identification process	Yes	Supported	This site lies within the approved corridor and is of high enough heritage significance to warrant a second phase of investigation that will be required before a permit for destruction can be issued by SAHRA. It is further recommended that the possible grave sites be investigated through a ground penetrating radar investigation to determine the likelihood of these being graves. Should there be sufficient evidence to suggest that these are graves they should be relocated to a cemetery under local municipal administration.
	2	Grave relocation process	Yes	Supported	These graves fall within the proposed construction camp site and are in

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
					imminent danger of being damaged should this site be developed. If the construction camp development is approved these graves will need to be relocated to a cemetery under local municipal administration. These recommendations are therefore dependant on the decision to utilise this area for the construction camp. Alternatively these sites can be fenced in with a 25m buffer zone to protect them from any damage. Signage at the site should indicated the access procedures in order that that fencing does not impair access to the site by next of kin. These procedures would also apply to access to the construction camp. It is however recommended for health, safety and security reasons that the grave rather be relocated to limited unauthorised access to the construction camp as well as possible injuries that could result to next of kin moving in and out of the site.
	3	Grave identification process	Yes	Supported	These are possible burial sites and should also be subjected to a ground penetrating radar study to determine whether or not sufficient evidence exists to classify them as graves. Should this be the case the same procedure as at Site 1 will apply.
	4	Grave relocation process	No	This site was found to be outside of the development corridor. It is however near	This site will not be affected by the proposed development. It is however recommended that it be demarcate by barrier tape to

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
				enough to warrant protection but not relocation. It is recommended that it be indicated by barrier tape and a 25m buffer be observed around it.	ensure that no secondary construction activities impact on it inadvertently.
	5	Second phase documentation through a heritage architect. Public participation and permit applications needed.	No	It was found that this site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	6	Second phase documentation through a heritage architect. Public participation and permit applications needed.	No	It was found that this site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	7	Grave relocation process	No	It was found that this site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	8	Archaeological watching brief	Yes	Supported	<p>This site falls within the proposed development corridor and will most likely be impacted upon. The purpose of a watching brief is</p> <p>a. to allow, within the resources available, the preservation by record of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works</p> <p>b. to provide an opportunity, if needed, for the watching archaeologist to signal to all</p>

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
					<p>interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard. A watching brief is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.</p> <p>The objective of a watching brief is to establish and make available information about the archaeological resource existing on a site.</p> <p>Specific terms of reference in terms of the required watching brief will be made available by the contracted heritage practitioner.</p>
	9	Full second phase documentation and permit application.	Yes	Supported	<p>This site lies within the approved pipeline corridor and is of extended enough size and high enough heritage value that it warrants recording before development can commence. It will also be subject to the issuing of a permit for destruction from the SAHRA. Only the areas that will be directly affected by the pipeline excavation will need to be excavated and documented. Specific terms of reference for the is phase will be supplied by the contracted heritage</p>

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
					practitioner. Due to the subterranean nature of the deposits proper recommendations regarding its extent cannot be made from surface observations.
	10	Full second phase documentation and permit application	No	The site was found to be 200m outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	11	Grave identification process	No	This site is 1680m away from the nearest proposed development.	The site no longer falls within the approved corridor and no further mitigation work is required.
	12	Grave identification process	No	This site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	13	Grave relocation process	No	This site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	14	Grave identification process	No	This site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	15	Second phase documentation through a heritage architect. Public participation and permit applications needed.	No	This site falls outside of the proposed development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	16	Grave identification process	Yes	Supported	It is recommended that this site undergoes a ground penetrating radar investigation to determine the likelihood of it being a burial site. If the results of the GPR study imply that this is the case it should be relocated to a cemetery

PHASE	SITE	ORIGINAL RECOMMENDATIONS	RELEVANT	NEW RECOMMENDATIONS	MITIGATION ACTIONS
					under local municipal administration.
	17	Interview with landowner	No	This site lies 460m away from the nearest part of the development corridor.	The site no longer falls within the approved corridor and no further mitigation work is required.
	18	No site-specific recommendations	No	This site is 3km from the nearest proposed development.	The site no longer falls within the approved corridor and no further mitigation work is required.
PIA 2020 G Groenewald	No specific sites were identified and recommendations regarding wider areas of palaeontological sensitivity is supported.				
	A termitaria with coins imbedded in it was observed and reported to the heritage investigator. The site was investigated on the 14 th of October and found to be of no special heritage significance. No other indications of burials as suggested, could be identified in the immediate vicinity of the termite mound.				This site is of no heritage significance and no further actions are required.
2020 HIA & Walk down	No new sites of heritage significance were identified within the development corridor. It is recommended that the chance finds protocols be applied during the construction and operational phase of the project. All the chance find sites identified proved to fall outside of the proposed development corridor and approved pipeline route.				No further heritage actions are required.

Chance Finds Protocol Heritage Sites

Purpose of the chance find procedure

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources are encountered during project construction or operation. A Chance Find Procedure, as described in IFC Performance Standard 8, is a process that prevents chance finds from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements are implemented.

Scope of the chance find procedure

This procedure is applicable to all activities conducted by the personnel, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority be that provincial or national.

Induction/Training

All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the project induction and regular toolbox talks.

Chance find procedure

If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken:

1. Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;
2. Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Control Officer (ECO)/Environmental Manager (EM);
3. Record details in Incident Report and take photos of the find;
4. Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
5. Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
6. Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the SAHRA, once completed.

7. In case of significant find the SAHRA should be informed immediately and in writing within 7 days from the find
8. The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.
9. The SAHRA must investigate the fact within 2 weeks from the date of notification and provide response in writing.
10. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
11. Construction works could resume only after permission is granted from the responsible authorities.
12. In case no response received within the 2 weeks period mentioned above, this is considered as authorisation to proceed with suspended construction works.

One of the main requirements of the procedure is record keeping. All finds must be registered. Photolog, copies of communication with decision-making authorities, conclusions and recommendations/guidance, implementation reports are kept.

Additional information

Management options for archaeological sites

- Site avoidance. If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost-effective management option).
- Mitigation. If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation. (The most expensive and time-consuming management option.)
- Site Protection. It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

Management of replicable and non-replicable heritage

Different approaches for the finds apply to replicable and non-replicable heritage.

Replicable heritage

Where tangible cultural heritage that is replicable and not critical, is encountered, mitigation measures will be applied.

The mitigation hierarchy is as follows:

- Avoidance;
- Minimization of adverse impacts and implementation of restoration measures, in situ;
- Restoration of the functionality of the cultural heritage, in a different location;

Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural

values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

- Permanent removal of historical and archaeological artefacts and structures ;
- Compensation of loss - where minimization of adverse impacts and restoration not feasible.

Non-replicable heritage

Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage. Nonreplicable cultural heritage must not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and

Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

Human Remains Management Options

The handling of human remains believed to be archaeological in nature requires communication according to the same procedure described above. There are two possible courses of action:

- Avoid. The development project is redesigned to completely avoid the found remains. An assessment should be made as to whether the remains may be affected by residual or accumulative impacts associated with the development, and properly addressed by a comprehensive management plan.
- Exhume. Exhumation of the remains in a manner considered appropriate by decision makers. This will involve the predetermination of a site suitable for the reburial of the remains. Certain ceremonies or procedures may need to be followed before development activities can recommence in the area of the discovery.

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity (50m radius of the site) should cease.

- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains the South African Police Services (SAPS) should be notified.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyse the finds.

Chance Finds Protocol Palaeontology

CHANCE FIND PROTOCOL FOR PALAEOLOGICAL HERITAGE

PHASE 1 PALAEOLOGICAL ASSESSMENT SURVEY AND A SITE VISIT FOR THE PROPOSED MOKOLO CROCODILE WATER AUGMENTATION PROJECT PHASE 2 (MCWAP-2), LEPHALALE AND THABAZIMBI LOCAL MUNICIPALITIES, WATERBERG DISTRICT MUNICIPALITY IN THE LIMPOPO PROVINCE.

MITIGATION FOR EXCAVATION IMPACT ON PALAEOLOGICAL HERITAGE RESOURCES

It is essential that the appointed palaeontologist, in consultation with the Project Environmental Manager and the contractors and ECO's of the excavation works develop a short-term strategy for the recovery of significant fossils during the excavation operation. As part of such a strategy, the discussions with the palaeontologist must include:

- Initially, and at least for the duration of excavation, visit the site on request of the ECO of the specific construction site, to ensure recording of all potentially significant fossil strata. Due to the longevity of this contractual involvement it is not possible to have pre-determined timing on these visits and it is a conclusion from present excavations, that more frequent visits by the Palaeontologist during excavations into the Malmani Subgroup, Waterberg Group, Karoo Supergroup Group and Quaternary sediments will most probably be required.
- Determine a short-term strategy and budget for the recording of significant fossils. This strategy is simply an oral agreement on when the site is to be inspected and what the finds are that might be recorded. The site visit must include an introduction session with all the managers of the project team, including training of the ECO and site managers by the appointed palaeontologist, to basically train people to know what to look out for in terms of fossil heritage on site. This action will be required at the start of each individual construction activity for the duration of construction in the "greenfield sections" of the route.
- In the case of reporting of any unusual sedimentary structures, the Palaeontologist must be notified, and a site visit must be arranged at the earliest possible time with the Palaeontologist. In the case of the site ECO or the Site Manager becoming aware of suspicious looking material that might be a "Significant Find", the construction must be halted in that specific area and the PEM must be informed who will inform the Project Engineer. The Palaeontologist must be given enough time to reach the site and the PEM will request a Site Instruction from the Engineer to allow for removal the material before excavation continues. Although significant finds of Stromatolites were recorded during the first site inspections (Phase 1 PIA, included in this document) the Palaeontologist foresee much more significant finds during the lifetime of the Project.

Mitigation Measures Normally Encountered

1. Mitigation of palaeontological material must begin as soon as possible and preferably when "trial excavation" takes place. The appointed specialists must acquaint themselves with the operation and determine feasible mitigation strategies.
2. A plan for systematic sampling, recording, preliminary sorting and storage of palaeontological and sedimentological samples will be developed during the early stages of the project, in collaboration with the Evolutionary Studies Institute (ESI) at WITS University, which is the closest Institute to the site. If appropriate, the Rhodes University as well as the University of KwaZulu-Natal, might be asked for their involvement in this project.
3. Mitigation will involve an 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, labelled, boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer and Project Environmental Managers for the Project

1. Ensuring, at their cost, that a representative archive of palaeontological samples and other records are assembled to characterise 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. In the case of this project it is foreseen that stromatolites, vertebrate, plant and trace fossils will be present. (If more fossils of Vaalian, Mokolian, Permian, Triassic or Quaternary age are exposed, it will be very highly significant and the Palaeontologist will obviously be in close communication with the site ECO and the PEM to act as required by SAHRA without causing undue standing time for the contractors).
3. “Facilitate” systematic recording of the stratigraphic and palaeo-environmental features of exposures in the fossil-bearing excavations, by allowing time to describe and measure geological sections, and by providing aid in the surveying of positions where significant fossils are found. (In the case of this specific development, the likelihood of such finds is high for the southern part of the development).
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 that is defined as a work area for sorting, labelling and boxing/bagging of samples.
6. Costs of basic curation and storage in the sample archive at the ESI, WITS University (labels, boxes, shelving and, if necessary, specifically-tasked temporary employees).

Documentary record of palaeontological occurrences

The contractors will, after consultation with the PEM and in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which the following information are indicated on the plan in the site office at the excavation site. This must be done in conjunction with the appointed specialist and form part of the on-going revision of the “Chance Find Protocol” (CFP) during the excavation stage of the project:

1. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.
2. Locations of samples and measured sections are to be pegged, and routinely accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any significant fossils are recorded during the time of excavation. This information must be recorded during the first site visit and a clearance from the Palaeontologist (e-mail message will suffice) must be followed up with subsequent e-mail communications with the Site Specific ECO, Site Manager and the PEM.

Functional responsibilities of the appointed Palaeontologist

1. Apply for a permit to collect fossils during the lifetime of the Project and establishment of a representative collection of fossils and a contextual archive of appropriately documented and sampled paleoenvironmental and sedimentological geodata in collaboration with the ESI at WITS University, or the Rhodes University, University of KwaZulu-Natal, depending on the expertise available at each Institute.
2. Undertake an initial evaluation of potentially affected areas and of available exposures in excavations. A short training session, inclusive of the PEM, Project Managers and the ECO's or their representatives, must be presented during the initial induction stages of this project.
3. On the basis of the above, and evaluation during the early stages of excavation development, in collaboration with the PEM and the contractor management team, more detailed practical strategies to deal with the fossils encountered routinely during excavation, as well as the strategies for major finds must briefly be agreed on.
4. Informal on-site training in responses applicable to "normal" fossil finds must be provided for the PEM, ECO and environmental staff by the appointed specialist. This step will only be arranged following the discovery of significant fossils at the time of the Phase 2 site visits.
5. Respond to significant finds and undertake appropriate mitigation.
6. Initially, for the first year of operation, and if the PEM or the appropriate ECO indicates significant "strange looking rocks" that might be similar to the fossils indicated to the staff during the information sessions, visit at least once in twelve weeks to "touch base" with the monitoring progress. Document interim "normal" finds and undertake an inspection and documentation of new excavation faces. A strategy for further visits during the life of the excavation must be discussed.
7. Transport of material from the site to the ESI, WITS University or the allocated Institute where an expert on the specific fossils discovered, is presently employed.
8. Reporting on the significance of discoveries, as far as can be preliminarily ascertained. This report is in the public domain and copies of the report must be deposited at ESI and the South African Heritage Resources Authority (SAHRA). It must fulfil the reporting standards and data requirements of these bodies.
9. Reasonable participation in publicity and public involvement associated with palaeontological discoveries.

Exposure of palaeontological material

In the event of construction exposing new palaeontological material, not regarded as normative/routine as outlined in the initial investigation, such as a major fossil find (for example the articulated remains of a vertebrate), the following procedure must be adhered to:

1. The appointed specialist or alternates (SAHRA; ESI WITS University, University of KZN; Rhodes University) must be notified by the responsible officer (e.g. the PEM, Chief Engineer, ECO or Contractor Manager). This is also applicable if major or unusual discoveries are made by the Contractor Staff during excavation.
2. Should a major in situ occurrence be exposed, excavation will immediately cease in that area so that the discovery is not disturbed or altered in any way until the appointed specialist or scientists from the ESI at WITS University, or its designated representatives, have had reasonable opportunity to investigate the find. Such work will be at the expense of the Developer.

Some poorly defined impressions of trace fossils were observed in the Waterberg Group Slate during the first site visit. The palaeontologist cleared the continued excavation on the proviso that any suspicious material will be indicated to the Palaeontologist via emailed photographic information.

It is recommended that:

- The PEM and ECO's must be informed of the fact that a very low to very high Palaeontological sensitivity was allocated to the entire development and due to the highly weathered nature of the material, significant fossils is expected after the start of excavations for pipeline construction and foundations at the weir, as well as in borrow pits excavations that exceed 1.5m.
- The allocated team members in the teams of the contractor should be introduced to Palaeontological material that is likely to be found on site. A once-off information session with the Palaeontological specialist must be arranged at the start of each individual contractual Construction Site, to present a simple and understandable (preferably audio-visual presentation) to the majority of the contractual Managers and ECO's on site during the initial site visit as is indicated in the EMPr for the Project.
- This "Chance Find Protocol" is included in the EMPr of the Project and a reasonable budget must be allocated to ensure compliance with the legal responsibility of the developer in terms of the proper conservation of and storage of Palaeontological Heritage. This also applies to areas that will be flooded by the weir, where exposures will only occur after filling of the proposed weir.
- SAHRA must be informed of the content of this "Chance Find Protocol" and EMPr arrangements by the PEM and the Developer, for final conclusion of the Project when completed.

Conclusions and Recommendations

Heritage

The second phase HIA investigation for the MCWAP-2 investigated areas that were not accessible during the previous study as well as some new borrow pit options. Although accessibility was again a limiting factor during the field survey a satisfactorily high percentage of the proposed development footprint was accessed to ensure an acceptable evaluation of the heritage sensitivity of the proposed development. No new sites of heritage significance were found to be endangered by the proposed alignment of the pipeline or its associated borrow pits and other infrastructure. All the sites of heritage significance that were noted fell outside of the proposed development footprint.

A walk-down survey of the previous investigation area (previous HIA by PGS) was done and no new sites could be identified and the recommendations of the original HIA is corroborated by the current study.

Provided the Chance Finds Protocol supplied in this report is applied to the monitoring of the site and the associated construction crew induction in terms of heritage is performed there is no reason from a heritage point of view why this development cannot proceed.

Palaeontology

The development site for the Phase 1 Palaeontological Assessment Survey and a site visit for the proposed Mokolo Crocodile Water Augmentation Project Phase 2 (MCWAP-2), Lephalale and Thabazimbi Local Municipalities, Waterberg District Municipality in the Limpopo Province falls on very low to very highly significant sedimentary rocks (Transvaal Supergroup, Karoo Supergroup and Quaternary surface deposits) that contain significant fossils. No fossils were collected to date due to very deep and severe weathering of rocks. No fossils will be present in granite, diabase and dolerite.

Poorly preserved imprints of trace fossils were recorded in the Waterberg Group slate. The potential for finding significant stromatolites, invertebrate, plant and trace-fossils, in any excavation into sediments of the , Malmani Subgroup, Waterberg Group, Karoo Supergroup and Quaternary termitaria is very high and the cooperation of the entire team of engineers and contractors, is of critical importance. The interest and cooperation of the management team will be highly appreciated and it is essential that the excavations be monitored during the entire period of excavation and that this "Chance Find Protocol" be updated on a regular bases during the life-time of the excavation period for the Project. It is essential that the Palaeontologist be notified of the final sign-off of the project date, for final posting of the "Chance Find Protocol" on the SAHRIS Website for record purposes.

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