

PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

For

**The Proposed Mining
Development on Three
Portions intersecting Portion
2 of the Farm Rietfontein 314
JS near Middelburg,
Mpumalanga**

Author ©:

Tobias Coetzee, MA (Archaeology) (UP)

August 2021

A Phase 1 Archaeological Impact Assessment for the Proposed Mining Development on Three Portions intersecting Portion 2 of the Farm Rietfontein 314 JS near Middelburg, Mpumalanga

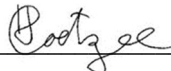
For: Elementum Sustainability (Pty) Ltd
102 The Meridian
160 AG De Witt Drive
Solheim
1401

Report No: 0308211_Rietfontein
Version: 1

Email: tobias.coetzee@gmail.com

I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Mining Development in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.



Date: 24 August 2021

List of Abbreviations

AIA – Archaeological Impact Assessment

CRM – Cultural Resource Management

EIA – Environmental Impact Assessment

ECO – Environmental Control Officer

ESA – Early Stone Age

GPS – Global Positioning System

ha – Hectare

HIA – Heritage Impact Assessment

km – Kilometre

LSA – Later Stone Age

m – Metre

MASL – Metres Above Sea Level

MEC – Member of the Executive Council

MSA – Middle Stone Age

NHRA – National Heritage Resources Act

SAHRA – South African Heritage Resources Agency

WMA – Water Management Area

NEMA Appendix 6

NEMA Specialist reports	
Item	Page/section
1. (1) A specialist report prepared in terms of these Regulations must contain—	
(a) details of-	
(i) the specialist who prepared the report; and	Cover, p2
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Cover, Appendix B
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	p2
(c) an indication of the scope of, and the purpose for which, the report was prepared;	1.1, 2.2
(cA) an indication of the quality and age of base data used for the specialist report;	3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	2.1, 2.2, 3.1.2
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	4, 5, 7.1
(g) an identification of any areas to be avoided, including buffers;	7.2
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	P21
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	3.2
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity[, including identified alternatives on the environment]or activities;	5, 7
(k) any mitigation measures for inclusion in the EMPr;	7.2, Appendix D
(l) any conditions for inclusion in the environmental authorisation;	7.2
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	7.2
(n) a reasoned opinion—	
(i)[as to] whether the proposed activity, activities or portions thereof should be authorised	7.2
(iA) regarding the acceptability of the proposed activity or activities; and	7.2
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	7.2
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A

NEMA Specialist reports	
Item	Page/section
(p)a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q)any other information requested by the competent authority.	Nothing received to date
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Noted

Executive Summary

The author was appointed by Elemental Sustainability (Pty) Ltd to undertake a Phase 1 Archaeological Impact Assessment for the proposed Mining Development on three portions intersecting Portion 2 of the Farm Rietfontein 314 JS near Middelburg in the Mpumalanga Province. The proposed mining development is located approximately 12 km southwest of Middelburg and falls within the Steve Tshwete Local Municipality. The aim of the study is to determine the scope of archaeological resources that could be impacted by the proposed mining development.

The three areas demarcated for mining permit applications for coal, labelled Area 1 – 3, measure 5 ha each and are located next to each other. The applicants for the three demarcated areas are:

Area 1: Myae (Pty) Ltd

Area 2: Amaren Anaia (Pty) Ltd

Area 3: Ndlovamahle Resources (Pty) Ltd

The majority of the demarcated study areas is associated with cultivated crops and pastures, while the remaining section has been disturbed by past diggings. The 1974 topographical map indicates one building in the south-eastern corner of Area 3, but the building has subsequently completely been demolished and currently falls within the cultivated section. No material culture is associated with this site and no additional potential heritage sites were observed during the pedestrian survey or on historical topographical maps. From a heritage perspective, the demarcated study areas are not considered to be sensitive.

Subject to adherence to the recommendations and approval by SAHRA, the proposed Mining Development as per the indicated boundaries may continue. Should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority contacted (See National Heritage and Resources Act, 25 of 1999 section 36 (6)). Also, should culturally significant material be discovered during the course of the said development, all activities must be suspended pending further investigation by a qualified archaeologist.

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1. Project Background

1.1 Introduction

Elemental Sustainability (Pty) Ltd appointed the author to undertake a Phase 1 Archaeological Impact Assessment for the proposed Myae (Pty) Ltd, Amaren Anaia (Pty) Ltd and Ndlovamahle Resources (Pty) Ltd Mining Development on three portions intersecting Portion 2 of the Farm Rietfontein 314 JS (**Table 1**) near Middelburg in the Mpumalanga Province (**Figures 1 – 3**). The proposed coal mining development falls within the Steve Tshwete Local Municipality and is located approximately 12 km southwest of Middelburg. The purpose of this study is to examine the demarcated study areas in order to determine if any archaeological resources of heritage value will be impacted by the proposed mining development, as well as to archaeologically contextualise the general study area. The aim of this report is to provide the developer with information regarding the location of heritage resources on the demarcated study areas.

In the following report, the implication for the proposed Mining Development on the demarcated portions with regard to heritage resources is discussed: Three portions intersecting Portion 2 of the Farm Rietfontein 314 JS. The development will consist of opencast mining methods. The legislation section included serves as a guide towards the effective identification and protection of heritage resources and will apply to any such material unearthed during development and construction phases within the demarcated study areas.

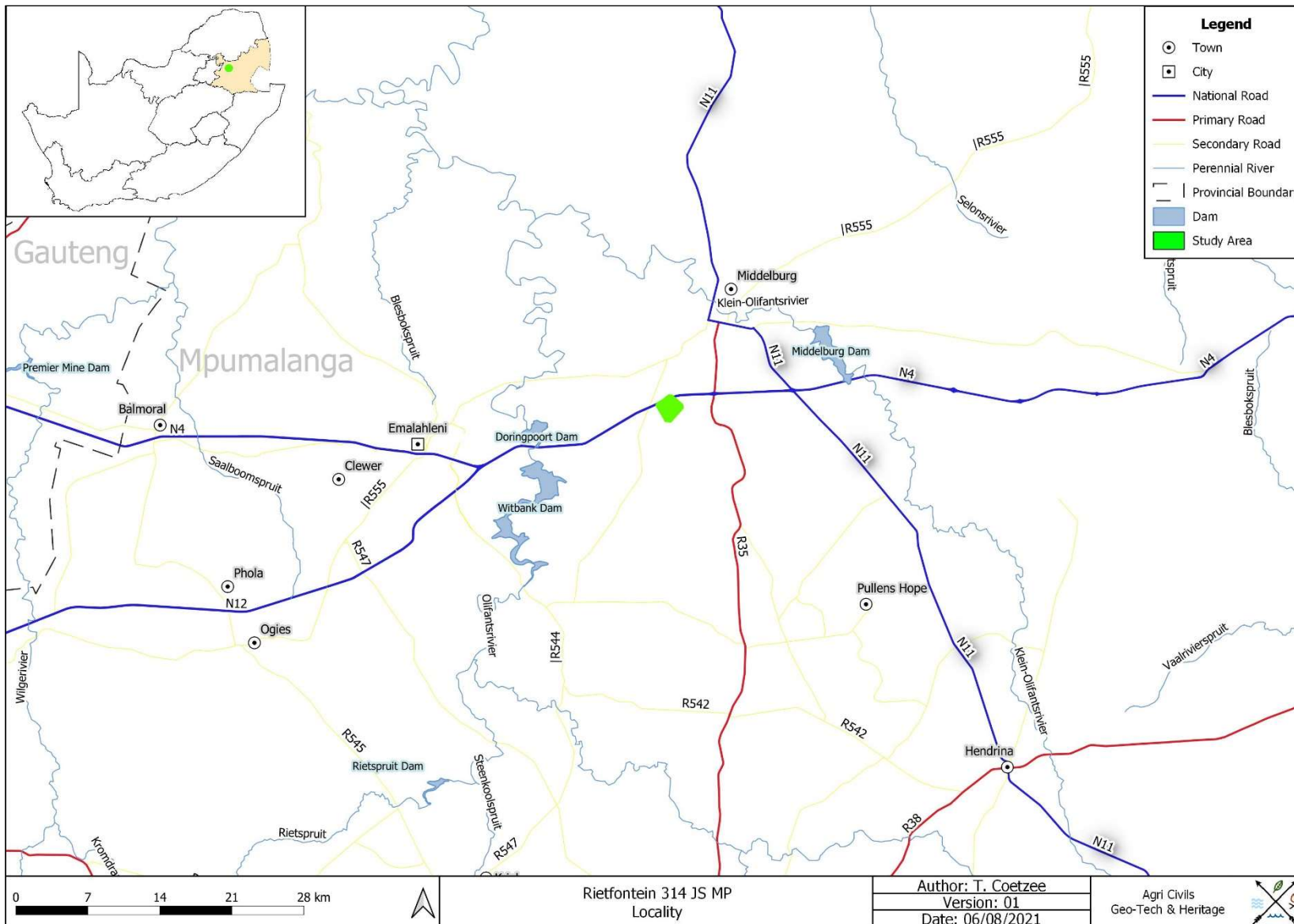


Figure 1: Regional and Provincial location of the study area.

1.2 Legislation

The South African Heritage Resources Agency (SAHRA) aims to conserve and control the management, research, alteration and destruction of cultural resources of South Africa and to prosecute if necessary. It is therefore crucially important to adhere to heritage resource legislation contained in the Government Gazette of the Republic of South Africa (Act No.25 of 1999), as many heritage sites are threatened daily by development. Conservation legislation requires an impact assessment report to be submitted for development authorisation that must include an AIA (Archaeological Impact Assessment) if triggered.

AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources that might occur in areas of development and (b) make recommendations for protection or mitigation of the impact of the sites.

1.2.1 The EIA (Environmental Impact Assessment) and AIA processes

Phase 1 Archaeological Impact Assessments generally involve the identification of sites during a field survey with assessment of their significance, the possible impact that the development might have, and relevant recommendations.

All Archaeological Impact Assessment reports should include:

- a. Location of the sites that are found;
- b. Short descriptions of the characteristics of each site;
- c. Short assessments of how important each site is, indicating which should be conserved and which mitigated;
- d. Assessments of the potential impact of the development on the site(s);
- e. In some cases a shovel test, to establish the extent of a site, or collection of material, to identify the associations of the site, may be necessary (a pre-arranged SAHRA permit is required); and
- f. Recommendations for conservation or mitigation.

This AIA report is intended to inform the client about the legislative protection of heritage resources and their significance and make appropriate recommendations. It is essential to also provide the heritage authority with sufficient information about the sites to enable the authority to assess with confidence:

- a. Whether or not it has objections to a development;
- b. What the conditions are upon which such development might proceed;

- c. Which sites require permits for mitigation or destruction;
- d. Which sites require mitigation and what this should comprise;
- e. Whether sites must be conserved and what alternatives can be proposed to relocate the development in such a way as to conserve other sites; and
- f. What measures should or could be put in place to protect the sites which should be conserved.

When a Phase 1 AIA is part of an EIA, wider issues such as public consultation and assessment of the spatial and visual impacts of the development may be undertaken as part of the general study and may not be required from the archaeologist. If, however, the Phase 1 project forms a major component of an AIA it will be necessary to ensure that the study addresses such issues and complies with Section 38 of the National Heritage Resources Act.

1.2.2 Legislation regarding archaeology and heritage sites

National Heritage Resource Act No.25 of April 1999

Buildings are among the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Farming Community settlements. The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives;
- any other prescribed category.

With regards to activities and work on archaeological and heritage sites this Act states that:

“No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.” (34. [1] 1999:58)

and

“No person may, without a permit issued by the responsible heritage resources authority:

- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;*
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;*
- (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or*
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.”(35. [4] 1999:58)*

and

“No person may, without a permit issued by SAHRA or a provincial heritage resources authority:

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;*
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;*
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals.” (36. [3] 1999:60)*

On the development of any area the gazette states that:

“...any person who intends to undertake a development categorised as:

- (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- (b) the construction of a bridge or similar structure exceeding 50m in length;*

- (c) *any development or other activity which will change the character of a site-*
 - i. *exceeding 5000m² in extent; or*
 - ii. *involving three or more existing erven or subdivisions thereof; or*
 - iii. *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - iv. *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*
- (d) *the re-zoning of a site exceeding 10000m² in extent; or*
- (e) *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.” (38. [1] 1999:62-64)*

and

“The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

- (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 section 6(2) or prescribed under section 7;*
- (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.”*
(38. [3] 1999:64)

The Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC (Member of the Executive Council) as well as the relevant Local Authorities. Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act (NHRA) as well as the Human Tissues Act, 1983.

2. Study Area and Project Description

2.1 Location & Physical Environment

The proposed Mining Development is situated to the southwest of Middelburg. The intersecting farm portion is listed below:

Table 1: Property name & coordinates

Area	Property	Portion	Map Reference (1:50 000)	Lat	Lon	Proposed development (ha)
1	Rietfontein 314 JS	Portion of Portion 2	2529 CD	-25.843998	29.421013	5
2	Rietfontein 314 JS	Portion of Portion 2	2529 CD	-25.845322	29.420665	5
3	Rietfontein 314 JS	Portion of Portion 2	2529 CD	-25.846469	29.420738	5

The study area is located 12 km southwest of Middelburg, while eMalahleni is located roughly 25 km to the west and Pullens Hope 26 km to the southeast (**Figures 1 – 3**). The study area falls within the Nkangala District Municipality and the Steve Tshwete Local Municipality in the Mpumalanga Province. The N4 National Road runs 700 m to the north of the study area and the R575 Secondary Road 1.8 km to the west. Several local roads are also found in the general area (**Figures 1 – 3**).

In terms of vegetation, the study area falls within the Grassland Biome and Mesic Highveld Grassland Bioregion. On a local scale, the proposed prospecting area is classified as Rand Highveld Grassland. According to Mucina & Rutherford (2006) Rand Highveld Grassland has a conservation status of endangered. The conservation target for this area is 24% and only a small portion is conserved in statutory and private conservation areas. Rand Highveld Grassland consists of the areas between rocky ridges from Pretoria to eMalahleni, extending onto ridges in the Stofberg and Roosenekal regions. Other localities include the area west of Krugersdorp, as well as the Potchefstroom and Derby surroundings. Almost 50% of this vegetation unit has been transformed by cultivation,

plantations, urbanisation and the building of dams. Scattered alien invasive species are found in about 7% of the vegetation unit. Erosion in this area is moderate to high in only about 7% of the vegetation unit.

The average elevation for Rand Highveld Grassland varies between 1300 and 1635 MASL (Metres Above Sea Level) while the average elevation of the study area is 1600 MASL and is associated with a relatively flat area.

The study area falls within the summer rainfall region and the average annual rainfall is roughly 714 mm. The average annual temperature is 16.5 °C. The average summer temperature is 20.1 °C, while the winter temperature averages 10.4 °C (Climate-data.org accessed 06/08/2021).

The study area falls within the B11H Quaternary Catchment that forms part of the Olifants Water Management Area (WMA). The closest perennial rivers to the study area are the Olifants 13 km to the west and the Klein-Olifants 20 km to the east. The Doringpoort Dam is located 12 km to the west and the Middelburg Dam 15 km to the east-northeast. A non-perennial river is also found 2.8 km to the southwest and another 7.4 km to the east. Locally, a non-perennial stream is located 50 m to the west of the study area.

When the surrounding environment is considered, the region is associated with crop cultivation and mining activity. Access to the study area is via a local road turning from the R575 Secondary Road (**Figures 2 & 3**). On a local scale, the study area is associated with harvested maize fields, previously cultivated fields and a small portion of open veldt in the south-western corner that is associated with past diggings.

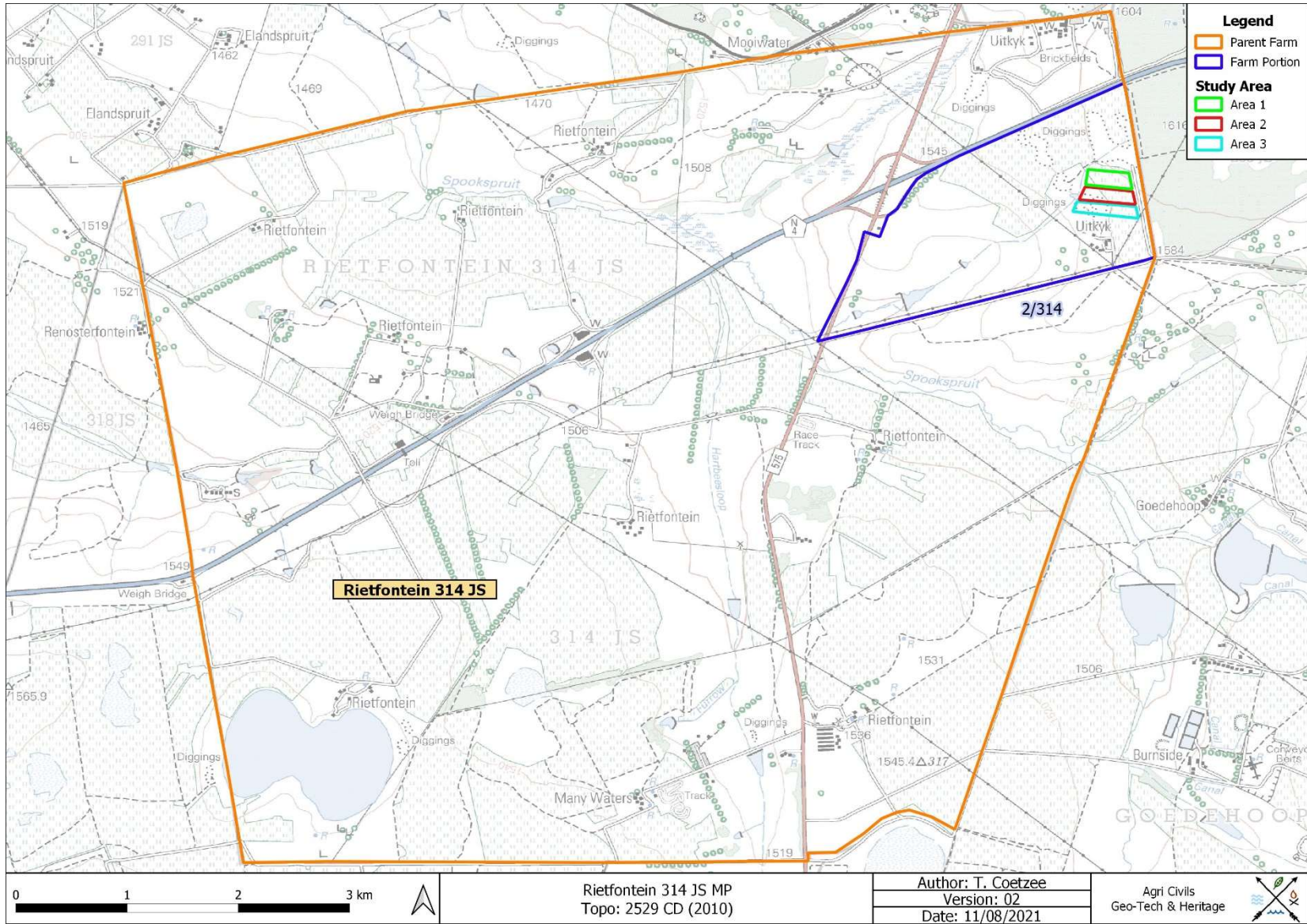


Figure 2: Segment of SA 1: 50 000 2629 AA & AB indicating the study area.

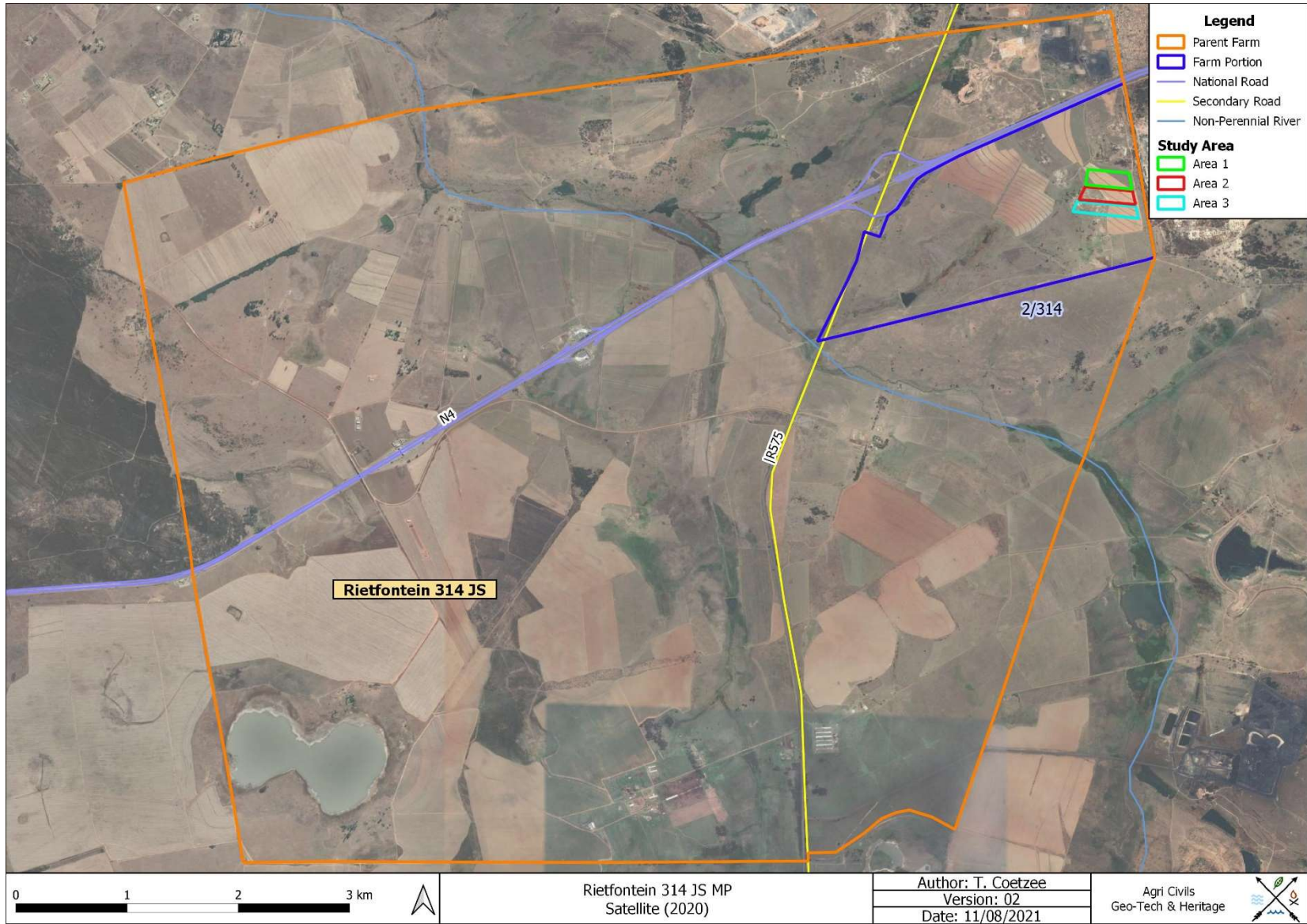


Figure 3: Study area portrayed on a 2020 satellite image.

2.2 Project description

The proposed development consists of three areas demarcated for the mining of coal. The permit area will be mined by opencast mining methods using excavators. Each area measures 5 ha and is located on a portion of Portion 2 of the Farm Rietfontein 314 JS (**Figure 4**).

In Terms of the mining sequence, the volumes in the 1-year LOM production schedule are expected to include:

- Topsoil - Thickness of the topsoil is assumed to be 1.0m. Loading and hauling to topsoil stockpile by truck and shovel.
- Soft overburden - Loading and hauling to waste stockpile or in-pit backfill by truck and shovel.
- Hard Overburden - This material lies just below the weathered material and above the coal seam - Loading and hauling to waste stockpile or in-pit backfill by truck and shovel.
- The coal seams are expected to be mined by a free dig method using excavators.
- Loading and hauling to ROM Tip by truck.

Proposed infrastructure include:

- Mobile offices
- Access road
- Electrical supply
- Electrical supply (Eskom)
- Mining pit and access ramp through box cut
- Water management facilities
- Workshop
- Mobile office
- Weighbridge
- Material stockpile
- Crushing and screening facilities

3. Methodology

Archaeological reconnaissance of the study area was conducted during August 2021 through a systematic pedestrian and vehicular survey of the proposed study area (**Figure 4**). The transects of the pedestrian survey were spaced roughly 50 m apart in undisturbed areas, while the contours of the cultivated section were inspected via vehicle. General site conditions were recorded via photographic record (**Figures 5 – 16**). Also, the project area was inspected beforehand on Google Earth and historical topographical maps in order to identify potential heritage remains (**Appendix A**). The 1974 topographical map indicates a building in the south-eastern corner of Area 3, but was subsequently demolished. No sites were observed during the pedestrian survey. The historical topographical datasets dating to 1954, 1974, 1996, 2003 and 2010 proved useful in terms of providing an indication of potential heritage remains and past land uses associated with the study areas. The total area inspected was 15 ha.

The reconnaissance of the area under investigation served a twofold purpose:

- To obtain an indication of heritage material found in the general area as well as to identify or locate archaeological sites on the area demarcated for development. This was done in order to establish a heritage context and to supplement background information that would benefit developers through identifying areas that are sensitive from a heritage perspective.
- All archaeological and historical events have spatial definitions in addition to their cultural and chronological context. Where applicable, spatial recording of these definitions were done by means of a handheld GPS (Global Positioning System) during the site visit, as well as by plotting the boundaries from aerial imagery and topographical maps.

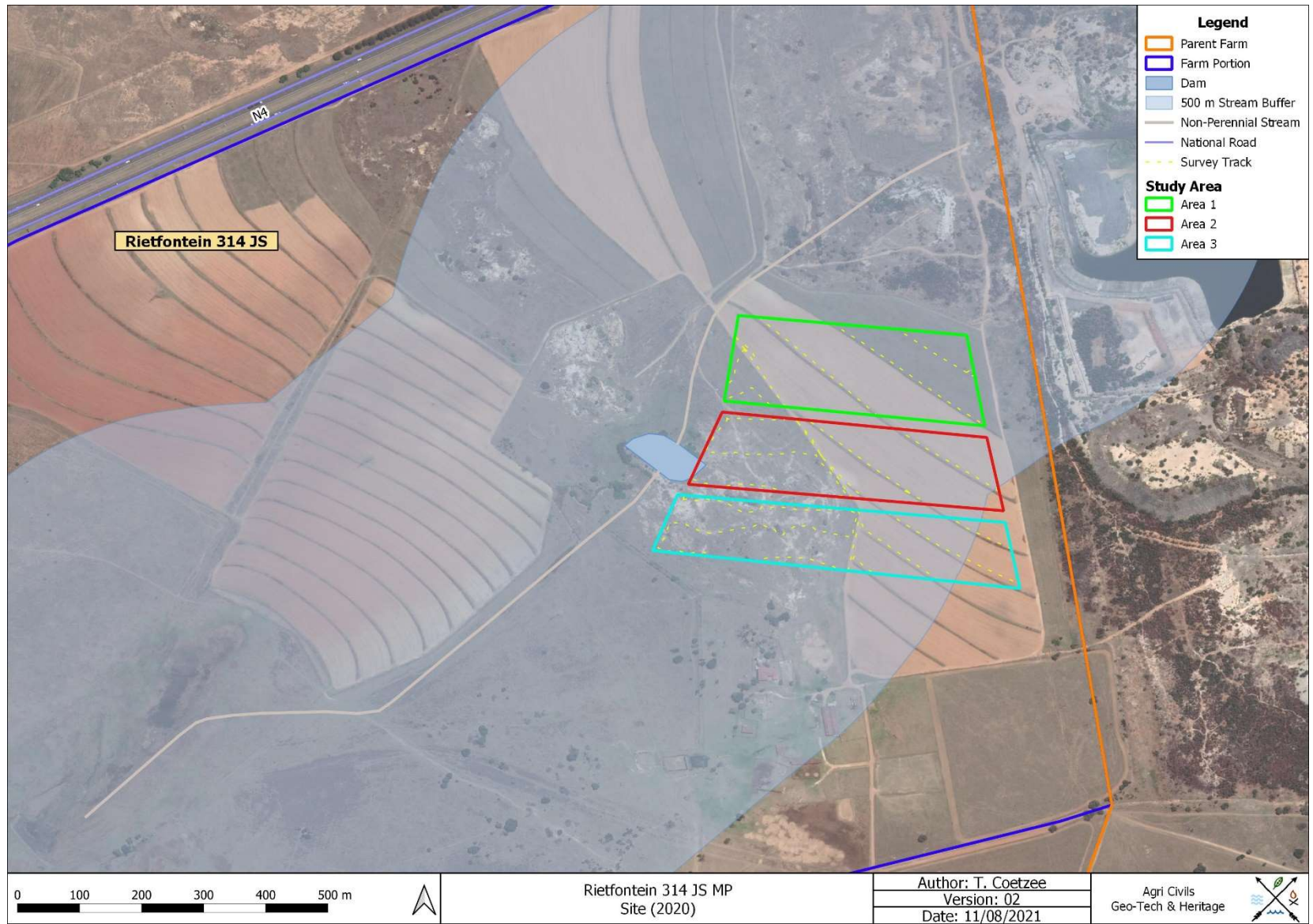


Figure 4: Study areas with survey track portrayed on a 2020 satellite image.

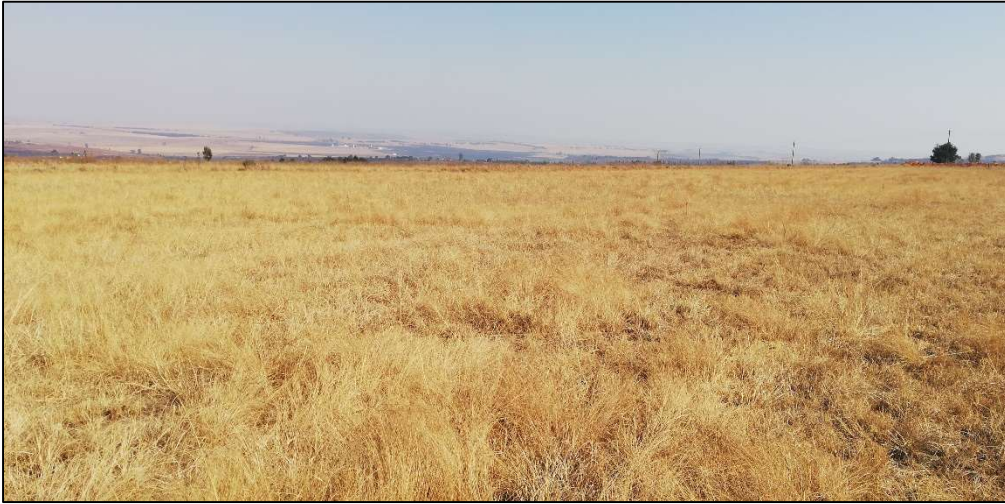


Figure 5: North-eastern section of study area 1.



Figure 6: North-western section of study area 1.



Figure 7: South-western section of study area 1.



Figure 8: South-eastern section of study area 1.



Figure 9: North-eastern section of study area 2.



Figure 10: North-western section of study area 2.



Figure 11: South-western section of study area 2.



Figure 12: South-eastern section of study area 2.



Figure 13: North-eastern section of study area 3.



Figure 14: North-western section of study area 3.



Figure 15: South-western section of study area 3.



Figure 16: South-eastern section of study area 3.

3.1 Sources of information

At all times during the survey, standard archaeological procedures for the observation of heritage resources were followed. As most archaeological material occur in single or multiple stratified layers beneath the soil surface, special attention was paid to disturbances; both man-made such as roads and clearings, and those made by natural agents such as burrowing animals and erosion. Locations associated with archaeological material remains were recorded by means of a Garmin Oregon 750 GPS and were photographed with a Samsung S7 mobile phone.

A literature study, which incorporated previous work done in the region, was conducted in order to place the study area into context from a heritage perspective.

3.1.1 Previous Heritage Studies

Mining development on the Farm Elandspruit 291 JS

A Heritage Impact Assessment was conducted for the expansion of Shanduka Collieries on the farm Elandspruit 291 JS about 4 km northwest of the proposed Rietfontein study area. During the survey, five sites were recorded: Three homesteads dating to the recent past, one site consisting of farming related structures and one mining related feature. All the identified sites were graded with a low significance and required no further action. A possibility of informal graves consisting of stacked stones was also noted. It was recommended that the two areas associated with potential graves be cleared of vegetation and inspected by a qualified archaeologist (Van Schalkwyk 2008).

Rossouw Dam

The Archaeological Survey conducted for Middelburg Mine's (Ingwe Coal Corporation) pollution contrail dam was done by Huffman (1999). The project entailed the construction of the pollution control dam, as well as barrow areas in the dam basin, gravity pipelines in the stream bed and the rerouting of powerlines. The survey recorded several sites ranging in age from the Stone Age to the Historic Period. Two Early Stone Age sites consisting of cores, handaxes and flakes were noted, as well as one Middle Stone Age site characterised by cores, flakes and scrapers. Two types of historic sites were noted. The first type is associated with large, rectangular stone-walled areas characterised by houses, kitchens, grainbins, cattle kraals and small stock kraals, while the second type lacks cattle kraals and are characterised by rectangular houses facing rectangular courtyards. According to Huffman (1999), both types mark homesteads of Southern Transvaal Ndebele who were farm labourers. The first type dates to between 1883 and the 1920's, while the second type dates from about 1920. A cemetery consisting of about 21 graves and the foundations of the Rietfontein farmhouse dating to the 1940's were noted as well. The Rossouw dam project area is located in the general vicinity of the proposed Rietfontein Mining Development.

Clean water pipeline between Middelburg reclamation plant and Middelburg colliery

A Phase 1 HIA was conducted by Dr Julius Pistorius (2013) for the construction of a clean water pipeline from the Middleburg water reclamation plant to the Middelburg Colliery. The pipeline project is located approximately 9 km south of the proposed Rietfontein study area. No sites of heritage significance were observed during the study.

3.1.2 Historical topographical maps

The historical topographical map dating to 1954 (**Appendix A: Figure 22**) indicates the study area to be open veldt with a road intersecting Areas 2 & 3. The 1974 topographical map (**Appendix A: Figure 23**), however, indicates the road further to the northeast, thereby intersecting Area 1 as well. A building is also indicated in the south-eastern corner of Area 3. When the 1996 and 2003 topographical maps (**Appendix A: Figures 24 & 25**) are inspected, the eastern sections of all three areas are shown to be cultivated – the same extent currently associated with a cultivated maize field, except for the north eastern corner of Area 1 that consists of what appears to form part of cultivated pastures. A non-perennial stream is also shown to the west, while the road and building previously indicated are no longer shown. By 2010 (**Appendix A: Figure 26**), a road is shown to the east of the study area, as well as diggings on the western half of Areas 2 & 3.

3.2 Limitations

During the survey (August 2021), the north-eastern section of Area 1 that used to consist of cultivated crops, was characterised by short grass cover. The western sections of the study areas, associated with past diggings, were also characterised by short grassland (**Figures 17 & 18**). Visibility at this time was therefore considered to be very good. No other access constraints were encountered.



Figure 17: Short grass cover associated with cultivated pastures.



Figure 18: Short grass cover associated with the western section.

4. Archaeological Background

Southern African archaeology is broadly divided into the Early, Middle and Later Stone Ages; Early, Middle and Later Iron Ages; and Historical or Colonial Periods. This section of the report provides a general background to archaeology in South Africa and focuses on more site-specific elements where relevant.

4.1 The Stone Ages

The earliest stone tool industry, the Oldowan, was developed by early human ancestors which were the earliest members of the genus *Homo*, such as *Homo habilis*, around 2.6 million years ago. It comprises tools such as cobble cores and pebble choppers (Toth & Schick 2007). Archaeologists suggest these stone tools are the earliest direct evidence for culture in southern Africa (Clarke & Kuman 2000). The advent of culture indicates the advent of more cognitively modern hominins (Mitchell 2002: 56, 57)

The Acheulean industry completely replaced the Oldowan industry. The Acheulian industry was first developed by *Homo ergaster* between 1.8 to 1.65 million years ago and lasted until around 300 000 years ago. Archaeological evidence from this period is also found at Swartkrans, Kromdraai and Sterkfontein. The most typical tools of the ESA (Early Stone Age) are handaxes, cleavers, choppers and spheroids. Although hominins seemingly used handaxes often, scholars disagree about their use. There are no indications of hafting, and some artefacts are far too large for it. Hominins likely used choppers and scrapers for skinning and butchering scavenged animals and often obtained sharp ended sticks for digging up edible roots. Presumably, early humans used wooden spears as early as 5 million years ago to hunt small animals.

Middle Stone Age (MSA) artefacts started appearing about 250 000 years ago and replaced the larger Early Stone Age bifaces, handaxes and cleavers with smaller flake industries consisting of scrapers, points and blades. These artefacts roughly fall in the 40-100 mm size range and were, in some cases, attached to handles, indicating a significant technical advance. The first *Homo sapiens* species also emerged during this period. Associated sites are Klasies River Mouth, Blombos Cave and Border Cave (Deacon & Deacon 1999).

Although the transition from the Middle Stone Age to the Later Stone Age (LSA) did not occur simultaneously across the whole of southern Africa, the Later Stone Age ranges from about 20 000 to 2000 years ago. Stone tools from this period are generally smaller, but were used to do the same job as those from previous periods; only in a different, more efficient way. The Later Stone Age is associated with: rock art, smaller stone tools (microliths), bows and arrows, bored stones, grooved stones, polished bone tools, earthenware pottery and beads. Examples of Later Stone Age sites are Nelson Bay Cave, Rose Cottage Cave and Boomplaas Cave (Deacon & Deacon 1999).

4.2 The Iron Age & Later History

The Early Iron Age marks the movement of farming communities into South Africa in the first millennium AD, or around 2500 years ago (Mitchell 2002:259, 260). These groups were agro-pastoralist communities that settled in the vicinity of water in order to provide subsistence for their cattle and crops. Archaeological evidence from Early Iron Age sites is mostly artefacts in the form of ceramic assemblages. The origins and archaeological identities of this period are largely based upon ceramic typologies. Some scholars classify Early Iron Age ceramic traditions into different “streams” or “trends” in pot types and decoration, which emerged over time in southern Africa. These “streams” are identified as the Kwale Branch (east), the Nkope Branch (central) and the Kalundu Branch (west). Early Iron Age ceramics typically display features such as large and prominent inverted rims, large neck areas and fine elaborate decorations. This period continued until the end of the first millennium AD (Mitchell 2002; Huffman 2007). Some well-known Early Iron Age sites include the Lydenburg Heads in Mpumalanga, Happy Rest in the Limpopo Province and Mzonjani in Kwa-Zulu Natal.

The Middle Iron Age roughly stretches from AD 900 to 1300 and marks the origins of the Zimbabwe culture. During this period cattle herding appeared to play an increasingly important role in society. However, it was proved that cattle remained an important source of wealth throughout the Iron Age. An important shift in the Iron Age of southern Africa took place in the Shashe-Limpopo basin during this period, namely the development of class distinction and sacred leadership. The Zimbabwe culture can be divided into three periods based on certain capitals. Mapungubwe, the first period, dates from AD 1220 to 1300, Great Zimbabwe from AD 1300 to 1450, and Khami from AD 1450 to 1820 (Huffman 2007: 361, 362).

The Late Iron Age roughly dates from AD 1300 to 1840. It is generally accepted that Great Zimbabwe replaced Mapungubwe. Some characteristics include a greater focus on economic growth and the increased importance of trade. Specialisation in terms of natural resources also started to play a role, as can be seen from the distribution of iron slag which tend to occur only in certain localities compared to a wide distribution during earlier times. It was also during the Late Iron Age that different areas of South Africa were populated, such as the interior of KwaZulu Natal, the Free State, the Gauteng Highveld and the Transkei. Another characteristic is the increased use of stone as building material. Some artefacts associated with this period are knife-blades, hoes, adzes, awls, other metal objects as well as bone tools and grinding stones.

The Historical period mainly deals with Europe's discovery, settlement and impact on southern Africa. Some topics covered by the Historical period include Dutch settlement in the Western Cape, early mission stations, Voortrekker routes and the Anglo Boer War. This time period also saw the compilation of early maps by missionaries, explorers, military personnel, etc.

4.2.1 Coal mining general history near eMalahleni, Middelburg, Bethal, Hendrina, Ermelo and Carolina

Mpumalanga, especially the area between eMalahleni, Middelburg, Bethal, Hendrina, Ermelo and Carolina, is associated with vast coal fields. These coal fields formed between 200 and 300 million years ago from rotten forests in swamps. During this period, Africa was still attached to South America, India and Antarctica as part of the Gondwana supercontinent. By 250 million years ago, the climate changed to dry warm conditions and the swamps in Mpumalanga were replaced by desert-like conditions around 200 million years ago. By 180 million years ago, when the Gondwana supercontinent started to split up, volcanic lava fields covered areas in Mpumalanga (De Wit 2007: 37).

With the rich coal deposits in Mpumalanga, it was only a matter of time before its value was realised and the coal extracted. Coal mining is Mpumalanga's most important industrial activity and produces about 80% of South Africa's coal. The earliest coal mining in the area dates to 1868 when farmers extracted coal for personal use in the Middelburg district. Large-scale coal mining around eMalahleni, however, only started after the discovery of gold on the Witwatersrand in 1886. Due to the discovery of coal in the Brakpan and Springs surroundings in 1887 and no railway linking eMalahleni with the Rand, these early eMalahleni coal mines closed down. It was more cost effective to exploit the closer Brakpan and Springs coal deposits than the coal found at eMalahleni (Schirmer 2007: 316).

After the construction of the railway line between the Rand and eMalahleni the deposits were exploited on large scale again. The coal fields, which are about 40 km wide, are concentrated around eMalahleni and run towards Belfast in the east. The first collieries around eMalahleni were Douglas, Transvaal and Delagoa Bay, Witbank and Landau and are of a higher quality compared to the coal found at Brakpan and Springs. During the 1890s some of the coal was exported via Delagoa Bay. In addition, the coal was readily accessible as the deposits

occurred at a depth of 100 m or less (Schirmer 2007: 316-317). It should also be noted that the railway line between Pretoria and Lorenzo Marques (Maputo) was completed on 2 November 1894 and the connection between eMalahleni and Johannesburg during the 1910s (Heydenrych 1999).

Between 1900 and 1920 many new collieries were established and the coal price dropped. This led to the establishment of the Transvaal Coal Owners' Association with the main aim to regulate output coal prices. This also acted to counter possible competition. It should also be noted that not all collieries joined this association. The establishment of the Transvaal Coal Owners' Association had positive as well as negative influences. On the one hand eliminating the competition might have impacted negatively on efficiency and the workers. On the other hand, it is possible that the capacity of coal mines was enhanced and facilitated further development in the industry. One positive point was that the association eased interaction with international buyers. During the 1930s, however, the coal price continued to drop and resulted in mechanisation. This introduced electric coal cutters and eliminated the need for high number of unskilled workers. By 1946 eMalahleni and Middelburg saw the emergence of a modern coal industry. The Transvaal had 34 large collieries that were responsible for 99.7% of the province's coal (Schirmer 2007: 317-319).

Between 1940 and 1960 coal output in the Eastern Transvaal increased from 13 million to 25 million tons. Although industrialisation expanded throughout this time in South Africa and a demand existed for coal both locally and internationally, a steady shift to oil as the dominant form of energy was noted. In light of these developments Anglo American Corporation launched three research programmes in the 1960s. As a result of these programmes the region's coal mines became export orientated. This trend continued throughout the 1980s. During these times a series of coal-burning power stations around the eastern Highveld coal deposits were constructed (Schirmer 2007: 321).

5. Archaeological and Historical Remains

5.1 Stone Age Remains

No Stone Age archaeological remains were located within the demarcated study areas.

Although no Stone Age archaeological remains were located, such artefacts may occur in the area. These artefacts are often associated with rocky outcrops and water sources. **Figures 19 – 21** below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

The heritage study conducted by Huffman (1999) recorded two Early Stone Age sites consisting of cores, handaxes and flakes, as well as one Middle Stone Age site characterised by cores, flakes and scrapers.

According to Bergh (1999: 5), no major Stone Age archaeological sites are located in the direct vicinity of Middelburg, but some rock art have been noticed in the area to the south of eMalaheni (Bergh 1999: 6).



Figure 19: ESA artefacts from Sterkfontein (Volman 1984).

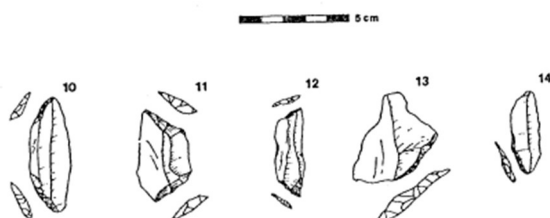


Figure 20: MSA artefacts from Howiesons Poort (Volman 1984).



Figure 21: LSA scrapers (Klein 1984).

5.2 Iron Age Farmer Remains

No Iron Age Farmer remains were located within the demarcated study areas.

Heritage studies done in the surrounding areas did not record Iron Age remains. See Huffman (1999), Van Schalkwyk (2008) and Pistorius (2013).

5.3 Historical

No sites dating to the Historic Period were located within the demarcated study areas.

The heritage study conducted by Huffman (1999) recorded two types of historic stone-walled sites. The first type dates to between 1883 and the 1920's, while the second type dates from about 1920.

5.4 Contemporary Remains

No sites of contemporary origin were located within the demarcated study areas.

Van Schalkwyk (2008) recorded five sites dating to contemporary times: Three homesteads, one site consisting of farming related structures and one mining related feature.

5.5 Graves

No burial sites were observed during the pedestrian survey.

The heritage study conducted by Huffman (1999) recorded one cemetery, while Van Schalkwyk (2008) mentions two areas that might be associated with informal graves.

6. Evaluation

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

6.1 Field Ratings

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 2: Prescribed Field Ratings

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3 A	High	Mitigation not advised
Local	Grade 3 B	High	Part of site should be retained
General protection A	4 A	High/Medium	Mitigate site
General Protection B	4 B	Medium	Record site
General Protection C	4 C	Low	No recording necessary

*Note – no sites were located.

7. Statement of Significance & Recommendations

7.1 Statement of significance

The study area: The Proposed Mining Development on Areas 1, 2 and 3

Although the study areas fall within the 500 m river/stream buffer, the majority of the study area has been disturbed by crop cultivation and diggings and no sites of heritage significance were observed during the pedestrian survey. One building existed in the south-eastern corner of Area 3, but has completely been demolished. The study area is therefore not considered to be sensitive from a heritage perspective.

7.2 Recommendations

The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for development:

- Although no heritage sites were located, archaeological artefacts generally occur below surface. Therefore, the possibility exists that culturally significant material may be exposed during the construction phase, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all

activities must be suspended and the relevant heritage resources authority contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).

- From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency.

8. Conclusion

The proposed Mining Development on Areas 1, 2, and 3 consists of surface infrastructure and activities impacting approximately 15 ha. The Archaeological Impact Assessment examined the area and determined that past diggings and crop cultivation disturbed the study areas. Also, no sites of heritage significance were observed during the pedestrian survey. The area is therefore not considered to be sensitive from a heritage perspective.

Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Mining Development may proceed.

9. Addendum: Terminology

Archaeology:

The study of the human past through its material remains.

Artefact:

Any portable object used, modified, or made by humans; e.g. pottery and metal objects.

Assemblage:

A group of artefacts occurring together at a particular time and place, and representing the sum of human activities.

Context:

An artefact's context usually consist of its immediate *matrix* (the material surrounding it e.g. gravel, clay or sand), its *provenience* (horizontal and vertical position within the matrix), and its *association* with other artefacts (occurrence together with other archaeological remains, usually in the same matrix).

Cultural Resource Management (CRM):

The safeguarding of the archaeological heritage through the protection of sites and through salvage archaeology (rescue archaeology), generally within the framework of legislation designed to safeguard the past.

Excavation:

The principal method of data acquisition in archaeology, involving the systematic uncovering of archaeological remains through the removal of the deposits of soil and other material covering and accompanying it.

Feature:

An irremovable artefact; e.g. hearths or architectural elements.

Ground Reconnaissance:

A collective name for a wide variety of methods for identifying individual archaeological sites, including consultation of documentary sources, place-name evidence, local folklore, and legend, but primarily actual fieldwork.

Matrix:

The physical material within which artefacts is embedded or supported, i.e. the material surrounding it e.g. gravel, clay or sand.

Phase 1 Assessments:

Scoping surveys to establish the presence of and to evaluate heritage resources in a given area.

Phase 2 Assessments:

In-depth culture resources management studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required.

Sensitive:

Often refers to graves and burial sites although not necessarily a heritage place, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

Site:

A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity.

Surface survey:

There are two kinds: (1) unsystematic and (2) systematic. The former involves field walking, i.e. scanning the ground along one's path and recording the location of artefacts and surface features. Systematic survey by comparison is less subjective and involves a grid system, such that the survey area is divided into sectors and these are walked all, thus making the recording of finds more accurate.

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National Heritage Resource Act No.25 of 1999, Government Gazette, Cape Town

Removal of Graves and Dead Bodies Ordinance No. 7 of 1925, Government Gazette, Cape Town

Appendix A: Historical Topographical Maps

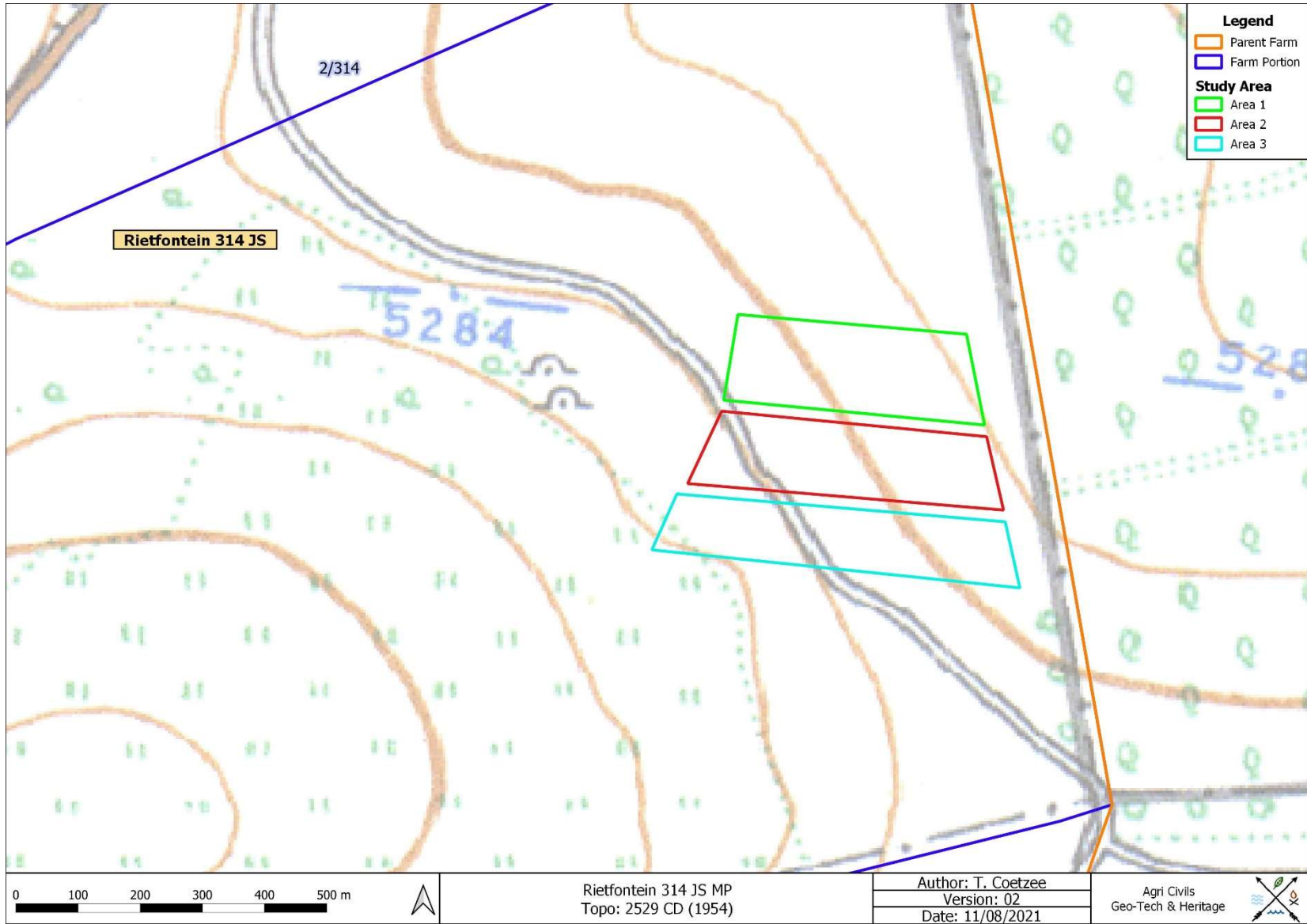


Figure 22: Study area superimposed on a 1954 topographical map.

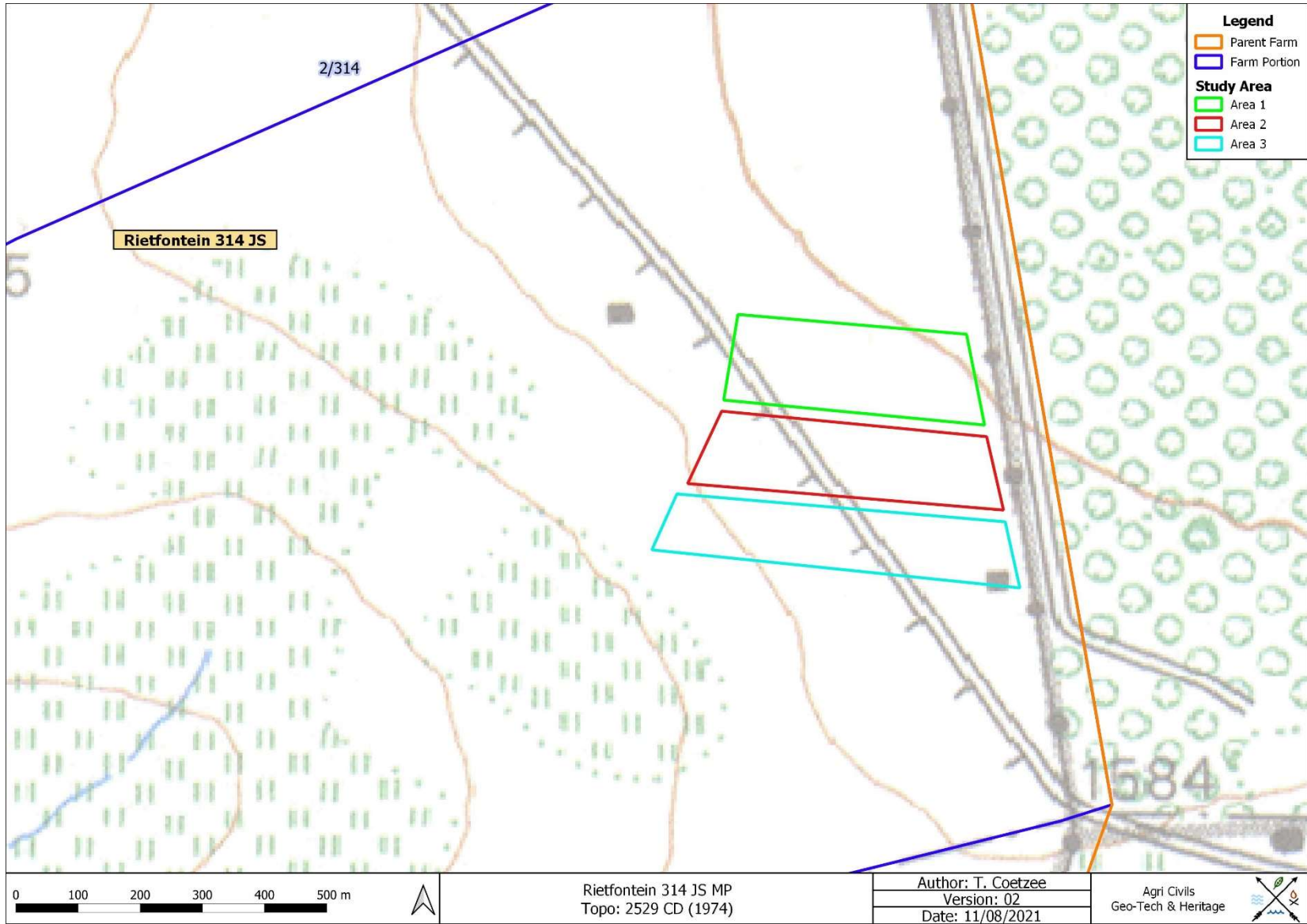


Figure 23: Study area superimposed on a 1974 topographical map.

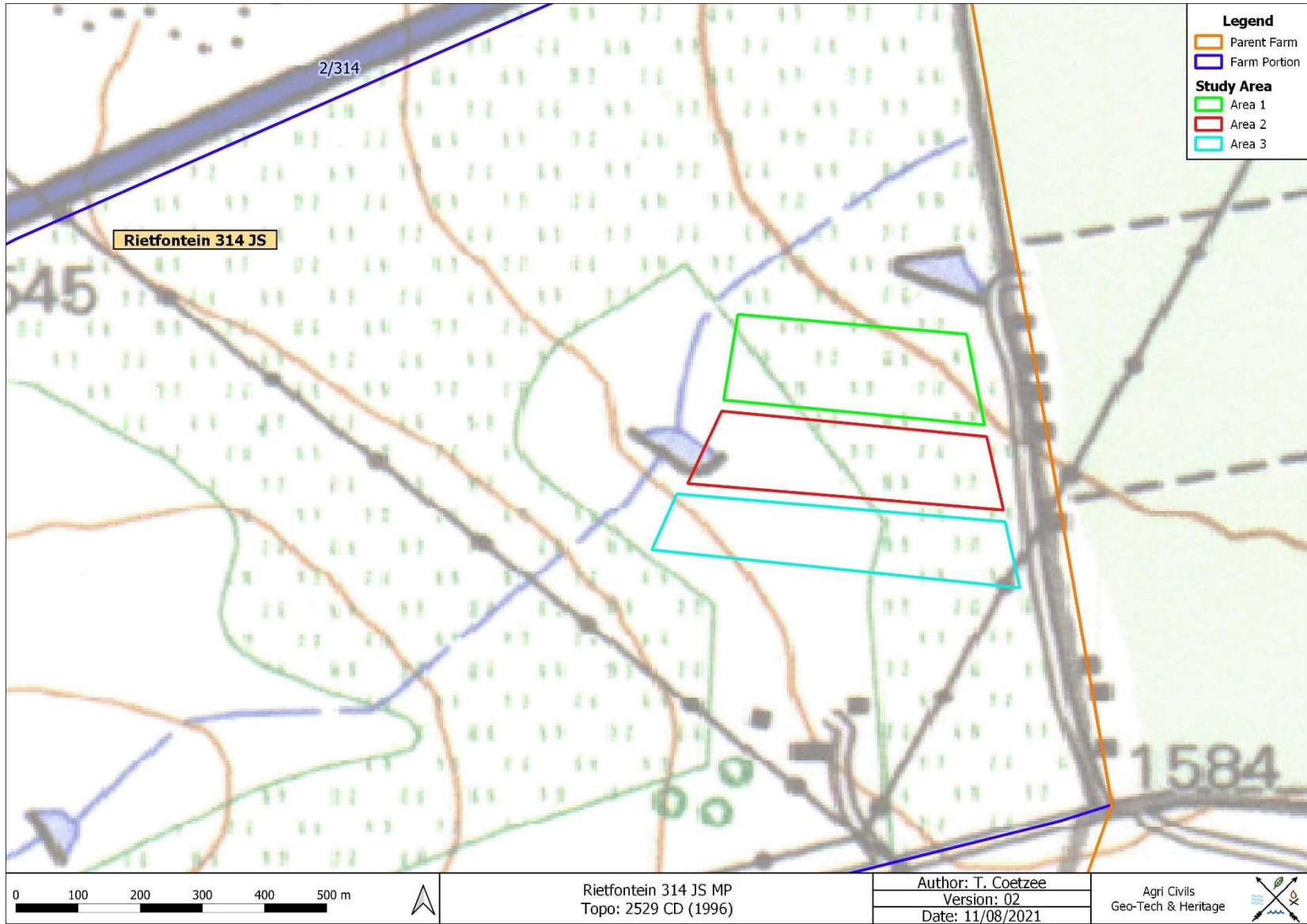


Figure 24: Study area superimposed on a 1996 topographical map.

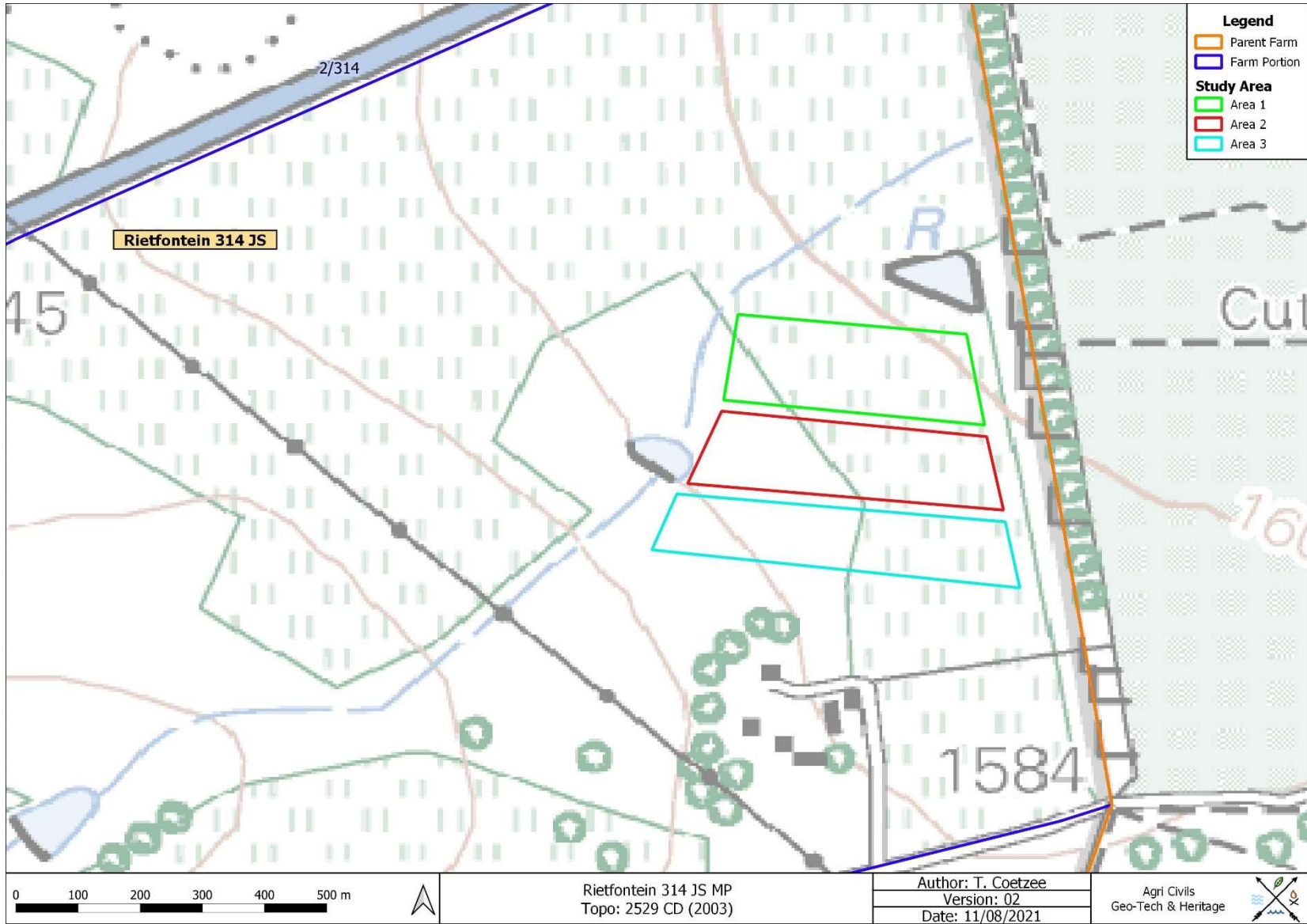


Figure 25: Study area superimposed on a 2003 topographical map.

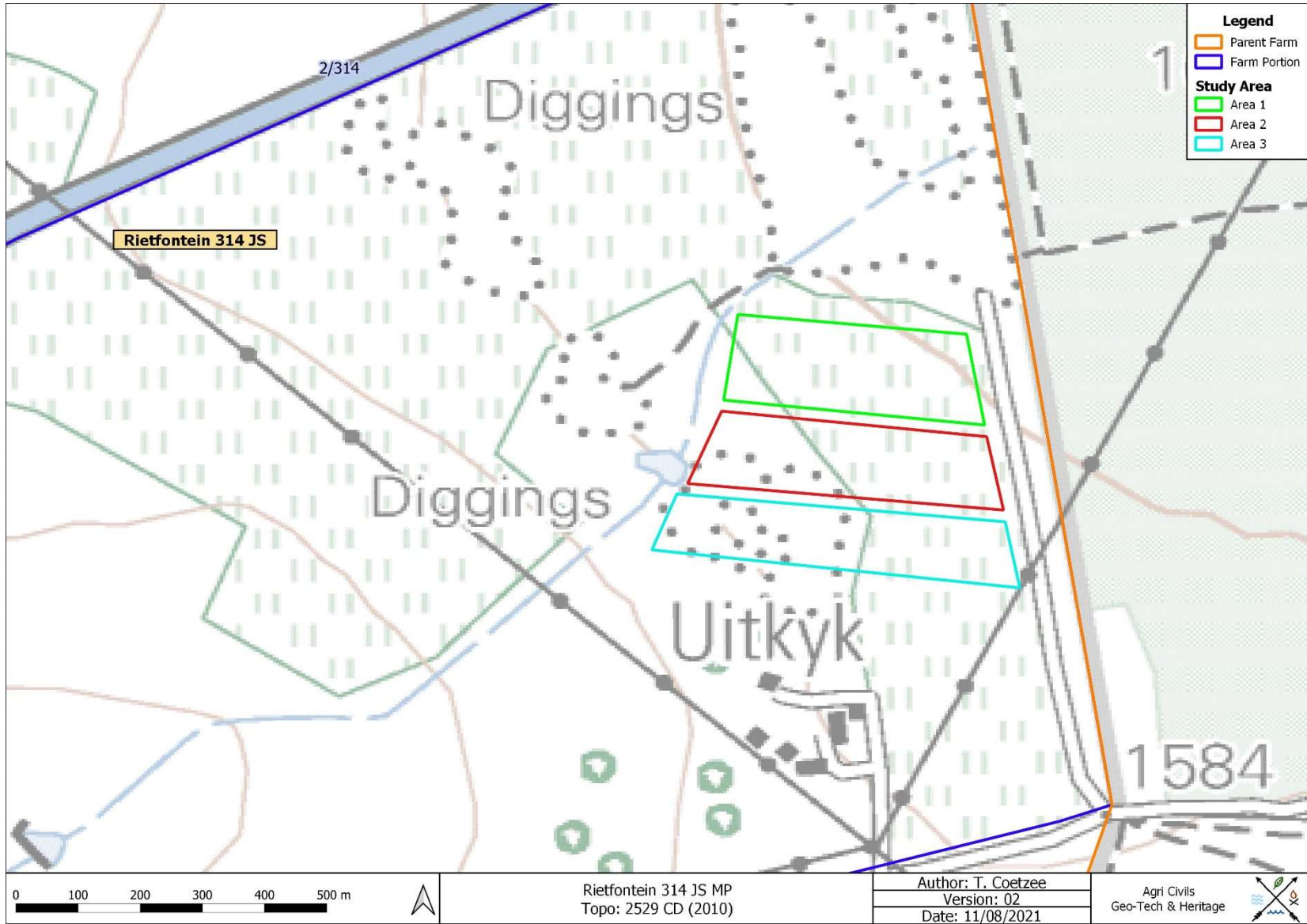


Figure 26: Study area superimposed on a 2010 topographical map.

Appendix B: Curriculum Vitae

Curriculum vitae

Tobias Coetzee

tobias.coetzee@gmail.com

082 821 3104

Registered Professional Archaeologist, Association of Southern African Professional Archaeologists (ASAPA), CRM accredited, membership no: 289

Full names: Tobias Johannes Coetzee

Date of birth: 19 May 1986

Qualifications: MA (Archaeology)

Education:

- 2017 MA (Archaeology)
University of Pretoria
Dissertation: *Mapping Bokoni: Exploring Bokoni settlement choices and changes in Mpumalanga and Limpopo, South Africa using GIS site distribution analysis techniques*
- 2008 BA (Hons) (Archaeology)
University of Pretoria
Dissertation: *Mapping Bokoni towns & trade: Applying Geographic Information Systems to the articulation of Mpumalanga stonewalled sites with pre-colonial trade routes*
- 2006 – 2008 BA (Archaeology & Geography)
University of Pretoria
Subjects: Zulu, Afrikaans, Cartography, GIS and ArcGIS applications, Meteorology, Anthropology, Ancient History, Isotope Ecology and Dating, Computer and Information Literacy, Academic Skills and Introduction to research

Employment:

2020 – present	Heritage Practitioner Agri Civils Geo-Tech & Heritage
2013 – 2019	GIS Practitioner Bigen Group (Pty) Ltd
2013	Specialist consultant: Heritage Environmental Assurance (Pty) Ltd
2011	Junior lecturer in Archaeology at the University of South Africa (UNISA) at the department of Anthropology & Archaeology Primary lecturer for: The Prehistory of South Africa Assistant lecturer for: Applied Archaeology - Heritage Conservation
2009	Tutor Department of Anthropology & Archaeology, University of Pretoria

Conference papers, publications & Cultural Resources Management Reports:

Coetzee, T. 2020. *Conservation Management Plan for Cemetery 1 at the Kwagga North Mine, Middelburg, Mpumalanga*. Lydenburg: Agri Civils Geo-Tech & Heritage

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University of the Witwatersrand
1 Jan Smuts Avenue
Braamfontein
2000
Tel. :011 717 6046
Cell. :082 827 9731
Email :alex.schoeman@wits.ac.za
- Prof. I. Pikirayi, Head: Department anthropology & archaeology
University of Pretoria
Lynnwood Road
Pretoria
0002
Tel. :012 420 4661
Cell. :082 786 6137
Email :innocent.pikirayi@up.ac.za
- Neels Kruger, Cultural resources manager
Exigo3
Tygerpoort
Pretoria
0007
Tel. :012 751 2160
Cell. :082 967 2131
Email :neels@exigo3.com

Appendix C: NEMA Risk Assessment Methodology

1.1 RISK ASSESSMENT

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. The receptors and resources are also identified, which allows for an understanding of the impact pathway and assessment of the sensitivity to change.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The values for the likelihood and consequence (severity, spatial scope and duration) of the impact are then used to determine whether mitigation is necessary.

1.1.1 Methodology used in Determining the Significance of Environmental impacts

The Environmental Impact Assessment (EIA) 2014 Regulations [as amended] promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), requires that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below

Extent of the impact		
The EXTENT of an impact is the physical extent/area of impact or influence.		
Score	Extent	Description
1	Footprint	The impacted area extends only as far as the actual footprint of the activity.
2	Site	The impact will affect the entire or substantial portion of the site/property.
3	Local	The impact could affect the area including neighbouring properties and transport routes.
4	Region	Impact could be widespread with regional implication.
5	National	Impact could have a widespread national level implication.
Duration of the impact		
The DURATION of an impact is the expected period of time the impact will have an effect.		
Score	Duration	Description
1	Short term	The impact is quickly reversible within a period of less than 2 y limited to the construction phase, or immediate upon the commencement of floods.
2	Short to medium term	The impact will have a short term lifespan (2–5 years).
3	Medium term	The impact will have a medium term lifespan (6 – 10 years)
4	Long term	The impact will have a medium term lifespan (10 – 25 years)
5	Permanent	The impact will be permanent beyond the lifespan of the development
Intensity of the impact		
The INTENSITY of an impact is the expected amplitude of the impact.		
Score	Intensity	Description
1	Minor	The activity will only have a minor impact on the affected environment in a way that the natural processes or functions are not affected.
2	Low	The activity will have a low impact on the affected environment.
3	Medium	The activity will have a medium impact on the affected environment function and process continue, albeit in a modified way.
4	High	The activity will have a high impact on the affected environment which be disturbed to the extent where it temporarily or permanently ceases
5	Very High	The activity will have a very high impact on the affected environment may be disturbed to the extent where it temporarily or permanently ceases

Reversibility of the impact

The REVERSIBILITY of an impact is the severity of the impact on the ecosystem structure

Score	Reversibility	Description
1	Completely reversible	The impact is reversible without any mitigation measures and management measures
2	Nearly completely reversible	The impact is reversible without any significant mitigation management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implementation of mitigation management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implementation of significant mitigation and management measures. Significant time resources required to ensure impact is on a controllable level.
5	Irreversible	The impact is irreversible.

Probability of the impact

The PROBABILITY of an impact is the severity of the impact on the ecosystem structure

Score	Probability	Description
1	Improbable	The possibility of the impact occurring is highly improbable (less than of impact occurring).
2	Low	The possibility of the impact occurring is very low, due either to circumstances, design or experience (5% to 30% of impact occurring)
3	Medium	There is a possibility that the impact will occur to the extent that provision must be made therefore (30% to 60% of impact occurring).
4	High	There is a high possibility that the impact will occur to the extent that provision must be made therefore (60% to 90% of impact occurring).
5	Definite	The impact will definitely take place regardless of any prevention plan and there can only be relied on migratory actions or contingency plans to contain the effect (90% to 100% of impact occurring).






Calculation of Impacts – Significance Rating of Impact

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact.

The significance of an impact is rated according to the scores as presented below:

Equation 1:

$$\text{Significance} = \text{Irreplaceability (Reversibility + Intensity + Duration + Extent)} \times \text{Probability}$$

Significance Rating		
Score	Significance	Colour Code
1 to 20	Very low	
21 to 40	Low	
41 to 60	Medium	
61 to 80	High	
81 to 100	Very high	
Mitigation Efficiency		
<p>Degree to which the impact can be mitigated: <i>The effect of mitigation measures on the impact and its degree of effectiveness:</i></p> <p><i>Equation 2:</i></p> $\text{Significance Rating} = \text{Significance} \times \text{Mitigation Efficiency}$		
High		0,2
Medium to High		0,4
Medium		0,6
Low to Medium		0,8
Low		1,0

Confidence rating: *Level of certainty of the impact occurring.*

- **Certain**
- **Sure**
- **Unsure**

Cumulative impacts: *The effect the combination of past, present and “reasonably foreseeable” future actions have on aspects.*

- Very Low cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

Appendix D: Monitoring – Heritage

Site type	Impact	Applicable Phase	Action	Frequency	Responsible person
All surface impacts	Potential damage to subsurface culturally significant material	Construction/Development	Monitor subsurface material	Duration of construction	ECO