



PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

for the Proposed Buffelshoek Mine intersecting the Farms Buffelshoek
351 KQ and Grootfontein 352 KQ, Thabazimbi, Limpopo

For:

BECS Environmental (Pty) Ltd

Project Ref:

Proposed Buffelshoek Mine

Date:

03/04/2023

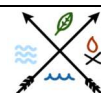
**Phase 1 Archaeological Impact Assessment for the Proposed Buffelshoek Mine intersecting the Farms
Buffelshoek 351 KQ and Grootfontein 352 KQ, Thabazimbi, Limpopo**

Project Ref: Proposed Buffelshoek Mine
 Report No: BE-0303231
 Report Version: 3

I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Buffelshoek Mine 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.

Author	Qualification	Email	Date	Signature
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Executive Summary

The author was appointed by BECS Environmental (Pty) Ltd to undertake a Phase 1 Archaeological Impact Assessment for the proposed Buffelshoek Mine on a portion intersecting Portion 4 and the Remaining Extent of the Farm Buffelshoek 351 KQ, and the Remaining Extent of Portion 1 of the Farm Grootfontein 352 KQ in the Limpopo Province. The proposed mine is located approximately 9 km southwest of Thabazimbi and falls within the Thabazimbi 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 area demarcated for mining development is associated with extremely dense vegetation cover that has partially been disturbed by the construction of roads, modern infrastructure and previous prospecting and mining activities. A total of 25 sites were identified using a combination of sources including a site visit, historical aerial imagery, topographical maps, and a previous heritage study conducted on the demarcated study area: One cemetery, one area associated with graves, eight sites associated with historic infrastructure, two historical stone-walled sites/features, two Middle Stone Age artefacts recorded as one site, two Late Iron Age sites, and 10 contemporary sites that are not considered to be significant from a heritage perspective. A delineated sensitive area consisting of several sites was identified in the south-western corner of the proposed impact area as well. The area includes Middle Stone Age, Late Iron Age, historic and contemporary sites.

The following sites are considered as sensitive from a heritage perspective and are at risk of being impacted by the proposed mining development: The sensitive area near the south-western border of the proposed impact area (Site B08 on Figure 70), a cemetery (Site B11), four graves (Site F14), two intact buildings and an area associated with demolished huts near the eastern corner of the proposed impact area (Site B03). Should it not be possible to avoid the demarcated sensitive area, a Phase 2 Archaeological Impact Assessment is recommended. In order to ensure the safeguarding of the cemetery and graves site, a 50 m fenced-off conservation buffer must be established around the sites and no blasting should take place within 100 m of the sites. Alternatively, a grave relocation process may be considered. Should the need exist to demolish the two buildings at Site B03, a destruction permit from the Provincial Heritage Resources Agency will be required. Care must also be exercised when developing in the remaining area of Site B03 since historical huts and buildings existed in the area and significant cultural material might be present at a subsurface level.

The remaining sites are located either outside of the proposed impact area or are not sensitive from a heritage perspective. These sites have adequately been recorded and require no further action.

Subject to adherence to the recommendations and approval by the South African Heritage Resources Agency, the proposed Buffelshoek Mine as per the indicated boundary may continue. Should skeletal remains be exposed during development and construction phases, all activities must be suspended, and the relevant heritage resources authority must be contacted (See National Heritage and Resources Act, 1999 (Act No. 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.



List of Abbreviations

AIA – Archaeological Impact Assessment

CRM – Cultural Resource Management

DMR – Department of Mineral Resources

ECO – Environmental Control Officer

EIA – Environmental Impact Assessment

ESA – Early Stone Age

ha – Hectare

HIA – Heritage Impact Assessment

km – Kilometre

LIA – Late Iron Age

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

ya – Years ago



NEMA Appendix 6

NEMA Specialist reports	
Item	Section / Page No
1. (1) A specialist report prepared in terms of these Regulations must contain—	
(a) details of-	
(i) the specialist who prepared the report; and	P2
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	P2
(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;	2.1, 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	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;	5, 7.1
(g) an identification of any areas to be avoided, including buffers;	7
(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;	P24 – 27, P67
(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 B
(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, Appendix B
(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, Appendix B
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	None



NEMA Specialist reports	
Item	Section / Page No
(p)a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(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



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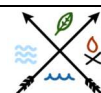
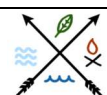


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1. Project Background

1.1 Introduction

BECS Environmental (Pty) Ltd appointed Agri Civils Geotech & Heritage to undertake a Phase 1 Archaeological Impact Assessment (AIA) for the proposed Imerys Refractory Minerals SA's Buffelshoek Mine on a portion intersecting Portion 4 and the Remaining Extent of the Farm Buffelshoek 351 KQ, and the Remaining Extent of Portion 1 of the Farm Grootfontein 352 KQ (**Table 1**) to the southwest of Thabazimbi in the Limpopo Province (**Figure 1**). The purpose of this study is to examine the demarcated study area 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 and sensitivity of heritage resources within the demarcated study area.

In the following report, the implications for the proposed Buffelshoek Mine regarding heritage resources are discussed: a demarcated portion intersecting Portion 4 and Remaining Extent of the Farm Buffelshoek 351 KQ, and the Remaining Extent of Portion 1 of the Farm Grootfontein 352 KQ. The mining development will consist of opencast mining methods and infrastructure. 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 of the project.



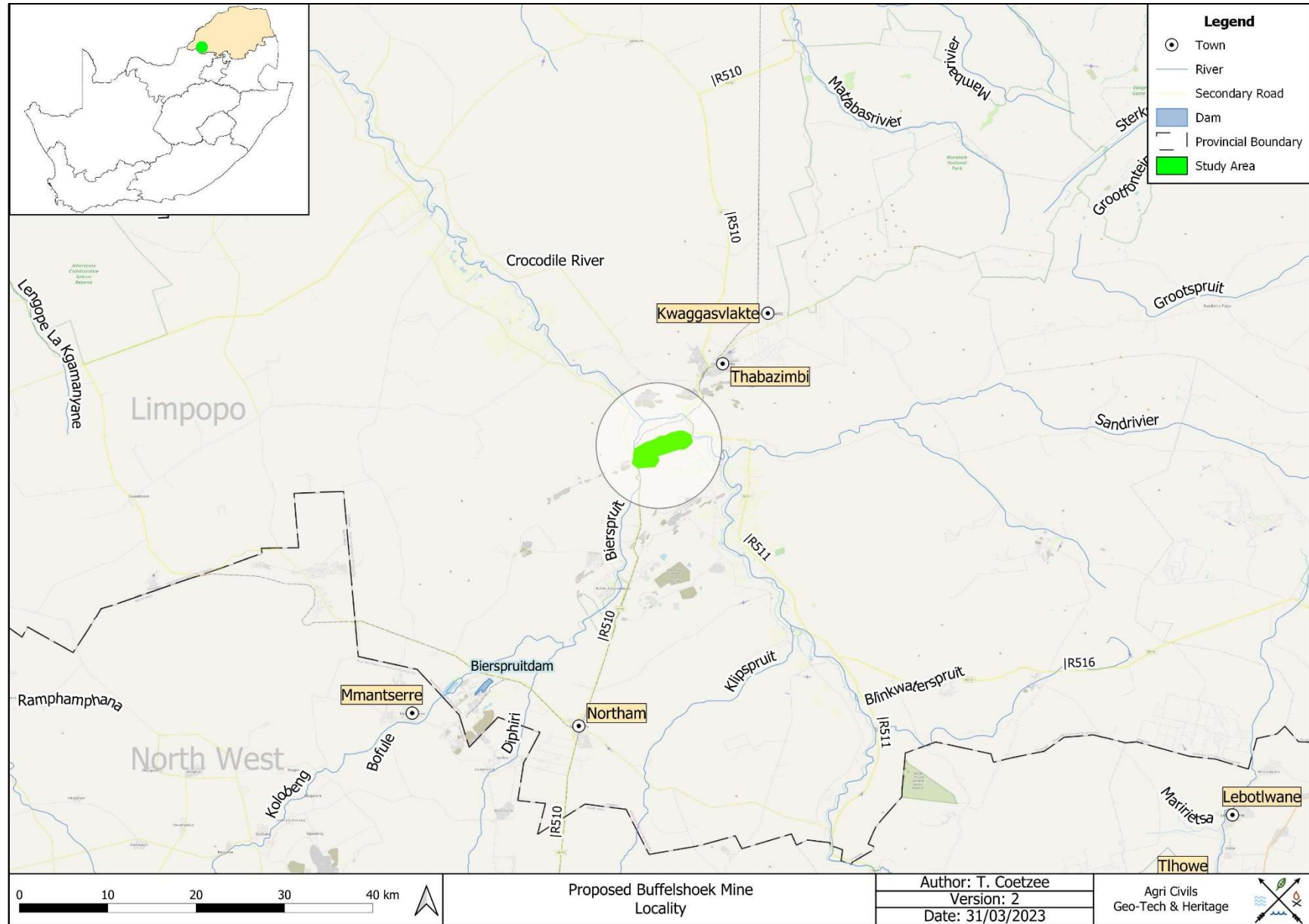


Figure 1: Regional and Provincial location of the study area.



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 if triggered.

Archaeological Impact Assessments (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 Environmental Impact Assessment (EIA) 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 as well as the relevant Local Authorities. Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act as well as the Human Tissues Act, 1983.

2. Study Area and Project Description

2.1 Location & Physical Environment

The proposed Buffelshoek Mine is situated to the southwest of Thabazimbi. The identified land parcels are listed below (Table 1):

Table 1: Farm Portions & Coordinates.

Farm Name	Farm Portion	Map Reference (1:50 000)	Lat	Lon	Land Parcel Extent (ha)	Mine Extent (ha)	Proposed impact area (ha)
Buffelshoek 351 KQ	RE/268	2427 CB	-24.669739	27.356794	1786.3	599	260
Buffelshoek 351 KQ	4	2427 CB	-24.665687	27.373159	0.93		
Grootfontein 352 KQ	RE/1/352	2427 CB	-24.679011	27.332463	654.7		

Thabazimbi is located about 9 km northeast of the project area, while Kwaggasvlakte is located 17 km to the northeast and Northam 30 km to the south-southwest. The study area falls within the Thabazimbi Local Municipality and the Waterberg District Municipality in the Limpopo Province. The R510 secondary road runs east-west through a section of the proposed study area and 160 m south of the proposed impact area while the junction with the R511 secondary road is located approximately 870 m to the north-northeast.

In terms of vegetation, the study area falls within the Savanna Biome and Central Bushveld Bioregion. According to the vegetation classification by Mucina & Rutherford (2006), the northern section of the study area falls within Waterberg Mountain Bushveld, while the southern section and majority of the study area is classified as Dwaalboom Thornveld.

Waterberg Mountain Bushveld is found in the Limpopo Province and occurs on the Waterberg Mountains, including the foothills and tablelands south of the line between Lephalale and Marken and north of Bela-Bela and west of Mokopane. Outliers are also found to the southwest such as the Boshofsberge and Vlieëpoortberge near Thabazimbi. In terms of conservation, Waterberg Mountain Bushveld is considered to be least threatened with a



conservation target of 24%. About 9% is statutorily conserved in the Marakele National Park and Moepel Nature Reserve. Cultivation transformed more than 3% of the vegetation unit and erosion generally varies between very low and low (Mucina & Rutherford 2006).

Dwaalboom Thornveld is associated with the Limpopo and North West Provinces. This vegetation unit is present on the flats to the north of the Dwarsberge and the ridges to the west of the Crocodile River in the Dwaalboom area and a patch near Sentrum. South of the ridges the vegetation unit extends eastwards from the Nietverdiend area, north of Pilanesberg to the Northam area. Dwaalboom Thornveld is considered least threatened with a conservation target of 19%. Some 6% is statutorily conserved mainly in the Madikwe Game Reserve, while about 14% is transformed mainly by cultivation. Erosion varies between very low and low and the main use is extensive cattle grazing (Mucina & Rutherford 2006).

The average elevation for Waterberg Mountain Bushveld varies between 1000 and 1600 Metres Above Sea Level (MASL), while Dwaalboom Thornveld varies between 900 and 1200 MASL. The average elevation of the project area is 965 MASL and is associated with steep mountainous terrain and the associated foot slopes.

The study area falls within the summer rainfall region and the average annual rainfall is roughly 552 mm per year. The average maximum temperature for the study area is recorded during January when an average of 24.7 °C is reached. The average minimum temperature is recorded during July when an average of 13.6 °C is reached (Climate-data.org 07/02/2023).

The western half of the study area falls within the A24F Quaternary Catchment, while the eastern half falls within the A24H Quaternary Catchment of the Limpopo Water Management Area. The closest perennial rivers to the study area are Bierpsruit along the western border of the study area and the Crocodile River along the eastern border of the study area. Several non-perennial streams also intersect the study area, while the Bierpsruit Dam is located 30 km to the southwest.

When the surrounding environment is considered, the region is associated with significant mining development and crop cultivation, while the demarcated study area is mostly associated with open land with traces of past prospecting and mining activities. Several roads and cutlines are located on the demarcated property, as well as a school and two residential buildings. The majority of the demarcated area is used as grazing camps for game and the area is fenced-off from the road, school and residential buildings with strict access control. Access to the study area is via the R510 secondary road (**Figures 2 & 3**).



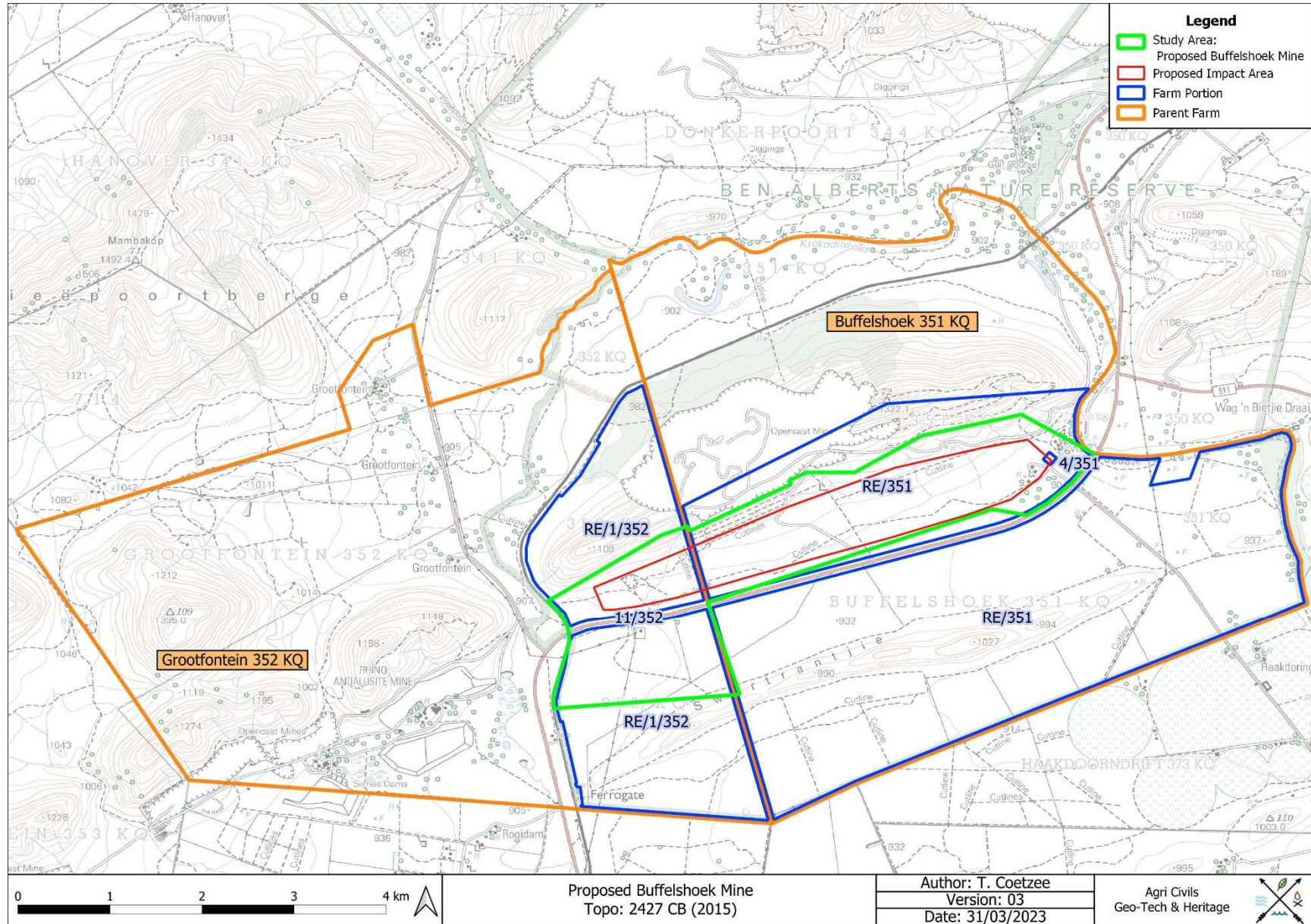


Figure 2: Segment of SA 1: 50 000 2427 CB indicating the study area.



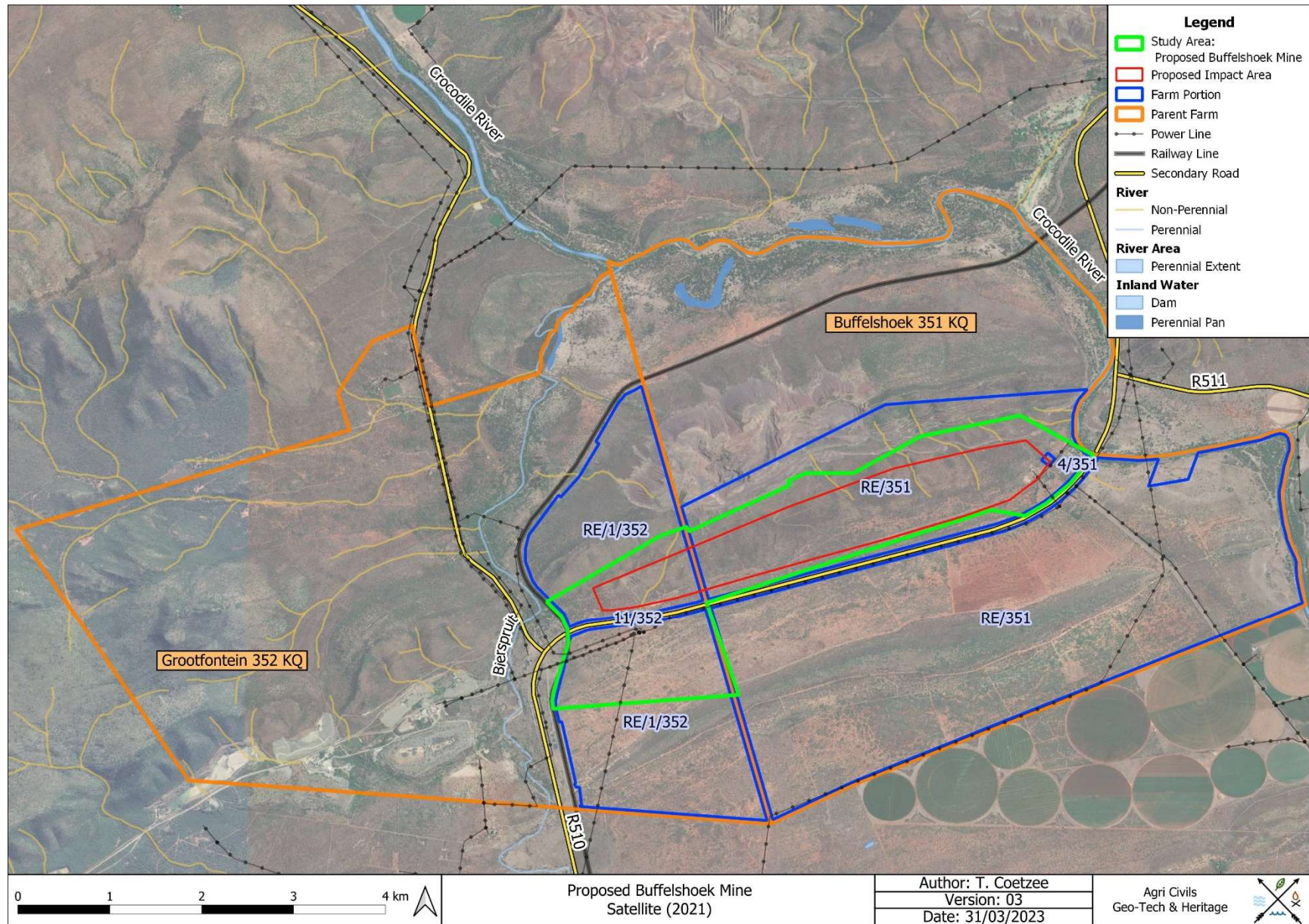


Figure 3: Study area portrayed on a 2021 satellite image.



2.2 Project Description

The proposed Imerys Refractory Minerals SA's Buffelshoek Mine is located on a Portion intersecting Portion 4 and the Remaining Extent of the Farm Buffelshoek 351 KQ, and the Remaining Extent of Portion 1 of the Farm Grootfontein 352 KQ. The proposed mine measures 599 ha, but the actual impact area is estimated at 260 ha. The proposed development will consist of opencast bench mining methods. Although the mine will attempt to free dig the material, previous mining methods in the area included blasting as a result of the hardness of the ore body. It is therefore likely that blasting will be required as well. The duration of the proposed mining activities is unknown and is dependent on the results of the drilling campaign. The duration, however, is likely to span several years.

3. Methodology

Archaeological reconnaissance of the study area was conducted during January 2023 through an unsystematic pedestrian and vehicular survey of the proposed impact area within the greater study area (**Figures 4 & 5**). Since the area is associated with extremely dense vegetation cover, only clearings, roads and potential sites recorded during a previous heritage study, as well as sites identified on historical aerial images and topographical maps were inspected. General site conditions were recorded via photographic record (**Figures 8 – 18**). The historical topographical maps dating to 1963, 1980, 2005, and 2015, as well as the historical aerial images dating to 1947, 1969, 1980, 1987, 1990, and 2006, proved useful in terms of providing an indication of potential heritage sites and past land uses associated with the study area. Seven (7) potential sites were identified on historical aerial images and topographical maps, four (4) sites were identified and plotted from information gathered in the previous heritage study conducted on the area (Miller 2010a), and 14 additional sites were identified during the site inspection. Where access was not prohibited, the previously identified sites were visited and recorded (**Table 2 & Figures 4 – 5**). It should be noted that some of the sites identified during the site inspection are located in the same vicinity as the sites identified during the previous heritage study and could therefore be related to the already identified sites. Since these sites are located relatively close to each other, a 'sensitive area' was identified and plotted (**Figure 70**). The site status of all recorded sites is shown in **Figures 6 & 7**. The total area covered during the survey was approximately 260 ha. Since heritage resources are often associated with perennial and non-perennial rivers, the rivers and streams located within close proximity of the study area were buffered by a distance of 500 m, indicating a potentially sensitive area (**Figure 70**).

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 Global Positioning System (GPS) during the site visit, as well as by plotting the boundaries from aerial imagery and topographical maps.



Table 2: Site coordinates & description.

Name	Off. Name	Latitude	Longitude	Description	Age	Current Status	Estimated Extent	ID Source	Land Parcel	Intersecting Project Area
B01	2427CB-B01	-24.664137	27.374059	Building 1947	Historical	Demolished	2.2 ha	Aerial 1947	RE/351	No
B02	2427CB-B02	-24.669464	27.372721	Building 1963	Historical	Demolished	1.9 ha	Topo 1963	RE/351	No
B03	2427CB-B03	-24.666067	27.372055	Hut 1963	Historical	Demolished	4.0 ha	Topo 1963	RE/351; 4/351	Yes
B04	2427CB-B04	-24.667914	27.370961	Building 1980	Contemporary	Intact	1.2 ha	Aerial 1980	RE/351	Yes
B05	2427CB-B05	-24.682691	27.332717	Building 1980	Contemporary	Intact	2.3 ha	Aerial 1980	RE/1/352	No
B06	2427CB-B06	-24.666076	27.374600	Building 1947	Historical	Demolished	2.1 ha	Aerial 1947	RE/351	No
B07	2427CB-B07	-24.666443	27.376657	Building 1947	Historical	Demolished	0.5 ha	Aerial 1947	RE/351	No
B08	2427CB-B08	-24.679906	27.332993	Iron Age byre	LIA	Disturbed	0.4 ha	Prev HIA	RE/1/352	Yes
B09	2427CB-B09	-24.680132	27.330123	Historic Village 1920's	Historical	Demolished	0.2 ha	Prev HIA	RE/1/352	Yes
B10	2427CB-B10	-24.679101	27.330058	European Farmyard late 19th C	Historical	Dilapidated	0.4 ha	Prev HIA	RE/1/352	Yes
B11	2427CB-B11	-24.670022	27.365970	Cemetery	Historical	Intact	48 graves	Prev HIA	RE/351	Yes
F01	2427CB-F01	-24.679441	27.332890	Stone Tools MSA	MSA	Disturbed	2 Stone tools	Field	RE/1/352	Yes
F02	2427CB-F02	-24.680284	27.330740	Stone-Walling	Historical	Dilapidated	3m	Field	RE/1/352	Yes
F03	2427CB-F03	-24.679470	27.331078	Stone-Walling	Historical	Dilapidated	4m	Field	RE/1/352	Yes
F04	2427CB-F04	-24.679967	27.331054	Grinding stone	LIA	Disturbed	1 stone	Field	RE/1/352	Yes
F05	2427CB-F05	-24.672905	27.353058	Building foundation	Unknown	Dilapidated	16m ²	Field	RE/351	Yes
F06	2427CB-F06	-24.680415	27.333456	Feeding trough	Contemporary	Intact	5m ²	Field	RE/1/352	No



Name	Off. Name	Latitude	Longitude	Description	Age	Current Status	Estimated Extent	ID Source	Land Parcel	Intersecting Project Area
F07	2427CB-F07	-24.671773	27.359391	Cement dam	Contemporary	Intact	5m ²	Field	RE/351	Yes
F08	2427CB-F08	-24.671770	27.359205	Cement dam	Contemporary	Intact	5m ²	Field	RE/351	Yes
F09	2427CB-F09	-24.679782	27.328216	Cement dam	Contemporary	Intact	20m ²	Field	RE/1/352	No
F10	2427CB-F10	-24.681656	27.328086	Mining marker	Contemporary	Intact	1 marker	Field	RE/1/352	No
F11	2427CB-F11	-24.674136	27.337319	Mining marker	Contemporary	Intact	1 marker	Field	RE/1/352	No
F12	2427CB-F12	-24.673943	27.361004	Mining marker	Contemporary	Intact	1 marker	Field	RE/351	No
F13	2427CB-F13	-24.672228	27.344055	Mining Trenching	Contemporary	Intact	8m ²	Field	RE/351	Yes
F14	2427CB-F14	-24.671017	27.367964	Graves	Historical	Intact	4 Graves	Field	RE/351	No
Sensitive Area: B08 - B10, F01 - F04, F06		-24.679991	27.331331	Stone tools, grinders, stone-walling, feeding trough, ceramics, potsherds, metal remains	MSA, LIA, Historical, Contemporary	Dilapidated	8.5 ha	Field & Prev HIA	RE/1/352	Yes



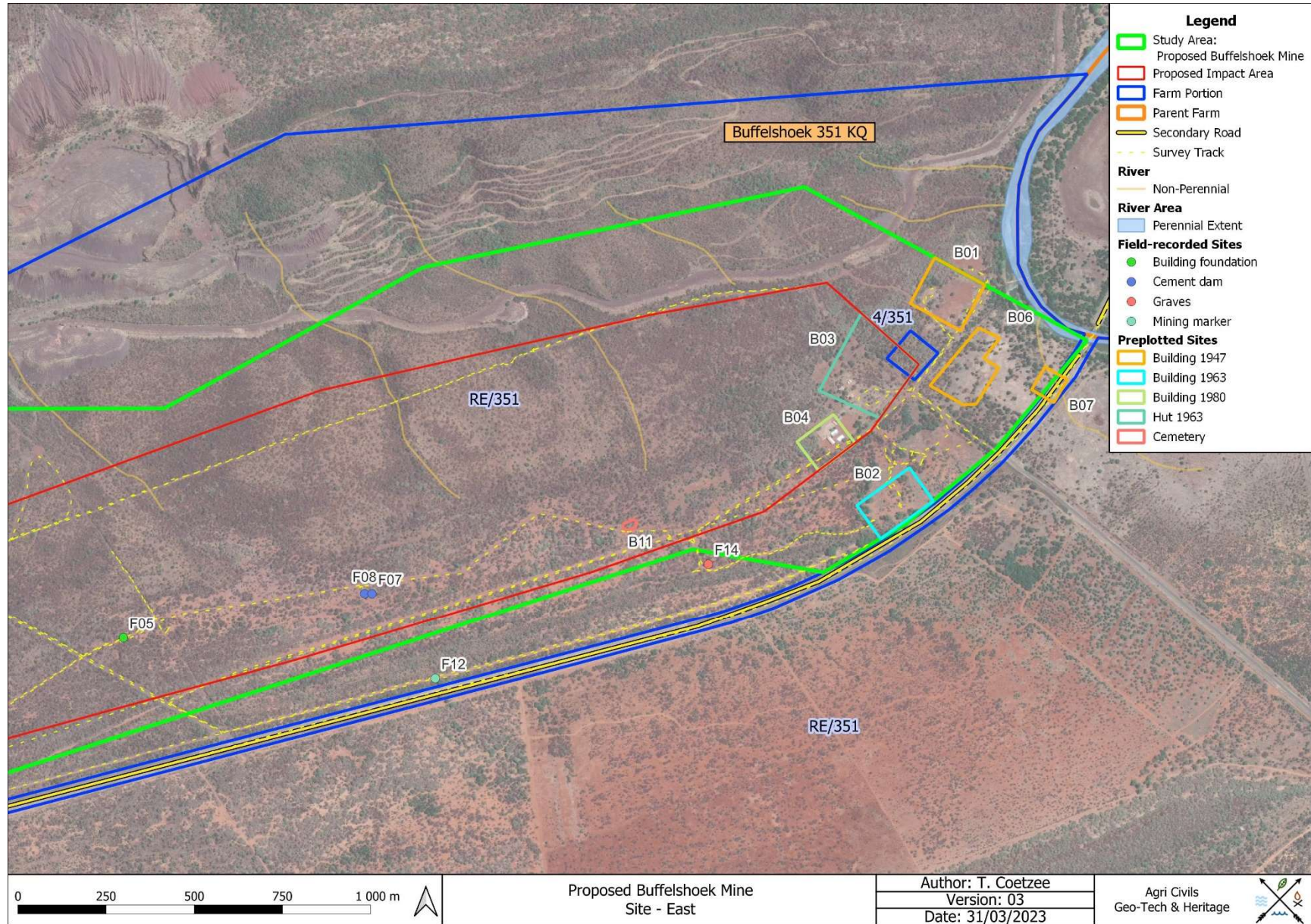


Figure 4: Eastern section of study area with survey track portrayed on a 2021 satellite image.



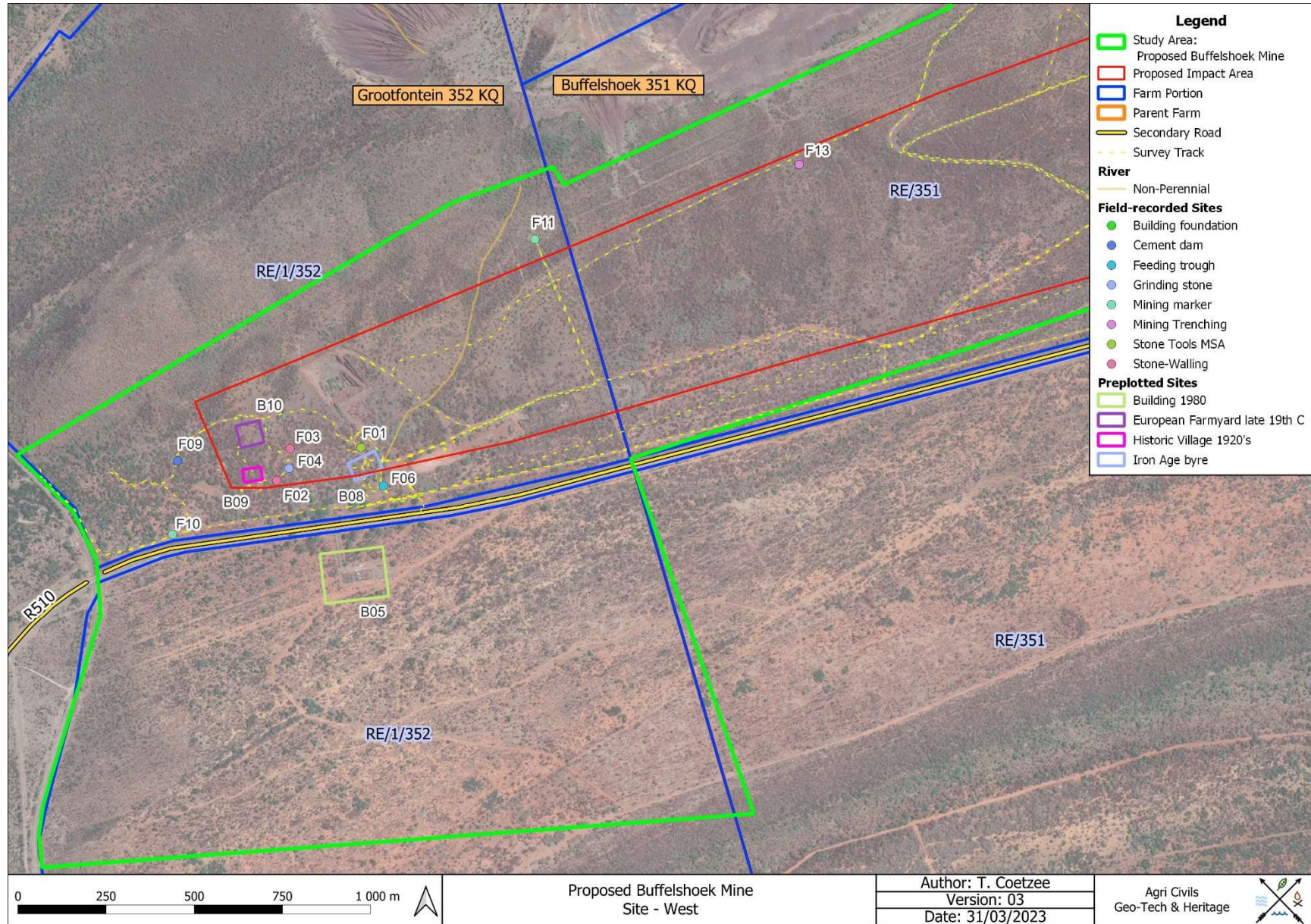


Figure 5: Western section of study area with survey track portrayed on a 2021 satellite image.



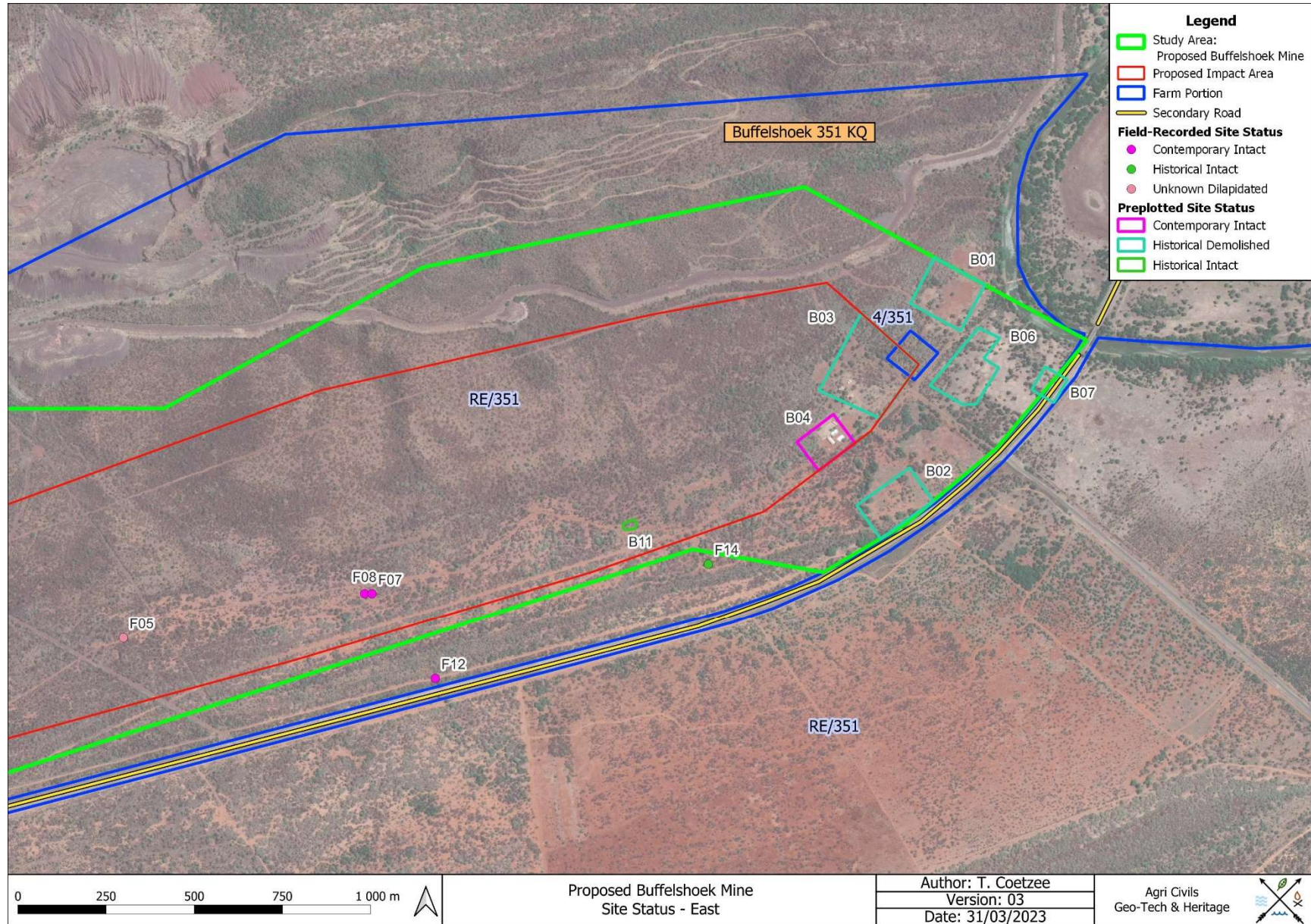


Figure 6: Site status portrayed on a 2021 satellite image – eastern section.



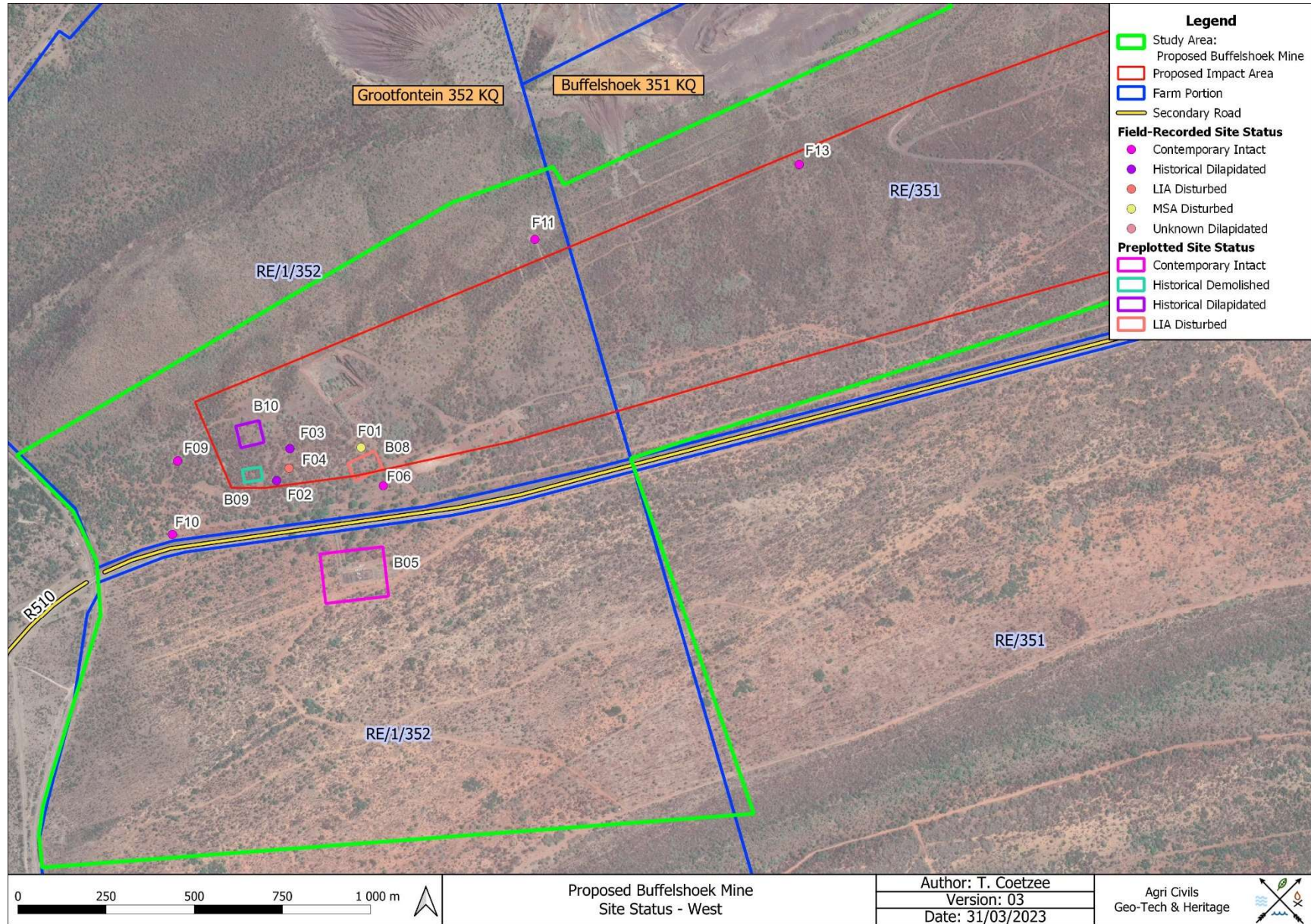


Figure 7: Site status portrayed on a 2021 satellite image – western section.





Figure 8: North-eastern corner of the study area.



Figure 9: Fenced-off south-eastern corner of the study area.



Figure 10: Environment near the centre of the study area.





Figure 11: South-western corner of the accessible section of the study area.



Figure 12: North-western section of the study area.



Figure 13: Northern section of the study area.





Figure 14: Section of less dense vegetation associated with the southern section of the study area.



Figure 15: Section of cleared vegetation near the western end of the study area.



Figure 16: Previously mined area in the north-eastern section of the study area.





Figure 17: One of the roads associated with the study area.



Figure 18: One of the several cutlines associated with the study area.

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, as well as general environmental conditions, were recorded by means of a Garmin Oregon 750 GPS and were photographed with a Samsung A71 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

Rhino Andalusite Mine, Kumba Properties, Thabazimbi

A Heritage Impact Assessment was conducted by African Heritage Consultants cc for the proposed expansion of the Rhino Andalusite Mine to the southwest of Thabazimbi (Miller 2010a). The investigated study area is the same as the proposed impact area of the proposed Buffelshoek Mine. It should be noted that the heritage study conducted by Miller (2010a) built on several previous studies conducted in the area. These are: Huffman (2004, 2006), Miller (2005, 2010b), Prinsloo (date unknown). According to the heritage study conducted by Miller (2010a), the area has been mined since the 1930's. Miller (2010a) recorded four sites within the project area, three of which were considered to be significant. The three significant sites include a large 1920's village, European buildings and foundations dating to the late 19th Century, and a large cemetery containing between 30 and 40 graves. The fourth site was identified as a byre with non-diagnostic potsherds. Since the site was impacted by the construction of a road, it was no longer considered to be significant. Miller (2010a) also noted that the rest of the study area is either too steep for human occupation, or there is a lack of water sources to sustain settlements. Scattered MSA tools were noted as well, but were not considered to be significant since no concentrations were noted.

Private Eco Resort - Hanover 341 KQ

African Heritage Consultants cc conducted a Cultural Heritage Resources Impact Assessment for the development of a private eco resort on the Farm Hanover 341 KQ. The study area is located approximately 4 km northwest of the proposed Buffelshoek Mine. The heritage study, however, recorded not sites of heritage significance (Küsel 2007a).

Wildlife Estate on the Farm Grootfontein 352 KQ

Archaeo-Info Northern Province conducted a Heritage Impact Assessment for the development of a wildlife estate on the Farm Grootfontein 352 KQ approximately 2 km northwest of the proposed Buffelshoek Mine. The proposed project consisted of 60 one-hectare plots. The study did not record any heritage sites and it was noted that the area is not conducive to subsistence occupation due to the lack of surface water and building materials (Gaigher 2007).

Mining development on the farm Maroeloesfontein 366 KQ

A Cultural Heritage Resources Impact Assessment was conducted by African Heritage Consultants cc on Portions 1, 4, 5, 6, 7, 18, 19, 27 and 28 of the Farm Maroeloesfontein 366 KQ for mining development. The study recorded graves on portions 1, 6, 18, 19 and 28. A demolished historical building was noted as well. The study area is located approximately 13 km southwest of the proposed Buffelshoek Mine. Since extremely dense sickle bush occur in disturbed areas, often association with Iron Age sites, the recommendation was made that an archaeologist be present during the clearing of overburden at these localities (Küsel. 2007b).



Rhino Andalusite Mine

The Archaeological Assessment for the Rhino Andalusite Mine on the farms Buffelsfontein 350 KQ and Tygerkloof 354 KQ was conducted by Huffman (2004). The study recorded four sites. Site 1 was identified as ancient workings consisting of a long open trench and an underground stope with at least four ventilation shafts roughly 20 m apart. The area was sealed off with metal grids. Huffman (2004) suggested that the mining dated to pre-colonial times and that they have most likely been looking for tin. Site 2 consists of a cave on the steep slope of a low hill. The cave is approximately 10 m wide and 4 m deep with a flat floor. A few potsherds were noted, as well as vestiges of red ochre painting and one crude yellow figure. Huffman (2004) noted that the cave had potential ritual significance. Site 3 was identified as a Late Iron Age Site between two mining sections. Remains at Site 4 included upper and lower grinding stones, four burnt daga structures and pottery belonging to the *Icon facies* of the Moloko group. Icon pottery dates to between AD 1300 and 1500. Site 4 was identified as a second Moloko settlement a few hundred metres below the first village. The site, however, has been disturbed by a road and material noted include pottery, stone, daga and a small piece of slag from iron smelting (Huffman 2004). It should be noted that sites appear to fall on the Farm Buffelsfontein 639 KQ. However, according to the topographical maps, the farm is labelled as Buffelsfontein 353 KQ. The investigated area is located approximately 5 km west of the proposed Buffelshoek Mine.

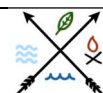
Rhino Andalusite Mine – Phase 2

The previous heritage studies conducted by Huffman (2004, 2005) recommended that two sites be mitigated prior to the expansion of the Rhino Andalusite mine: The first site consists of an Early Iron Age village (2427CB18) and the second of a Late Iron Age complex of homesteads (2427CB14). The ancient workings recorded as Site 1 in the 2004 study was mapped as well. The Early Iron Age site yielded a fragment of a ceramic mask, a collapsed grain bin, daga and pottery belonging to the *Happy Rest facies* of the Kalundu Tradition and sherds belonging to the *Mzonjani facies* of the Urewe Tradition. According to Huffman (2006), the presence of sickle bush in the area is indicative of past human settlement and land use. The LIA site yielded at least three homesteads marked by hut remains, middens, grinding stones, two furnaces, and pottery. The pottery fragments appear to belong to the *Madikwe facies* of the Moloko tradition. Radiocarbon dates of the site dated to 320 ± 40 BP which calibrates to a calendar age of AD 1535-1660. Radiocarbon dating of charcoal found within a furnace dated to AD 1420 – 1435. Based on findings of ochre at the historical mining activities, Huffman (2006) suggested that the miners were looking for red ochre rather than tin as previously thought.

3.1.2 Historical topographical maps & aerial images

1947 Aerial image

The 1947 aerial image (**Appendix A: Figure 71**) shows a project area largely characterised by undeveloped land. Patches of cultivated land are visible in the south-western and south-eastern corners of the study area. Three areas associated with buildings are also noted in the south-western corner between the proposed impact area



and the border of the proposed study area (Sites B01, B06, B07). The R510 secondary road also did not exist at the time, but another gravel road is visible intersecting the southern border of the demarcated study area.

1963 Topographical map

When the 1963 topographical map is inspected (**Appendix A: Figure 72**), buildings are indicated at Site B01, while no buildings or structures are shown at B06 and B07. Additionally, buildings are noted at Site B02 between the proposed impact area and the southern border of the study area, and huts are indicated in the eastern corner of the proposed impact area (Site B03). In terms of cultivation, only a small section is shown in the south-eastern corner of the project area. The R510 secondary road is also shown for the first time.

1969 Aerial image

By 1969 (**Appendix A: Figure 73**), buildings are still visible at Sites B01, B02, B03 and B06 (although buildings are omitted at Site B06 on the 1963 topographical map). Possible excavations are also noted between the proposed impact area and the western border of the demarcated study area near the south-western corner.

1980 Aerial image

The 1980 aerial image (**Appendix A: Figure 74**) shows two additional areas associated with buildings: Site B04 in the south-eastern corner of the proposed impact area, and Site B05 in the area to the south of the R510 secondary road. Several lines running perpendicular to the slope and likely to relate to mining development, are also noted. Additionally, excavations are visible next to Site B02, while the buildings at Site B06 appear to have been demolished.

1980 topographical map

The 1980 topographical map (**Appendix A: Figure 75**) confirms the excavations next to Site B02 and near the western corner of the study area, while no buildings are shown at Sites B05 and B06.

1987 Aerial Image

The same detail is noted on the 1987 aerial image (**Appendix A: Figure 76**) as on the 1980 topographical map and aerial image (**Appendix A: Figures 74 & 75**), with the addition of a road intersecting the study area in a northwest-southeast direction. The road appears to provide access to the top of the mountain.

1990 Aerial Image

The same detail is observed on the 1990 aerial image (**Appendix A: Figure 77**) as in the 1987 aerial image (**Appendix A: Figure 76**). However, the resolution of the 1990 image is significantly poorer.



2005 Topographical map

By 2005 (**Appendix A: Figure 78**), several cutlines and excavations are shown in the project area and a building is indicated at Site B05. The building at Site B02, however, appears to have been demolished. A large opencast mine is noted directly to the north of the proposed Buffelshoek Mine as well.

2006 Aerial image

The 2006 aerial image (**Appendix A: Figure 79**) shows the same detail noted on the 2005 topographical map (**Appendix A: Figure 78**), with the addition of several roads within the study area.

2015 topographical map

The 2015 topographical map is the most recent topographical map of the study area (**Appendix A: Figure 80**). The map shows additional cutlines within the study area and significantly fewer buildings at Site B03.

3.1.3 Personal Communication

Personal communication with Mr Phumudzo Rambau from Imerys, as well as a security guard, did not result in any information regarding the location of potential heritage resources within the demarcated study area (Phumudzo Rambau, pers. comm. 2023).

3.2 Limitations

The majority of the study area is associated with impenetrable vegetation that prohibited free movement and visibility (**Figure 19**). Investigation was therefore limited to clearings, areas associated with sparser vegetation and roads. The south-western section of the demarcated study area on the southern side of the R510 secondary road, as well as the south-eastern corner of the study area, could not be accessed due to locked gates. These areas, however, do not fall within the proposed impact area.

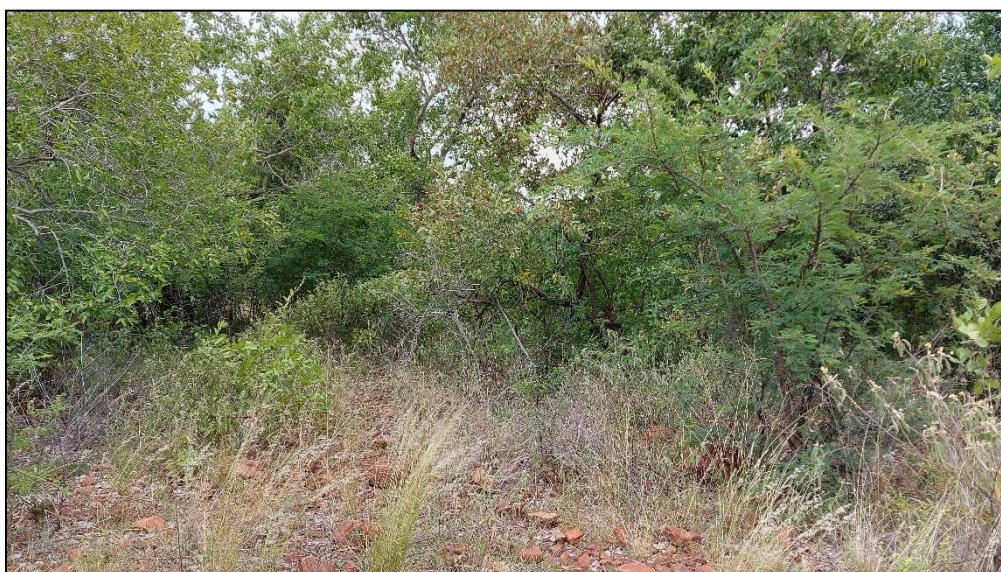


Figure 19: Dense vegetation associated with the majority of the study area.



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.

4.1 The Stone Age

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 Acheulean 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). These artefacts are often associated with rocky outcrops or water sources.



4.2 The Iron Age & Historical Period

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 (LIA) 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 Thabazimbi Archaeo-History

Research conducted by Huffman (2007: 89-90) revealed an 'ancient working' at the Rhino Mine near Thabazimbi. The working is associated with a tufa deposit at the base of a steep slope covered by broken ironstone from the ridge above. The working cuts through the tufa and consists of an open trench that extends upslope for more than 130 m whereafter it becomes an underground stope. Three or four vertical ventilation shafts were noted as well. According to the mine geologists, the immediate area is not associated with gold, copper or tin. However, poor quality ochre was noted in the spoil heaps next to the trench. Huffman (2007) suggested that this indicates that the miners were looking for high-quality ochre created by the hydration of ironstone by a fountain that also caused the tufa formation.

According to Huffman (2007: 90), the Sotho-Tswana people were the most likely ochre miners. He also noted that these were the same people who mined tin at Rooiberg, approximately 30 km from Thabazimbi. The tin mines of Rooiberg date to the same period as the gold mines of Zimbabwe and the same techniques were used in both areas. It appears that the same technique was used to mine ochre. According to Changuion & Bergh (1999: 103), the Kwena or their predecessors settled in the general Thabazimbi area and mined tin at Rooiberg around AD 950.

Huffman (2006) also uncovered evidence of Early Iron Age sites with pottery belonging to the *Happy Rest facies* of the Kalundu Tradition and sherds belonging to the *Mzonjani facies* of the Urewe Tradition. Late Iron Age pottery belonging to the *Madikwe facies* of the Moloko tradition were noted as well. The radio carbon dates of the LIA sites were dated to AD 1535-1660. Other dates obtained were AD 1420 – 1435.

In terms of the presence of maize and the role trade played, tin was traded to the Zimbabwe culture area, as well as to Tsonga-speaking people around Maputo before the arrival of the Portuguese. Accordingly, maize arrived in the Maputo area sometime after the mid-16th Century through Portuguese trade with the New World. Research has shown that maize was first grown in northern KwaZulu-Natal in the late 18th to early 19th Centuries. However, maize appears to have been grown in the Thabazimbi area by the mid-17th Century. Therefore, because of the trade links for tin, maize could have been traded into the Thabazimbi and Rooiberg areas shortly after arriving at the coast (Huffman 2006).

Although the rich iron deposits of the Thabazimbi area were mined during the Iron Age, it was only commercially mined from 1931 (Liebenberg 1999: 87 - 88).



5. Archaeological and Historical Remains

5.1 Stone Age Remains

Two Stone Age artefacts, likely belonging to the MSA, were located within the demarcated study area. Both were observed in isolation and in the south western corner of the proposed impact area (Table 3, Figures 20 & 21). Stone Age artefacts are often associated with rocky outcrops or water sources. Figures 22 – 24 below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

Table 3: Stone Age Sites.

Name	Type	Source	Year / Age	Surface Indications
F01	MSA artefacts	Field	300 000 – 30 000	Two artefacts

The heritage study conducted by Miller (2010a) noted the presence of scattered MSA tools within the study area. The remaining heritage studies did not record Stone Age artefacts. According to Bergh (1999: 4), no major stone age sites are found in the direct vicinity of the study area. Early Stone Age Achaean tools, as well as LSA tools, have however been found at Olieboompoort to the northeast of Thabazimbi. Early Stone Age tools have also been found at Rooiberg to the southwest of Thabazimbi.



Figure 20: MSA stone tools at site F01.



Figure 21: Reverse side of MSA stone tools at site F02.

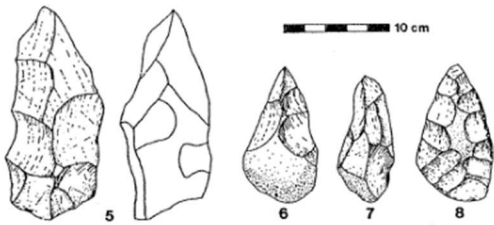


Figure 22: ESA artefacts from Sterkfontein (Volman 1984).

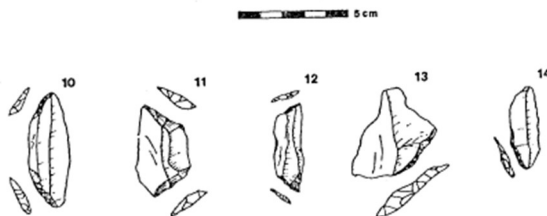


Figure 23: MSA artefacts from Howiesons Poort (Volman 1984).



Figure 24: LSA scrapers (Klein 1984).

5.2 Iron Age Farmer Remains

Two LIA sites were located within the demarcated study area (**Table 4**). Site B08 was identified as an Iron Age byre in the heritage study conducted by Miller (2010a). According to Miller (2010a), the site is characterised by a number of non-diagnostic potsherds and noted that the site was disturbed by the construction of a road. During the site inspection, a broken upper grinding stone, a non-diagnostic potsherd, as well as a small stone feature



that could possibly be the remains of a grain bin were observed (**Figures 25 – 27**). The remains of the byre, however, could not be located. Site F04 consists of another upper grinding stone approximately 160 m to the west of Site B08.

Table 4: Iron Age Sites.

Name	Type	Source	Year / Age	Surface Indications
B08	Byre	Prev. HIA	AD 1535-1660	. Grinding stone, undecorated potsherd, stone feature
F04	Grinding stone	Field	AD 1535-1660	One upper grinding stone

The heritage studies conducted by Huffman (2004, 2005, 2006) for the Rhino Andalusite Mine to the west of the project area recorded significant Early Iron Age, as well as Late Iron Age sites. Two of these sites were excavated in a Phase 2 assessment.



Figure 25: Broken upper grinding stone and potsherd at Site B08.



Figure 26: Reverse side of the broken upper grinding stone and potsherd at Site B08.





Figure 27: Potential grain bin at Site B08.



Figure 28: Upper grinding stone at site F04.

5.3 Historical Remains

Ten (10) potential sites dating to the Historic Period were noted on historical aerial imagery and during the site inspection (**Table 5**). Sites B01, B06 and B07 were identified as buildings on the 1947 aerial image and are located in the south-eastern corner between the proposed impact area and the study area boundary (**Appendix A: Figure 71**). Site B01 appears to have been associated with a shop and remained visible on all the aerial images and topographical maps. Contemporary satellite imagery, as well as observations made during the site inspection, confirmed that the buildings associated with the site have been demolished after 2015 and only few brick fragments were observed (**Figures 29 & 30**). The buildings at Sites B06 & B07 are not indicated on any of the topographical maps. However, the buildings at Site B06 remained visible on aerial imagery until 1969 (**Appendix A: Figure 73**) whereafter it appears to have been demolished, while the building at Site B07 is only visible on the 1947 aerial image (**Appendix A: Figure 71**). Due to restricted access, sites B06 (**Figure 35**) & B07 could not be inspected during the site visit.



Site B02, identified as a dairy on the 1963 topographical map (**Appendix A: Figure 72**) is located between the proposed impact area and the study area border near the south-eastern corner of the study area. The site appears to have been demolished between 1990 and 2005 (**Appendix A: Figures 77 & 78**). During the site visit, no material remains were observed (**Figure 31**).

Site B03 was identified as huts on the 1963 topographical map and is located in the eastern corner of the proposed impact area (**Appendix A: Figure 72**). The huts appear to have been demolished by 1969 (**Appendix A: Figure 73**) and several new buildings are visible on the subsequent datasets. The majority of these buildings were demolished between 2006 and 2015 (**Appendix A: Figures 79 & 80**). During the site inspection, however, two remaining buildings were noted (**Figures 32 – 34**).

Site B09 was identified by Miller (2010a) as a large 1920's village that was possibly inhabited before European occupation. The site is located near the south-western corner of the proposed impact area and is associated with a wagon wheel steel band and glass bottle remains dating to the period prior to 1930 (Miller 2010a). The same metal remains were noted during the site inspection, but no glass remains were noted (**Figures 36 & 37**).

Site B10 was recorded by Miller (2010a) as buildings and foundations dating to a late 19th Century European occupation. The site is located just to the north of Site B09 and near the western border of the proposed impact area. Remains recorded include a homestead consisting of slate and mud, as well as small sections of stone-walling. Miller (2010a) noted that about 95% of the farmyard complex was lost to time. During the site inspection, the same building ruin in roughly the same condition was noted (**Figures 38 & 39**). It should be noted that the sites identified by Miller (2010a) are not visible on any of the historical aerial images or on the historical topographical maps.

Sites F02 & F03 are located just to the east of Sites B09 and B10. These sites are associated with angular and curved stone-walling, glass and ceramic fragments, as well as metal objects likely to have been used in a historical farming context (**Figures 40 – 45**). These findings appear to be similar to the findings made by Miller (2010a) at Site B09 further to the west.

Site F05, located near the centre of the study area and next to a cutline, consists of what appears to be a building foundation / cement slab and two bricks. The feature measures approximately 16m² (**Figure 46**). The intended use and age of the feature is unknown, but could potentially date to historical times.

Apart from the Miller (2010a) heritage study, Küsel (2007b) recorded a demolished historical building as well.



Table 5: Historical Sites.

Name	Type	Source	Year / Age	Surface Indications
B01	Building 1947	Aerial 1947	Historical	Brick fragments
B02	Building 1963	Topo 1963	Historical	None
B03	Hut 1963	Topo 1963	Historical	None
B06	Building 1947	Aerial 1947	Historical	Unknown
B07	Building 1947	Aerial 1947	Historical	Unknown
B09	Historic Village 1920's	Prev. HIA	Historical	Metal objects
B10	European Farmyard late 19th C	Prev. HIA	Historical	Building ruin
F02	Stone-Walling	Field	Historical	Stone-walling
F03	Stone-Walling	Field	Historical	Ceramic & glass fragments
F05	Building foundation	Field	Unknown	Cement slab, bricks



Figure 29: Environment associated with Site B01.



Figure 30: Brick fragments at Site B01.





Figure 31: Environment associated with Site B02.



Figure 32: Area where buildings once existed at Site B03.



Figure 33: A remaining building at Site B03.





Figure 34: Another remaining building at Site B03.



Figure 35: Restricted access at Site B06.



Figure 36: Environment associated with Site B09.





Figure 37: Metal band at Site B09.



Figure 38: Building ruin at Site B10.



Figure 39: Slate and mud ruin at Site B10.





Figure 40: Linear stone-walling at Site F02.



Figure 41: Metal objects at Site F02.



Figure 42: Stone scatter and curved stone-walling at Site F02.





Figure 43: Stone-walling at Site F03.



Figure 44: Glass and ceramic fragments at Site F03.



Figure 45: Reverse side of glass and ceramic fragments at Site F03.





Figure 46: Building foundation / cement slab at Site F05.

5.4 Contemporary/Cultural Remains

Ten (10) sites dating to contemporary times were noted during the site inspection (**Table 6**). Site B04 was identified as a school along the south-eastern border of the proposed impact area (**Figure 47**). The school was first observed on the 1980 aerial image and topographical map (**Appendix A: Figures 74 & 75**) and was therefore constructed between 1969 and 1980 (**Appendix A: Figures 73 – 75**). The site visit confirmed that the school is still intact.

Site B05 is located to the south of the R510 secondary road, outside of the proposed impact area, but within the demarcated study area. The site was identified as a building on the 1980 aerial image (**Appendix A: Figure 74**) and is also indicated on the 2005 topographical map (**Appendix A: Figure 78**). Due to access constraints the site could, however, not be visited.

Site F06, located just south of the proposed impact area and near the south-western corner, is associated with a cement feeding trough. The feeding trough appears to be no longer in use and similar features are likely to be found within the study area (**Figure 48**).

Sites F07 – F09 are cement dams found throughout the study area. The dams are likely to be used as a water source for the game on the farm and range between 5m² and 20m². Only one dam, however, had water (**Figures 49 – 51**). Sites F07 and F08 are located near the centre of the study area, while Site F09 is located to the west of the proposed impact area. **Figures 52 & 53** indicate similar dams located close to Site B10.

Sites F10 – F12 indicate mining related structures found throughout the study area. These generally include what appear to be markers/boreholes/shafts (**Figures 54 – 57**). Site F10 was recorded near to western corner of the



demarcated study area, Site F11 between the proposed impact area and the northern border of the demarcated study area and Site F12 south of the demarcated study area along the R510 secondary road.

Site F13 appears to be a prospecting trench measuring approximately 8m². The site is located roughly in the middle of the study area and along the northern border of the proposed impact area (**Figure 58**).

The listed heritage studies did not record contemporary sites (see Miller 2010a, Küsel 2007a, Küsel 2007b, Gaigher 2007, Huffman 2004, Huffman 2006).

Table 6: Contemporary Sites.

Name	Type	Source	Year / Age	Surface Indications
B04	Building 1980	Aerial 1980	Contemporary	Intact building
B05	Building 1980	Aerial 1980	Contemporary	Unknown
F06	Feeding trough	Field	Contemporary	Cement feeding trough
F07	Cement dam	Field	Contemporary	Cement dam - water trough
F08	Cement dam	Field	Contemporary	Cement dam – water trough
F09	Cement dam	Field	Contemporary	Cement dam
F10	Mining marker	Field	Contemporary	Cement feature
F11	Mining marker	Field	Contemporary	Metal pipe / borehole
F12	Mining marker	Field	Contemporary	Cement and metal feature / shaft
F13	Mining Trenching	Field	Contemporary	Trench



Figure 47: School at Site B04.





Figure 48: Feeding trough at Site F06.



Figure 49: Cement dam at Site F07.



Figure 50: Cement dam at Site F08.





Figure 51: Cement dam at Site F09.



Figure 52: Cement dam at Site B10.



Figure 53: Small cement dam at Site B10.





Figure 54: Mining marker at Site F10.



Figure 55: Close-up of mining marker at Site F10.



Figure 56: Metal pipe at site F11.





Figure 57: Cement and metal feature at Site F12.



Figure 58: Prospecting trench at Site F13.

5.5 Graves/Burial Sites

One cemetery (Site B11) was identified in the heritage study conducted by Miller (2010a) and three graves during the site inspection (Site F14). The two sites are listed in **Table 7**. The grave/cemetery sites are not visible on any of the aerial images and are not indicated on any of the topographical maps (**Appendix A**).

Cemetery B11 is located within the proposed impact area, near the south-eastern corner of the study area and next to a road. Forty-five graves consisting of elongated stone cairns and without headstones or inscriptions were recorded. Five of these graves have been fenced-off and two of the graves are oriented in a north-south direction, while the rest are oriented in an east-west direction. Three graves consist of formal surface decorations oriented in an east-west direction, two of which have been fenced-off. Two piles of rocks possibly indicated that two informal graves were replaced by formal surface decorations. The heritage study conducted by Miller (2010a) stated that there were between 30 and 40 graves. No recent burials or grave goods were noted and the cemetery



is in a dilapidated state. Since the previous heritage study, some of the formal surface decorations have been damaged. The oldest grave dates to 1971, but the age of the remaining informal graves is unknown (**Figures 59 – 66**).

Site F14, located approximately 27 m south of the demarcated study area, 84 m south of the proposed impact area and 235 m southeast of cemetery Site B11, consists of one grave with formal surface decorations and three graves consisting of elongated stone cairns. One of the stone cairns, however, might be the discarded stones from when the formal surface decoration was erected. All four graves are oriented in an east-west direction and are not fenced-off (**Figures 67 – 69**). The only date observed was 1962. Also, no recent burials or grave goods were observed at the graves.

The heritage study conducted by Küsel (2007b) identified several graves on the farm Maroeloesfontein 366 KQ.

Table 7: Graves/Burial Sites/Cemeteries.

Name	Type	Source	Year	Current Status	Age
B11	Cemetery	Prev. HIA	1971, possibly older	Intact	Likely historical
F14	Graves	Field	1962	Intact	Historical



Figure 59: Cemetery B11 seen from the southeast.

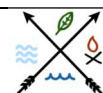




Figure 60: Cemetery B11 seen from the southwest.



Figure 61: Broken surface feature at Cemetery B11.





Figure 62: Grave dating to 1978 at Cemetery B11.



Figure 63: Double grave at Cemetery B11.





Figure 64: Close-up of double grave at Cemetery B11.



Figure 65: Informal grave at Cemetery B11.





Figure 66: Fenced-off grave at Cemetery B11.



Figure 67: Formal surface decoration at Site F14.





Figure 68: Possibly two informal graves at Site F14.



Figure 69: Elongated stone cairn at Site F14.

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, 1999 (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 8: 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

Table 9: Individual site ratings.

Site / Survey Point Name	Type	Rating	Field Rating/Grade	Significance	Recommendation
2427CB-B01	Demolished Building	General Protection B	4 B	Medium	Record site
2427CB-B02	Demolished Building	General Protection B	4 B	Medium	Record site
2427CB-B03	Demolished Hut	General protection A	4 A	Medium	Mitigate site
2427CB-B04	Building	General Protection B	4 B	Medium	Record site
2427CB-B05	Building	General Protection B	4 B	Medium	Record site
2427CB-B06	Demolished Building	General Protection B	4 B	Medium	Record site



Site / Survey Point Name	Type	Rating	Field Rating/Grade	Significance	Recommendation
2427CB-B07	Demolished Building	General Protection B	4 B	Medium	Record site
2427CB-B11	Cemetery	Local	Grade 3 A	High	Mitigation not advised
2427CB-F05	Building foundation	General Protection B	4 B	Medium	Record site
2427CB-F07	Cement dam	General Protection C	4 C	Low	No recording necessary
2427CB-F08	Cement dam	General Protection C	4 C	Low	No recording necessary
2427CB-F09	Cement dam	General Protection C	4 C	Low	No recording necessary
2427CB-F10	Mining marker	General Protection C	4 C	Low	No recording necessary
2427CB-F11	Mining marker	General Protection C	4 C	Low	No recording necessary
2427CB-F12	Mining marker	General Protection C	4 C	Low	No recording necessary
2427CB-F13	Mining Trenching	General Protection C	4 C	Low	No recording necessary
2427CB-F14	Graves	Local	Grade 3 A	High	Mitigation not advised
Sensitive Area: B08 - B10, F01 - F04, F06	Stone tools, grinders, stone-walling, feeding trough, ceramics, potsherds, metal remains	General protection A	4 A	Medium	Mitigate site

* Ratings are dependent on specific project boundaries and activities.



7. Statement of Significance & Recommendations

7.1 Statement of Significance

The study area: The Proposed Buffelshoek Mine

Some of the areas within the demarcated study area are considered to be significant from a heritage perspective. The significance of the proposed area and the observed sites are discussed here.

The general study area is associated with a combination of MSA, Early Iron Age, LIA, historical and contemporary remains, as well as cemeteries and graves. The demarcated study area is partially located within 500 m of rivers/streams, a zone that is generally associated with a higher heritage site probability. Several areas, however, have been disturbed by the dumping of building material, previous prospecting and mining activities, the clearing of roads and the construction of infrastructure that significantly lower the sensitivity in terms of heritage resources. These areas are illustrated on **Figure 70**.

MSA Sites

Site F01 consists of two MSA stone tools that were observed in the general area disturbed by the construction of a road. No concentrations were noted during the site visit and the findings appear to be similar to the findings made by Miller (2010a), who conducted an archaeological investigation on the same area. Although the site is not considered to be particularly significant from a heritage perspective, cognisance should be taken of the fact the stone tools are located in relatively close proximity of several other heritage sites, thereby contributing to the significance of the associated area. Also, the greater area is associated with Stone Age remains stretching from the ESA to the LSA.

LIA Sites

The two LIA sites (Sites B08 & F04) consist of a combination of potsherds, a byre, upper grinding stones and a stone feature. The heritage study conducted by Miller (2010a) noted that the byre and potsherds (Site B08) are located in a disturbed context and are no longer considered to be significant. The upper grinding stone at Site F04 is located to the west of Site B08 and might be related to the site. It should be noted that the delineated sensitive area as indicated on **Figure 70** is also labelled as Site F08 and includes several other sites. The heritage studies conducted by Huffman (2004, 2006) recorded significant Early and Late Iron Age sites to the west of the proposed Buffelshoek Mine. Accordingly, the Early Iron Age potsherds likely belong to the *Happy Rest facies* of the Kalundu Tradition and the *Mzonjani facies* of the Urewe Tradition, while the LIA potsherds belong to the *Madikwe facies* of the Moloko tradition. Radio carbon dates obtained for the LIA sites dated to AD 1535-1660 and AD 1420 – 1435. Significant ochre mining was also noted in the general area. As can be seen from the previous heritage studies, the general area is associated with Early and Late Iron Age occupation and mining activities. Although located in a disturbed context, Sites B08 and F04 should be considered potentially significant from a heritage perspective and are therefore protected by the NHRA, 1999 (Act No. 25 of 1999).



Historic Sites

Historic sites B01 – B03, B06, B07, B09, B10, F02, F03 and F05 are likely to exceed 60 years of age and would therefore be protected by the NHRA, 1999 (Act No. 25 of 1999). However, sites B01 and B02 have been demolished, fall outside of the proposed impact area and are therefore no longer considered to be significant from a heritage perspective. Site B03 used to be associated with huts exceeding 60 years of age and later by buildings that were eventually demolished. Two buildings, however, remained and are likely to exceed 60 years of age. These buildings are therefore protected by the NHRA, 1999 (Act No. 25 of 1999). Sites B06 and B07 used to be associated with buildings, but based on contemporary satellite imagery, have completely been demolished. Since these sites could not be accessed, they are considered to be potentially sensitive, but are unlikely to be impacted since both are located outside of the proposed impact area. Sites B09 and B10 are associated with historical built environment and include a building ruin and demolished infrastructure. These sites fall within the demarcated impact area and are considered to be significant from a heritage perspective. Sites F02 and F03 are located in relatively close proximity of Sites B09 and B10 and consist of angular and curved stone-walling in a dilapidated state. Since these sites are likely to relate to Site B09 and B10, they area also considered to be significant from a heritage perspective. Site F05, a foundation/cement slab near the middle of the study area might exceed 60 years of age, but is not considered to be significant or sensitive from a heritage perspective.

Sensitive area

Due to the relatively high concentration of sites consisting of MSA, LIA and historical sites in the south-western corner of the proposed impact area, the area was delineated as a sensitive area and consists of Sites B08 – B10, F01 – F04, and F06. The sensitive area is labelled as Site B08 in **Figure 70**. Although Miller (2010a) identified a 1920's historic village, a European farmyard dating to the late 19th C, and an LIA site in relatively close proximity of each other, the possibility exists that these sites form part of one site. Or perhaps one historic site and one LIA site. The demarcated area is therefore considered to be significant and sensitive from a heritage perspective.

Cemeteries / Graves

Cemetery B11 falls within the proposed impact area, is likely to exceed 60 years of age, and is considered to be significant and sensitive from a heritage perspective. At least one of the graves at Site F14 exceeds 60 years of age. Although the graves are located outside of the demarcated study area, the proposed mining development might have a negative impact on the graves. Site F14 is also considered to be significant and sensitive from a heritage perspective.

The following legislation concerning graves apply: For graves older than 60 years the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act, 1999 (Act No. 25 of 1999) apply, while graves younger than 60 years are protected by the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925).



Contemporary Sites

The identified contemporary sites (B04, B05, F06 – F13) mostly consist of modern mining related activities and buildings not exceeding 60 years of age. These sites are not considered to be significant or sensitive from a heritage perspective.



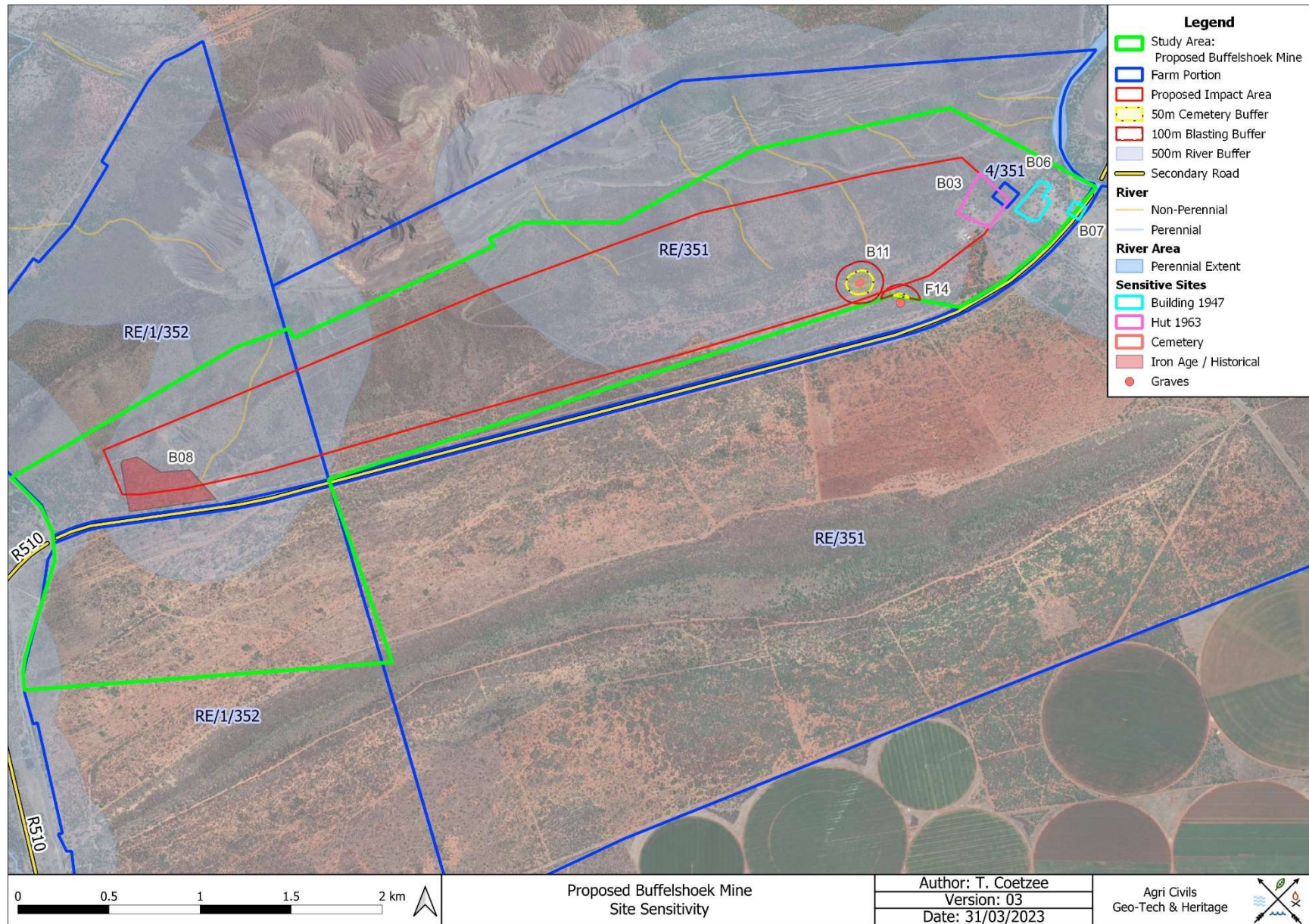


Figure 70: Study area and potentially sensitive areas portrayed on a 2021 satellite image.



7.2 Recommendations

The following recommendations are made in terms with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) in order to avoid the destruction of heritage remains associated with the area demarcated for the proposed mining development:

Sites intersecting the proposed impact area

- The demarcated Sensitive Area consists of various sites (B08 – B10, F01 – F04, F06) that include MSA tools, LIA material, historic and contemporary infrastructure. It is therefore recommended that the demarcated area be avoided by the proposed mining development. It should also be noted that due to the dilapidated state of the sites and consequential poor visibility, the sites might exceed the indicated boundary and care should therefore be exercised when developing in the general vicinity of the boundary. Should impact to the demarcated sensitive area be unavoidable, a Phase 2 AIA must be conducted. The Phase 2 AIA should map the sensitive area in detail and should include test pit excavations. A surface collection of the stone age material should also be conducted in the event of a Phase 2 AIA.
- Site B03 used to be associated with huts exceeding 60 years of age. The huts, however, were demolished and new buildings potentially exceeding 60 years of age were constructed. These buildings were demolished as well and only two remain intact. Since the two intact buildings are likely to exceed 60 years of age, these buildings are protected by the NHRA (Act No. 25 of 1999). Should the need exist to demolish these buildings, a destruction permit will be required from the Provincial Heritage Resources Authority. Also, the area where the huts were located should be considered to be potentially sensitive since significant subsurface cultural material might be unearthed during the proposed development. Care should therefore be exercised when developing within the demarcated boundary.
- Site B04 consists of a school that does not exceed 60 years of age. The site is not considered to be significant or sensitive from a heritage perspective, has sufficiently been recorded and requires no further action.
- Site F05 consists of a building foundation/cement slab that might exceed 60 years of age. The site, however, is not considered to be significant or sensitive from a heritage perspective, has sufficiently been recorded and do not require any further action.
- Cemetery B11 is significant and sensitive from a heritage perspective and is likely to be impacted by the proposed mining development. It is likely that some of the graves exceed 60 years of age. Therefore, the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act, 1999 (Act No. 25 of 1999) apply. It is



recommended that no blasting takes place within 100 m of the cemetery. Since the site appears not to be in use anymore and in order to prevent accidental damage to the graves, a fenced-off conservation buffer of 50 m must be established and maintained for effective in-situ preservation of the graves. The proposed fence infrastructure, which should be at least 1.8 m high, must include a gate to allow access by the family of the deceased individuals. A distance of at least 2 m must be maintained between the graves and fence. Should relocation of the graves be considered in the future, a full 60 days consultation process as stipulated in the NHRA Regulations of 2000 must be implemented to identify the family of the deceased individuals who must then be consulted to give consent for the relocation. Also, the Environmental Control Officer (ECO) should monitor the condition of the cemetery on a quarterly basis and before and after blasting. Should any damage as a result of the proposed mining activities be observed, a qualified archaeologist must be contacted as soon as possible.

- Sites F07 and F08 are two cement dams that appear to date to contemporary times. The sites are not considered to be significant or sensitive from a heritage perspective, have sufficiently been recorded and do not require any further action.
- Site F13 is characterised by what appears to be a contemporary prospecting trench near the northern border of the proposed impact area. The site is not considered to be significant or sensitive from a heritage perspective, has sufficiently been recorded and requires no further action.

Sites located within the demarcated study area, but outside of the proposed impact area

- Sites B01 and B02 consist of demolished historical infrastructure. The sites should be considered potentially sensitive since significant subsurface cultural material might be located at the sites. However, Sites B01 and B02 do not intersect the proposed impact area and are therefore not at risk of being impacted by the proposed development. No further action is therefore required at this stage.
- Sites B06 and B07 consist of demolished historical infrastructure, but the sites could not be inspected due to access constraints. The sites area therefore considered to be potentially sensitive. Also, Sites B06 and B07 do not intersect the proposed impact area and are therefore not at risk of being impacted by the proposed development. No further action is therefore required at this stage.
- Site B05 is characterised by what appears to be modern infrastructure near the western border of the demarcated study area. The site, however, could not be inspected due to access constraints, but is not considered to be significant or sensitive from a heritage perspective. No further action is required.
- Site F09 is a cement dam near the western border of the demarcated study area that appears to date to contemporary times. The site is not considered to be significant or sensitive from a heritage perspective, has sufficiently been recorded and do not require any further action.



- Site F10 appears to be a mining marker near the western border of the demarcated study area, while Site F11 appears to be a borehole near the northern border of the demarcated study area. These sites appear to date to contemporary times and are not considered to be significant or sensitive from a heritage perspective. Sites F10 and F11 have sufficiently been recorded and require no further action.

Sites located outside of the demarcated study and impact areas

- Site F12 appears to be a mining marker / shaft to the south of the demarcated study area. The site is likely to date to contemporary times and is not considered to be significant or sensitive from a heritage perspective. Site F12 has sufficiently been recorded and requires no further action.
- Site F14 consists of three graves located approximately 27 m south of the demarcated study area and 84 m south of the proposed impact area. The site is significant and sensitive from a heritage perspective and is likely to be impacted by the proposed mining development. At least one of the graves exceeds 60 years of age, while the remaining two graves are likely to exceed 60 years of age. Therefore, the Human Tissues Act (65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act, 1999 (Act No. 25 of 1999) apply. It is recommended that no blasting takes place within 100 m of the graves. Since the site appears not to be in use anymore and in order to prevent accidental damage to the graves, a fenced-off conservation buffer of 50 m must be established and maintained for effective in-situ preservation of the graves. The proposed fence infrastructure, which should be at least 1.8 m high, must include a gate to allow access by the family of the deceased individuals. A distance of at least 2 m must be maintained between the graves and fence. Should relocation of the graves be considered in the future, a full 60 days consultation process as stipulated in the NHRA Regulations of 2000 must be implemented to identify the family of the deceased individuals who must then be consulted to give consent for the relocation. Also, the ECO should monitor the condition of the graves on a quarterly basis and before and after blasting. Should any damage as a result of the proposed mining activities be observed, a qualified archaeologist must be contacted as soon as possible.

General

- The recommendations made in this study are based on the specific project extents as indicated by the figures of this report. Should the proposed boundaries be altered, a qualified archaeologist must review the potential impacts the altered boundaries will have on the identified sites and update the report and recommendations accordingly. Also, should the project area be changed to include additional areas, a qualified archaeologist must conduct a Phase 1 AIA on the new area if triggered.



- Should uncertainty regarding the presence of heritage remains exist, or if heritage resources are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted as soon as possible.
- Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, 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 must be contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).
- From a heritage point of view, development may proceed on the demarcated area, subject to the abovementioned conditions, recommendations, and approval by the South African Heritage Resources Agency.

8. Conclusion

The proposed Buffelshoek Mine will consist of opencast mining activities and surface infrastructure impacting approximately 260 ha. The project area is associated with a combination of intact, damaged, dilapidated, and demolished heritage sites and cemeteries, some of which are protected by legislation. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Buffelshoek Mining Project 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 ally, thus making the recording of finds more accurate.



10. References

Bergh, J.S. 1999. *Geskiedenisatlas Van Suid-Afrika: Die Vier Noordelike Provinsies*. Pretoria: J. L. van Schaik Uitgewers

Climate-Data.org. Thabazimbi Climate. <https://en.climate-data.org/africa/south-africa/limpopo/thabazimbi-27359/>
Accessed 07-02-2023.

Changuion, L. & Bergh, J.S. 1999. Swart gemeenskappe voor die koms van die blankes. In: Bergh, J. (ed.)
Geskiedenisatlas Van Suid-Afrika: Die Vier Noordelike Provinsies: 103-115. Pretoria: J. L. van Schaik Uitgewers.

Clarke, R.J. & Kuman, K. 2000. *The Sterkfontein Caves Palaeontological and Archaeological Sites*. Johannesburg:
University of the Witwatersrand.

Deacon, H. & Deacon, J. 1999. *Human beginnings in South Africa*. Cape Town: David Philip.

Gaigher, S. 2007. Heritage Impact Assessment for the proposed wildlife estate on the farm Grootfontein 352 KQ,
Limpopo Province. Thohoyandou: Archaeo-Info Northern Province.

Huffman, T.N. 2004. Archaeological Assessment for the Rhino Andalusite Mine. A Phase 1 report prepared for Rhino
Minerals. Wits: Archaeological Resources Management.

Huffman, T.N. 2006. Archaeological Mitigation for the Rhino Andalusite Mine, Thabazimbi. A Phase II report prepared
for Rhino Minerals. Wits: Archaeological Resources Management

Huffman, T.N. 2007. *Handbook to the Iron Age*. Pietermaritzburg: UKZN Press.

Klein, R. G. (ed.) 1984. *South African prehistory and paleoenvironments*. Rotterdam: Balkema.

Küsel, U.S. 2007a. Cultural Heritage Resources Impact Assessment of Hanover 341 KQ in the Thabazimbi Area
Limpopo Province. Magalieskruin: African Heritage Consultants cc.

Küsel, U.S. 2007b. New updated report of the cultural heritage resources impact assessment for portions 1, 4, 5, 6, 7,
18, 19, 27 and 28, of the farm Maroeloefontein 366 KQ Limpopo Province. Magalieskruin: African Heritage
Consultants cc.

Liebenberg, E.C. 1999. Die fisiese omewing. In: Bergh, J. (ed.) *Geskiedenisatlas Van Suid-Afrika: Die Vier Noordelike
Provinsies*: 81-92. Pretoria: J. L. van Schaik Uitgewers



Miller, S. 2005. Heritage Impact Assessment for the Phoenix Project, Kumba Mine, Thabimbi. Magalieskruin: African Heritage Consultants cc

Miller, S. 2010a. Heritage Impact Assessment for new Projects, Kumba Mine, Thabimbi. Magalieskruin: African Heritage Consultants cc

Miller, S. 2010b. Heritage Impact Assessment on proposed new impact site on Kumba properties, Thabazimbi. A Phase 1 Report. Rhino Andalusite Mine, Thabazimbi. Magalieskruin: African Heritage Consultants cc

Mitchell, P. 2002. *The archaeology of southern Africa*. Cambridge: Cambridge University Press.

Mucina, L. & Rutherford, M. C. 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Prinsloo, H.P. Date unknown. Inhouse report for Yskor.

Toth, N. & Schick, K. 2007. *Handbook of paleoanthropology*. Berlin: Springer.

Volman, T. P. 1984. Early Prehistory of southern Africa. In: Klein, R. G. (ed.) *Southern African prehistory and paleoenvironments*. Rotterdam: Balkema.

Human Tissue Act No. 65 of 1983, Government Gazette, Cape Town

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 Aerial Imagery & Topographical Maps



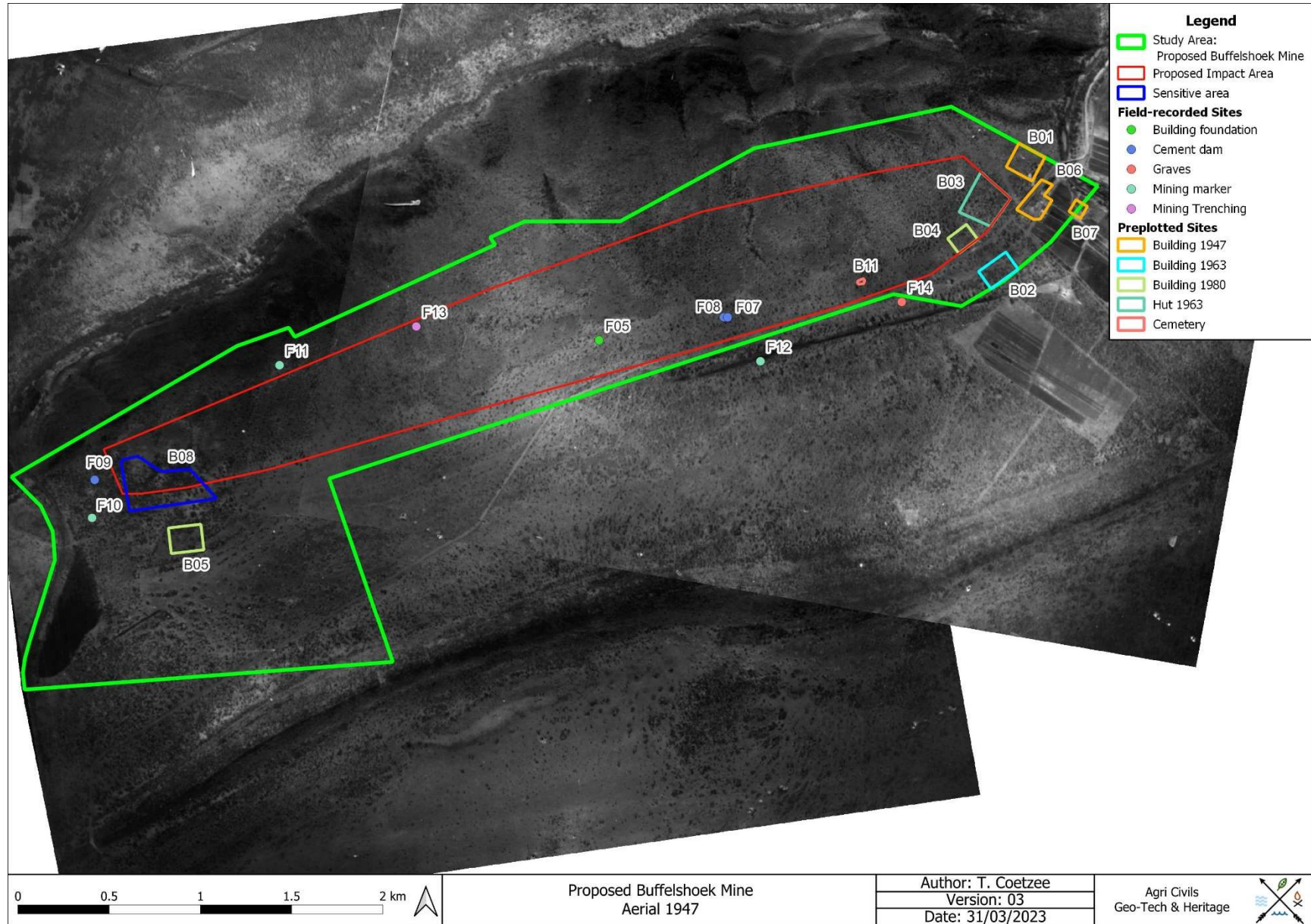


Figure 71: Study area superimposed on a 1947 aerial image.



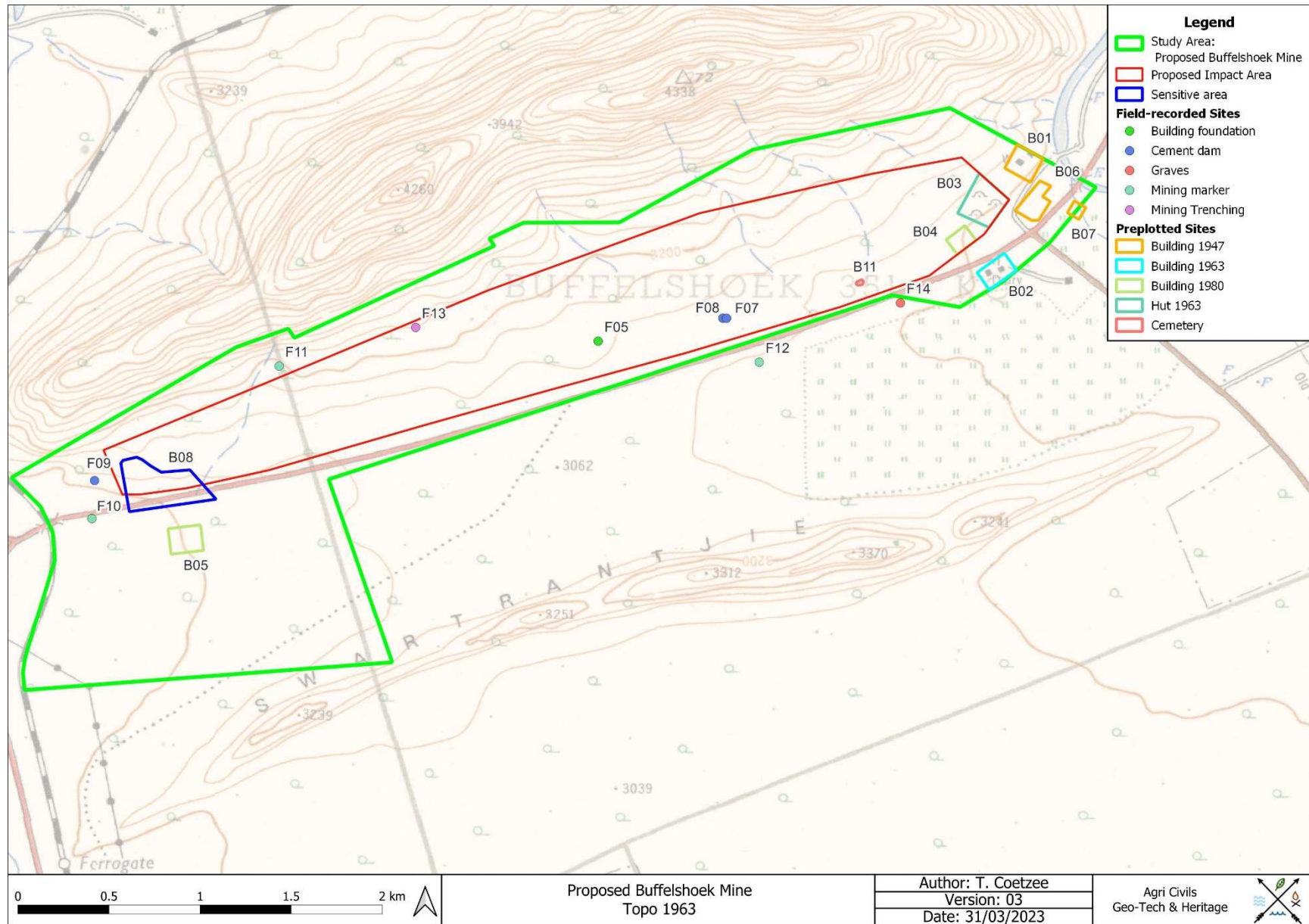


Figure 72: Study area superimposed on a 1963 topographical map.



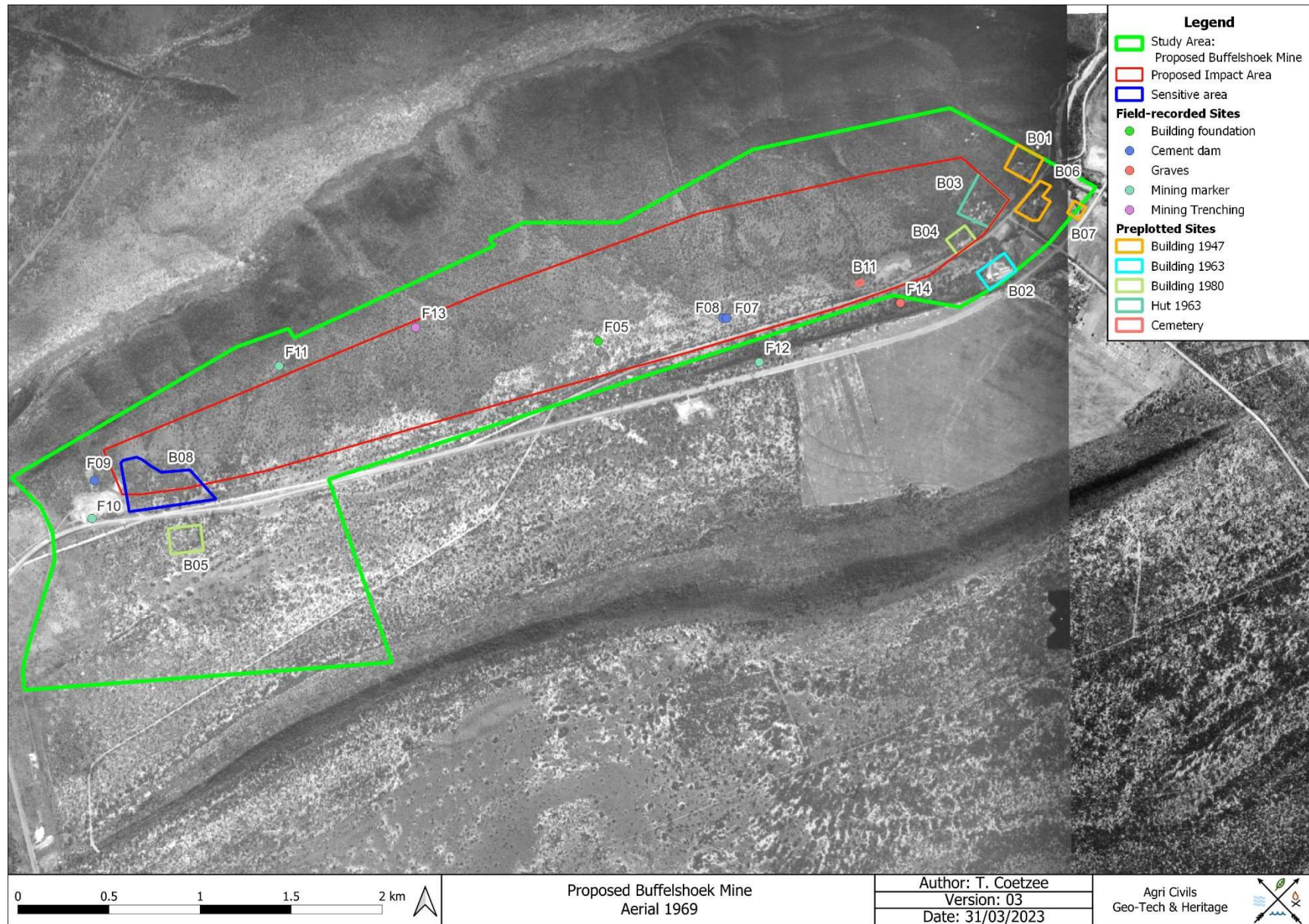


Figure 73: Study area superimposed on a 1969 aerial image.



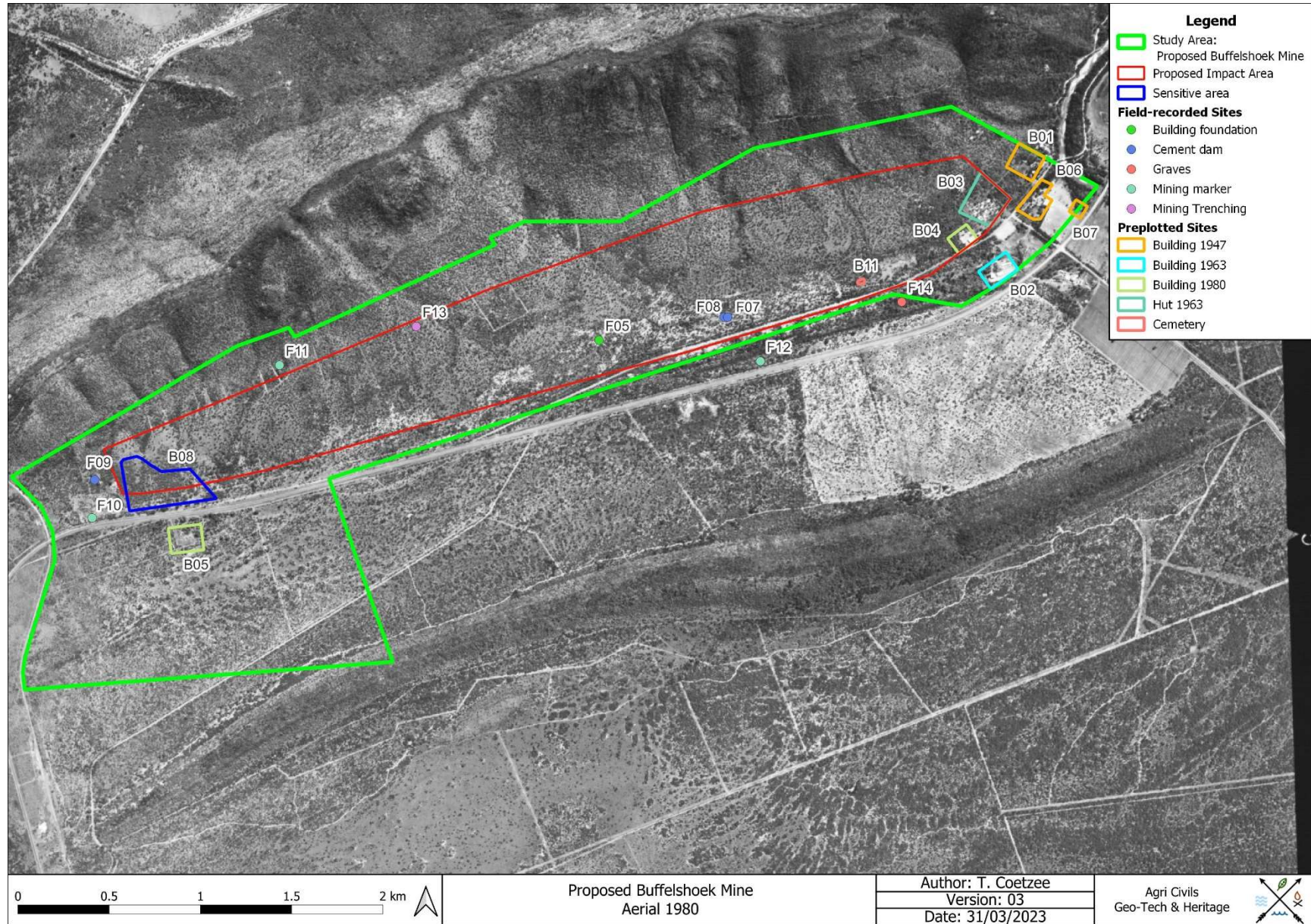


Figure 74: Study area superimposed on a 1980 aerial image.



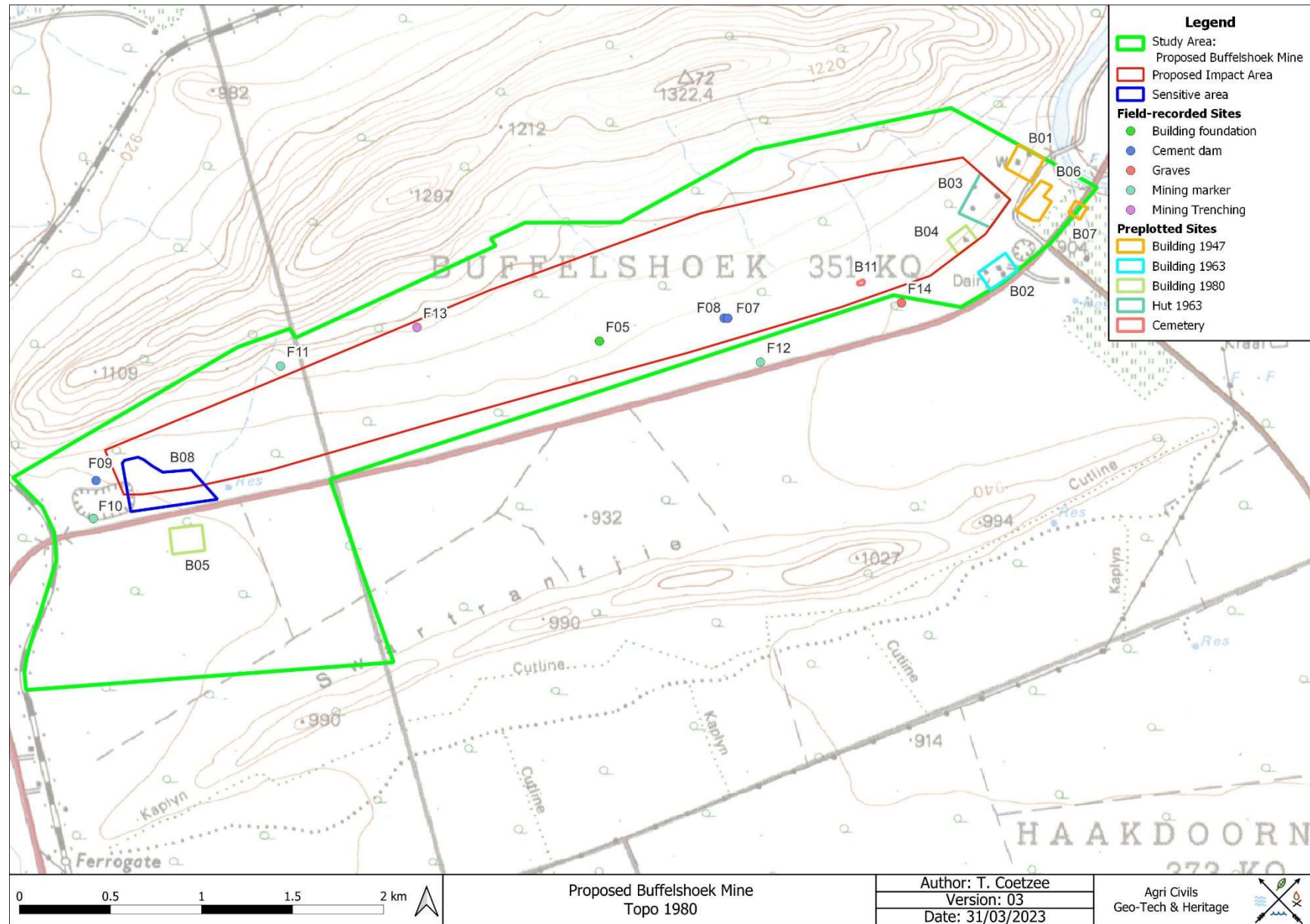


Figure 75: Study area superimposed on a 1980 topographical map.



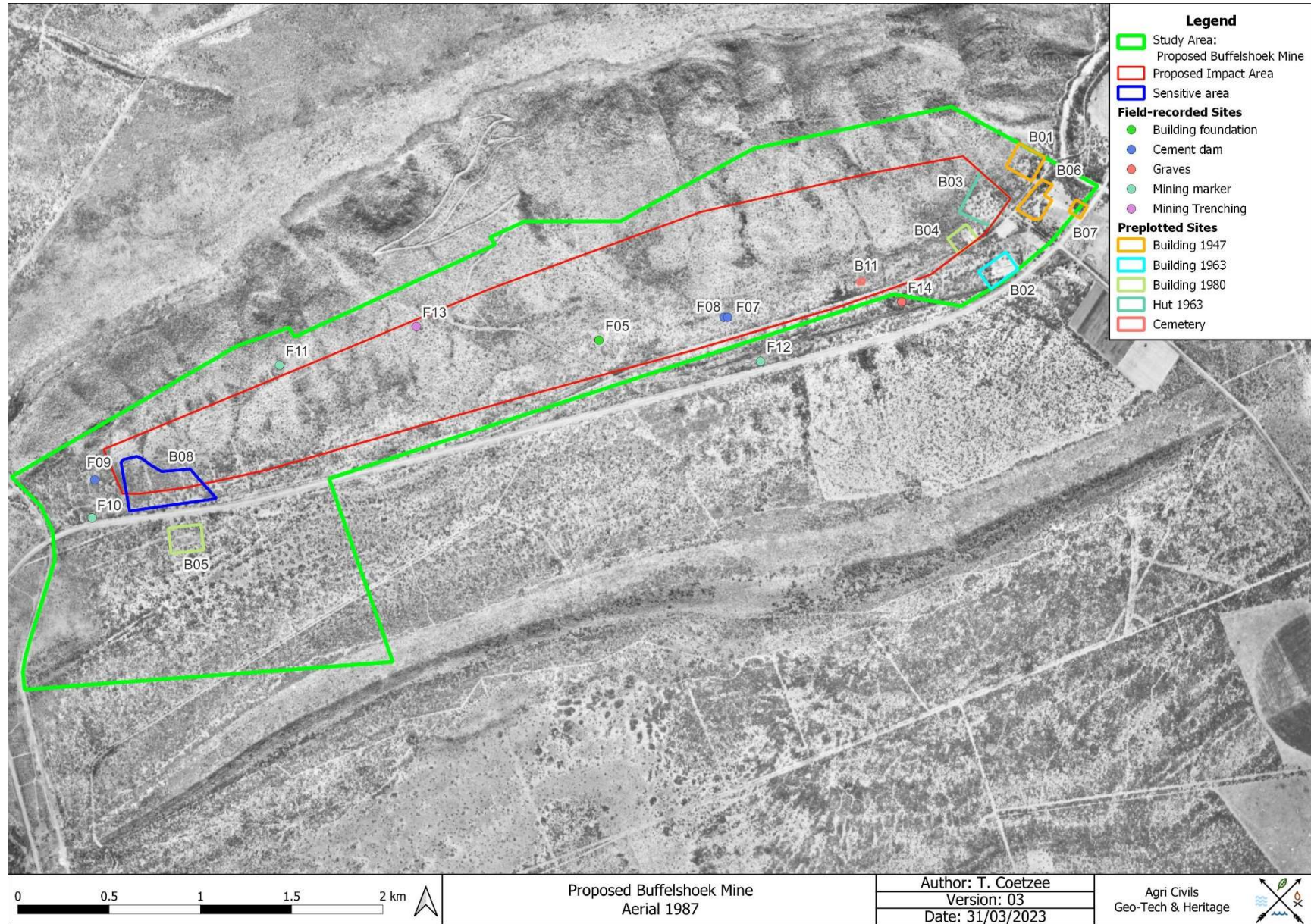


Figure 76: Study area superimposed on a 1987 aerial image.



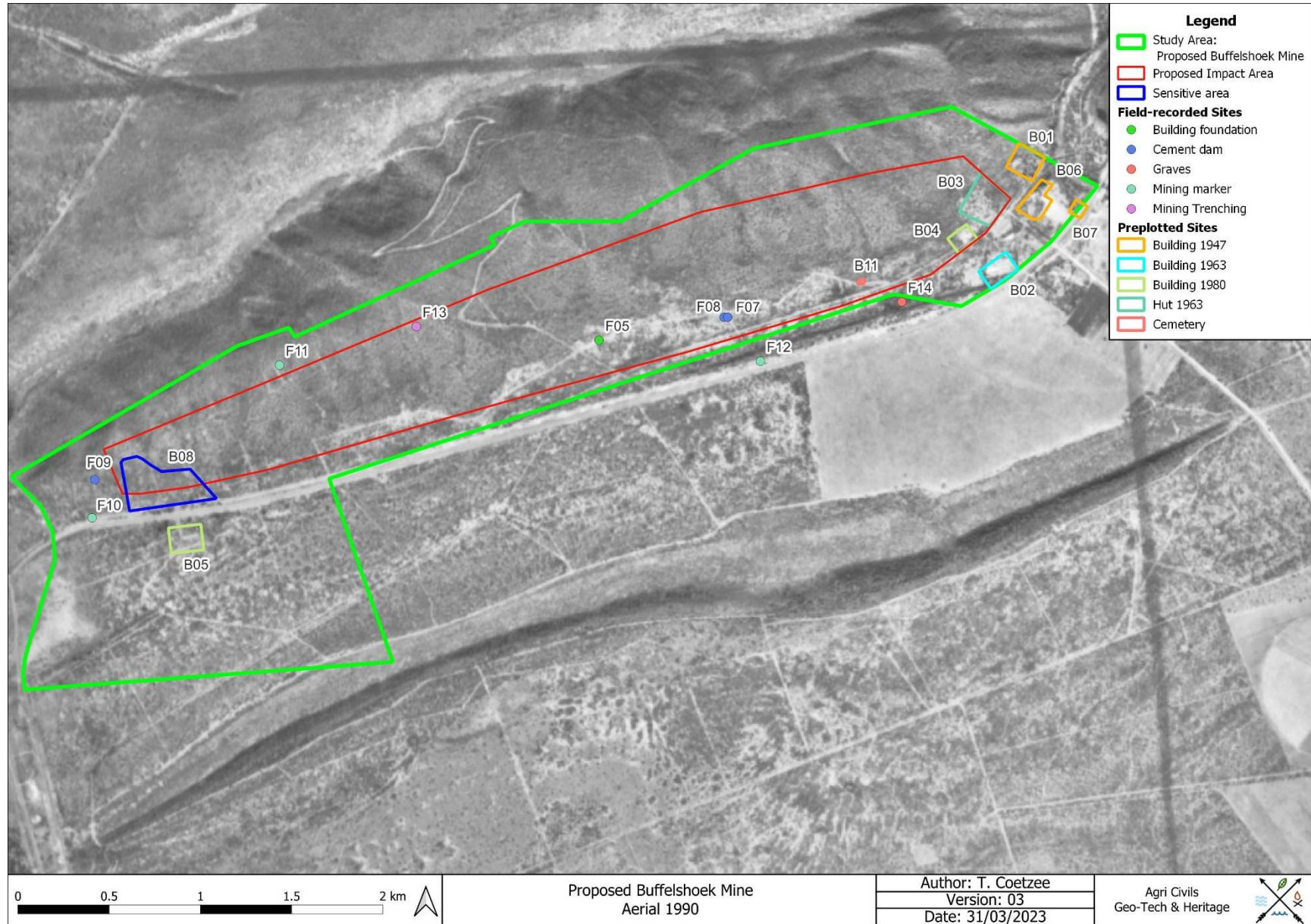


Figure 77: Study area superimposed on a 1990 aerial image.



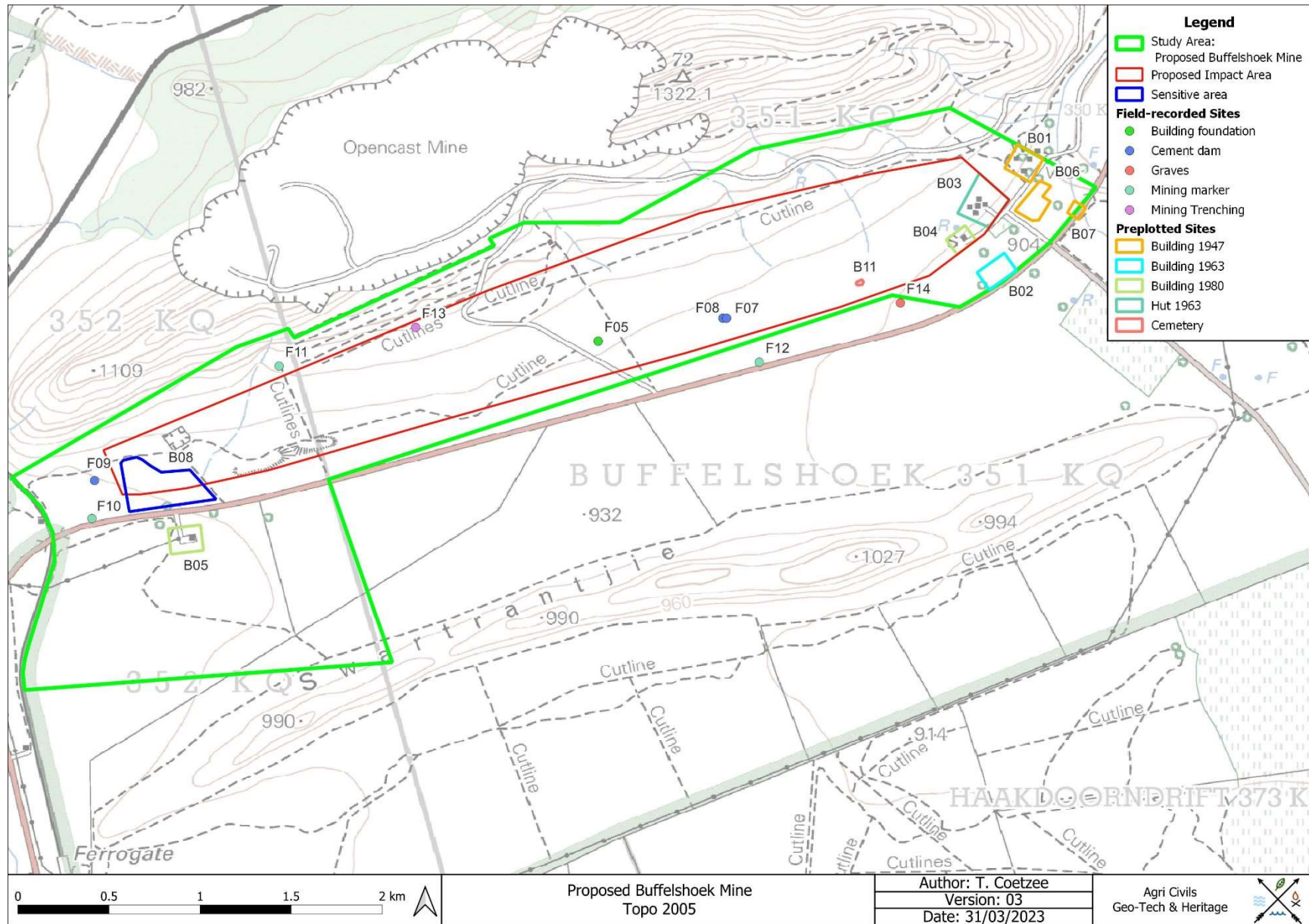


Figure 78: Study area superimposed on a 2005 topographical map.



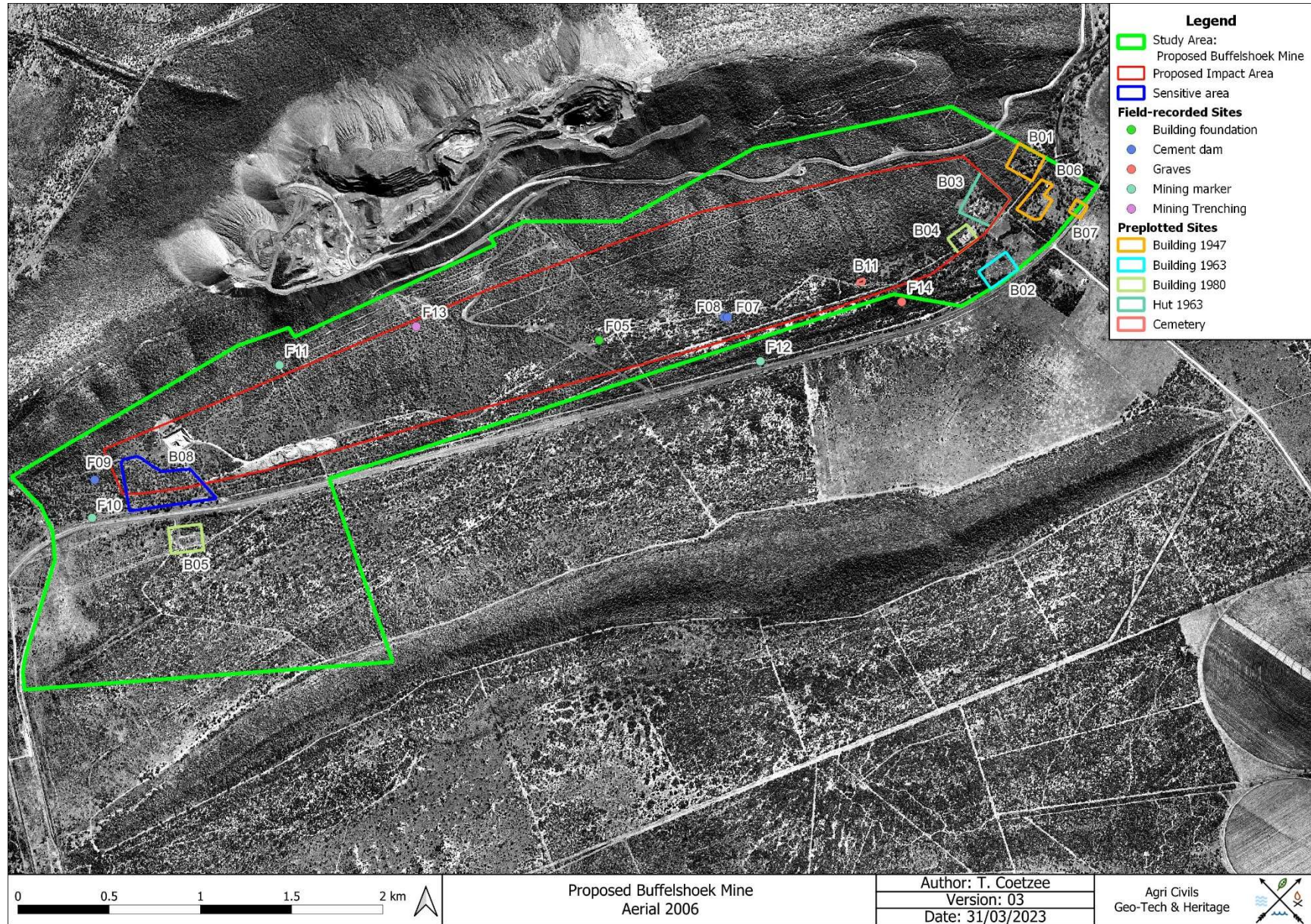


Figure 79: Study area superimposed on a 2006 aerial image.



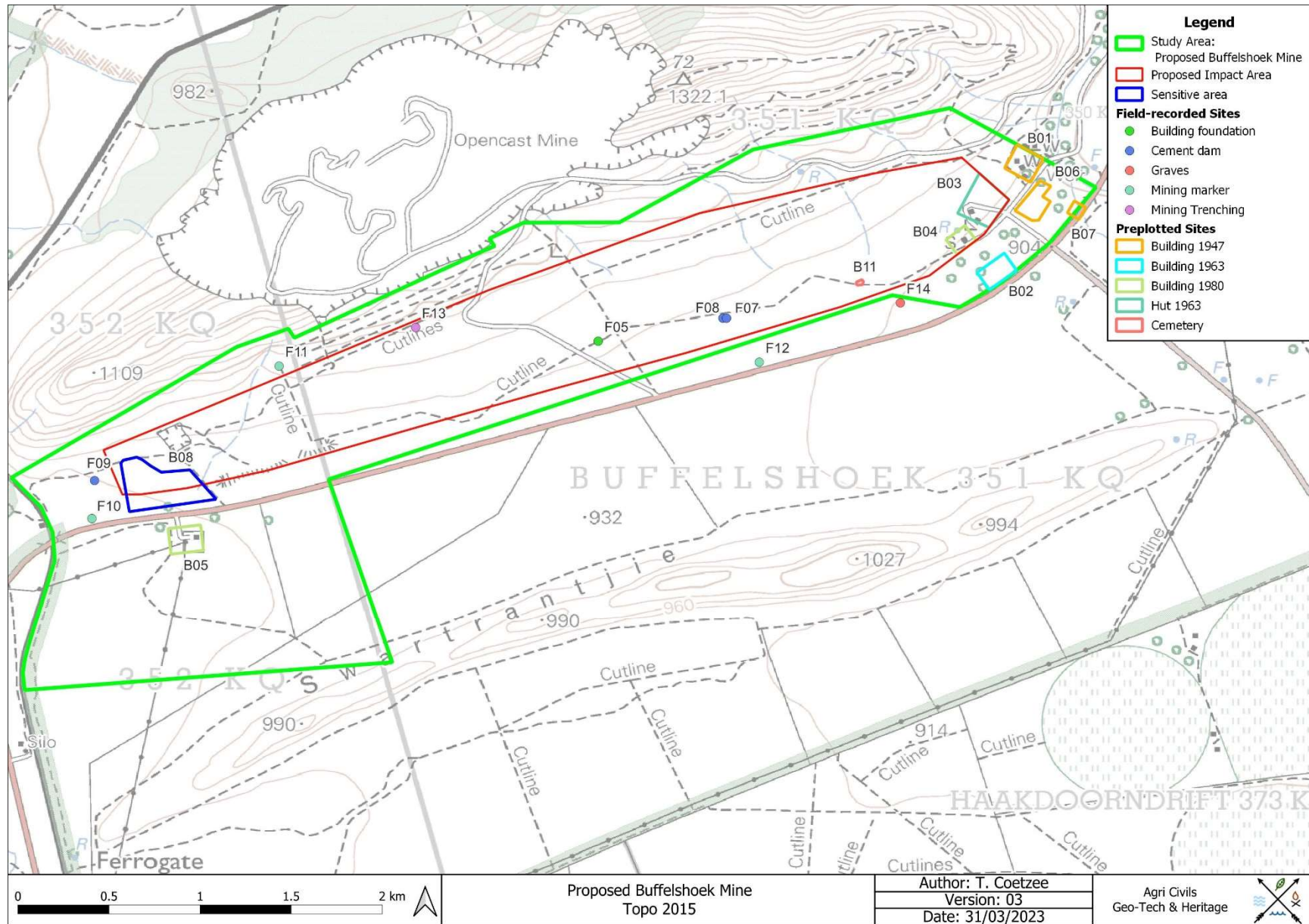


Figure 80: Study area superimposed on a 2015 topographical map.



Appendix B: Impact Table

v) Impacts and risks identified including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts

This section includes the impact management for the proposed Buffelshoek Mine.

1 Surface and subsurface impact on heritage resources due to mining development

Activity, nature, and consequence of impact:

During the development, construction and operational phases, surface and subsurface impacts take place. These activities can lead to irreparable damage or complete destruction of heritage resources if not correctly managed.

Cumulative impacts:

Based on current observation impact to LIA and historical sites, as well as burial sites might occur.

Assumptions, uncertainties, and gaps in knowledge:

Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the rehabilitation phase. Potential heritage surface indicators are therefore rather considered sites than assuming the presence of a natural feature. Due to extremely dense vegetation cover associated with the study area, a few locked gates and a large project area, the entire area could not be inspected.

Impact pre-mitigation:

	Heritage sites		
Intensity and magnitude	2 Potential destruction of culturally significant material		
Resource replaceability	3 Damage is irreversible		
Duration	3 The impact will not cease after the operational life of the activity ceases but will be permanent		
Extent or spatial scale	1 The impact will be site specific.		
Probability	3 The impact will definitely occur.		
Significance	12 High		



Impact post-mitigation:

	Heritage sites		
Intensity and magnitude	1 The proposed project can avoid and monitor the identified heritage sites and implement precautionary measures, thereby limiting/avoiding impact.		
Resource replaceability	3 Resources will be completely lost		
Duration	1 The impact will be short-lived		
Extent or spatial scale	1 The impact will be site specific.		
Probability	1 With correct management, it is unlikely that the impact will occur.		
Significance	7 Low		

Environmental objective

To ensure that heritage resources are not negatively impacted.

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Financial provision for long-term maintenance and/or environmental costs	Mitigation hierarchy
Heritage awareness must be included in normal site induction for all employees, contractors and visitors to the subject properties. This will ensure that the general level of heritage awareness is raised and that there is compliance with the act. The sections of the NHRA must be highlighted to each visitor, contractor and employee or any other person acting on the sites or immediate surrounds.	Development, construction, operational	General awareness	Site inspections	Inspections during Development, construction, operational	ECO	None	General awareness
All actions on the property will be subject to the provisions of the NHRA and any transgressions of the act will make the transgressor liable in terms of the act.	Development, construction, operational.	NHRA	Site inspections	Inspections during Development, construction, operational	ECO	Only necessary if any resource is impacted	Prevent
The demarcated project boundary must be enforced to limit the footprint of the impact of activities outside the project area.	Development, construction, operational	General awareness.	Site inspections.	Inspections during Development, construction, operational	ECO	None	Prevent
Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal	Development, construction, operational.	General awareness	Site inspections	Inspections during Development, construction, operational	ECO	Only necessary if any resource is found.	Prevent



Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Financial provision for long-term maintenance and/or environmental costs	Mitigation hierarchy
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)).							
Prior to the commencement of any work or action that will impact or effect a heritage resource, the relevant authorisation must be obtained from SAHRA.	Planning	N/A.	N/A.	N/A.	N/A.	N/A.	N/A.
Where there is uncertainty with regard to the status of a heritage resource, object, place or artefact, or any legislative or other policy issue the SAHRA can be contacted for clarity.	Development, construction, operational.	General awareness	Site inspections	Inspections during Development, construction, operational	ECO	Only necessary if any resource is found.	Prevent

Stakeholder expectations and / or comments

None received.

Residual and latent risks

If effective management takes place, there should not be residual impacts. No latent impacts foreseen.

Pre- and post-mitigation impacts per site (table1/2)

Line No	Site No	Site Type	Activity	Impact pre-mitigation						Impact post-mitigation					
				Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance	Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance
1	2427CB-B01	Building 1947	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Demolished building, potential subsurface remains.	1	3	1	1	1	7 Low
2	2427CB-B02	Building 1963	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Demolished building, potential subsurface remains.	1	3	1	1	1	7 Low



Line No	Site No	Site Type	Activity	Impact pre-mitigation						Impact post-mitigation					
				Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance	Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance
3	2427CB-B03	Hut 1963	Potential destruction of heritage resources	2	3	3	1	3	12 High Intact historical buildings are protected by the National Heritage Resources Act 25 of 1999.	1	3	1	1	1	7 Low
4	2427CB-B04	Building 1980	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Not culturally significant site	1	3	1	1	1	7 Low
5	2427CB-B05	Building 1980	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Not culturally significant site	1	3	1	1	1	7 Low
6	2427CB-B06	Building 1947	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Demolished building, potential subsurface remains.	1	3	1	1	1	7 Low
7	2427CB-B07	Building 1947	No impact to heritage resources foreseen (based on current project boundary)	1	3	2	1	1	8 Medium Demolished building, potential subsurface remains.	1	3	1	1	1	7 Low
8	2427CB-B11	Cemetery	Potential destruction of heritage resources	2	3	3	1	3	12 High Cemetery is protected by the National Heritage Resources Act 25 of 1999 and other legislation	1	3	1	1	1	7 Low



Line No	Site No	Site Type	Activity	Impact pre-mitigation						Impact post-mitigation					
				Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance	Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance
9	2427CB-F05	Building foundation	No impact to heritage resources foreseen (based on current project boundary)	2	2	2	1	3	10 Medium Foundation is not significant from a heritage perspective	1	2	1	1	1	6 Low
10	2427CB-F07	Cement dam	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant material	1	1	1	1	1	5 Low
11	2427CB-F08	Cement dam	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low
12	2427CB-F09	Cement dam	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low
13	2427CB-F10	Mining marker	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low
14	2427CB-F11	Mining marker	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low



Line No	Site No	Site Type	Activity	Impact pre-mitigation						Impact post-mitigation					
				Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance	Intensity & Magnitude	Resource replaceability	Duration	Extent or spatial scale	Probability	Significance
15	2427CB-F12	Mining marker	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low
16	2427CB-F13	Mining Trenching	No impact to heritage resources foreseen (based on current project boundary)	1	1	2	1	1	6 Low Not culturally significant site	1	1	1	1	1	5 Low
17	2427CB-F14	Graves	Potential destruction of heritage resources	2	3	3	1	3	12 High Cemetery is protected by the National Heritage Resources Act 25 of 1999 and other legislation	1	3	1	1	1	7 Low
18	B08 - B10, F01 - F04, F06	Sensitive Area: Stone tools, grinders, stone-walling, feeding trough, ceramics, potsherds, metal remains	Potential destruction of heritage resources	2	3	3	1	3	12 High Sites and artefacts are protected by the National Heritage Resources Act 25 of 1999 and other legislation	1	3	1	1	1	7 Low



Pre- and post-mitigation impacts per site (table2/2)

Line No	Environmental objective	Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Financial provision for long-term maintenance and/or environmental costs	Mitigation hierarchy	Residual and latent risks
1	To ensure that heritage resources are not negatively impacted.	None (based on current project boundary)	None	None	None	None	None	None (based on current project boundary)	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
2	To ensure that heritage resources are not negatively impacted.	None (based on current project boundary)	None	None	None	None	None	None (based on current project boundary)	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
3	To ensure that heritage resources are not negatively impacted.	Avoid, destruction permit if buildings can't be avoided. Monitoring of subsurface material at demolished huts	Construction & Development	General awareness	Site inspections	Inspection during construction, development and blasting	ECO	Only necessary if significant heritage site encountered or of destruction permit is required	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
4	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
5	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
6	To ensure that heritage resources are not negatively impacted.	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None (based on current project boundary)	Prevent	None



Line No	Environmental objective	Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Financial provision for long-term maintenance and/or environmental costs	Mitigation hierarchy	Residual and latent risks
7	To ensure that heritage resources are not negatively impacted.	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None (based on current project boundary)	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
8	To ensure that heritage resources are not negatively impacted.	Conservation buffer of 50m, 100 m no mining, monitoring	Construction & Development	General awareness	Site inspections	Inspection during construction, development and blasting	ECO	Only necessary if relocation is considered	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
9	To ensure that heritage resources are not negatively impacted.	Monitor subsurface material	Construction & Development	General awareness	Site inspections	Inspection during construction and development	ECO	Only necessary if significant heritage site is encountered	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
10	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
11	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
12	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
13	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None



Line No	Environmental objective	Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Financial provision for long-term maintenance and/or environmental costs	Mitigation hierarchy	Residual and latent risks
14	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
15	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
16	N/A	None (based on current project boundary)	None	None	None	Inspection during rehabilitation	None	None	N/A	None
17	To ensure that heritage resources are not negatively impacted.	Conservation buffer of 50m, 100 m no mining, monitoring	Construction & Development	General awareness	Site inspections	Inspection during construction, development and blasting	ECO	Only necessary if relocation is considered	N/A	If effective management takes place, there should not be residual impacts. No latent impacts foreseen
18	To ensure that heritage resources are not negatively impacted.	Avoid, Conduct Phase 2 assessment if not possible to avoid	Construction & Development	General awareness	Site inspections	Inspection during construction, development and blasting	ECO	Only necessary if Phase 2 assessment is considered	Prevent	If effective management takes place, there should not be residual impacts. No latent impacts foreseen



vi) **Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks**

Impact assessment

The methodology used to assess the significance of an impact is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Mining Activities that Require EA, of 2018, GN 86 in terms of NEMA. The impact significance methodology described below also complies to Appendix B of the Operational Guideline to Integrated Water and Waste Management of 2010 in terms of the NWA. In the event of any Section 21c&i water uses in terms of the NWA being assessed, Appendix A of the General Authorisations of 2016, GN 509 in terms of the NWA will be used to construct a risk matrix. Regulation 3(b) of the General Authorisations of 2016, GN 509 in terms of the NWA states that a suitably qualified SACNASP professional member must determine risks associated with this risk matrix.

Impact identification and prediction means forecasting the change of environmental parameters due to developmental patterns. These parameters may also be changing due to climate change and should be included.

Method of assessment: Impact identification and prediction is a stepwise procedure to identify the direct, indirect and cumulative impacts (relating to both positive and negative impacts) for which a proposed activity and its alternatives will have on the environment as well as the community. This should be undertaken by determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity aspects of sites and locations as well as the risk of impact of the proposed activity. Refer to part A(h)(iv) for a complete description of these environmental attributes. Sources of data to be used for gathering data on the environmental attributes as well as the impacts include; monitoring / sampling data collected and stored, assumptions and actual measurements, published data available from the departments or other stakeholders in the area as well as specialist studies. Likely impacts should be described qualitatively and then studied separately in detail. This provides consistent and systematic basis for the comparison and application of judgements.

Significance rating: Ratings should then be assigned to each criterion. Significance of impacts should be determined for each phase of the mining lifecycle this includes; preconstruction, construction, operational, closure (including decommissioning) and post closure phases. The significance of impacts should further be assessed both with and without mitigation action. The description of significance is largely judgemental, subjective and variable. However, generic criteria can be used systematically to identify, predict, evaluate and determine the significance of impacts resulting from project construction, operation and decommissioning. The process of determining impact magnitude and significance should never become mechanistic. Impact magnitude is determined by empirical prediction, while impact significance should ideally involve a process of determining the acceptability of a predicted impact to society. Making the process of determining the significance of impacts more explicit, open to comment and public input would be an improvement of environmental assessment practice. Impact magnitude and significance should as far as possible be determined by reference to either legal requirements (accepted scientific standards) or social acceptability. If no legislation or scientific



standards are available, the EAP can evaluate impact magnitude based on clearly described criteria. A matrix selection process is the most common methodology used in determining and ranking the site sensitivities:

- The consequence: includes the nature / intensity / severity of the impact, spatial extent of the impact, and duration of the impact.
 - The nature / intensity / severity of the impact: An evaluation of the effect of the impact related to the proposed development on the receiving environment. The impact can be either positive or negative. A description should be provided as to whether the intensity of the impact is high, medium, or low or has no impact in terms of its potential for causing negative or positive effects. Cognisance should be given to climate change which may intensify impacts.
 - The spatial extent of the impact: Indication of the zone of influence of the impact: A description should be provided as to whether impacts are either limited in extent or affect a wide area or group of people. Cumulative impacts must also be considered as the extent of the impact as may increase over time.
 - The duration of the impact: It should be determined whether the duration of an impact will be short-term, medium term, long term or permanent. Cumulative impacts must also be considered as the duration of the impact as it may increase over time.
- The likelihood: includes the probability of the potential occurrence of the impact, and frequency of the potential occurrence of the impact
 - The probability of the impact: The probability is the quality or condition of being probable or likely. The probability must include the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated
 - The frequency of the potential occurrence of the impact.
- The significance: This is worst case scenario without any management measures. See below how significance is determined: Impact that may have a notable effect on one or more aspects of the environment or may result in noncompliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence. Mitigation measures should be provided with evidence or motivation of its effectiveness



Example of significance rating:

Prior to mitigation

Intensity and magnitude	1 Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated.	2 Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated	3 Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated
Resource replaceability	1 Loss of resource can be completely replaced.	2 Loss of resource can somewhat be replaced.	3 Resources will be completely lost.
Duration	1 The impact will be short-lived.	2 The impact will last for the entire operational life of the activity but will be mitigated thereafter.	3 The impact will not cease after the operational life of the activity ceases but will be permanent.
Extent or spatial scale	1 The impact will be site specific.	2 The impact will affect the local area.	3 The impact will affect an area larger than just the local area.
Probability	1 It is unlikely that the impact will occur.	2 There is a probability for the impact to occur.	3 The impact will definitely occur.
Significance	None or low If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3.	Medium If the sum of the above ranking is equal or more than 8 to 11.	High If the sum of the above ranking is 12 or more.

Post to mitigation

Intensity and magnitude	1 Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated.	2 Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated	3 Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated
Resource replaceability	1 Loss of resource can be completely replaced.	2 Loss of resource can somewhat be replaced.	3 Resources will be completely lost.
Duration	1 The impact will be short-lived.	2 The impact will last for the entire operational life of the activity but will be mitigated thereafter.	3 The impact will not cease after the operational life of the activity ceases but will be permanent.
Extent or spatial scale	1 The impact will be site specific.	2 The impact will affect the local area.	3 The impact will affect an area larger than just the local area.
Probability	1 It is unlikely that the impact will occur.	2 It is likely for the impact to occur.	3 The impact will definitely occur.
Significance	None or low If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3.	Medium If the sum of the above ranking is equal or more than 8 to 11.	High If the sum of the above ranking is 12 or more.

Mitigation and management

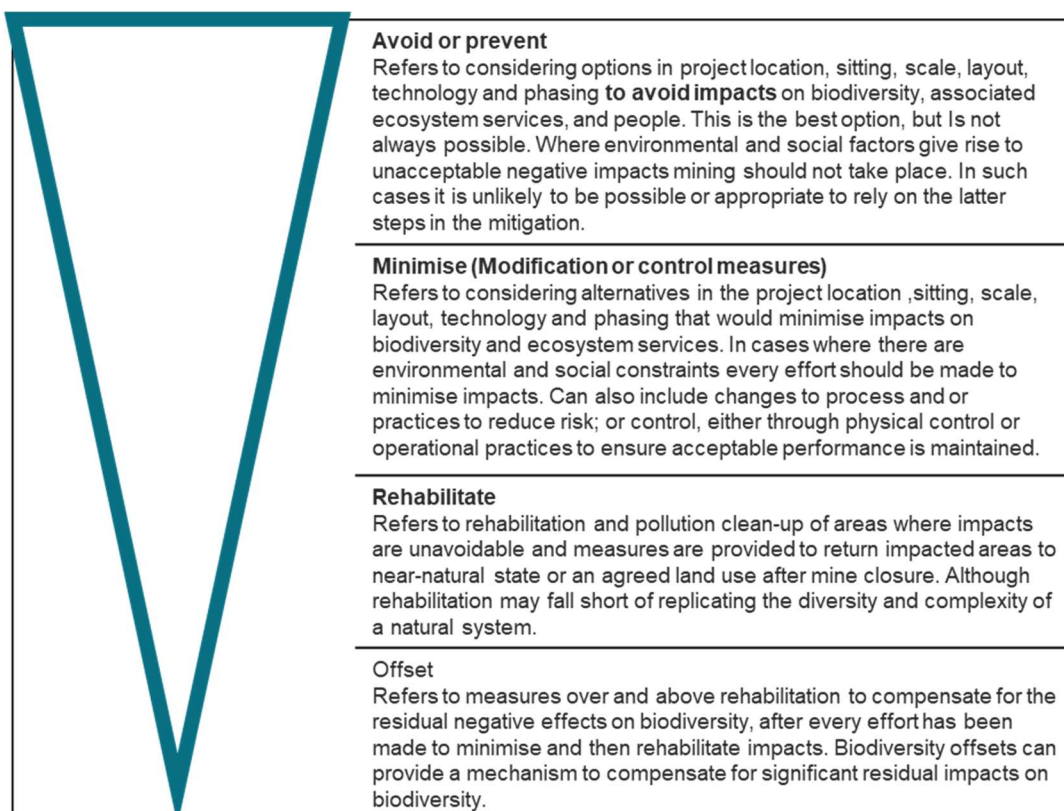
Management methodology is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Mining Activities that Require EA, of 2018, GN 86 in terms of NEMA; and the Mining and Biodiversity Guideline (Mainstreaming Biodiversity into the Mining Sector) IDB of 2013 in terms of the MPRDA.

Management statements detail the processes, procedures and practices required to achieve an impact management outcome. A hierarchy of management tools used can also be used as seen below.





Mitigation should include measures in the following order of priority. The aim is to prevent adverse impacts from happening or, where this is unavoidable, to limit their significance to an acceptable level.



Avoiding or preventing impacts



If the biodiversity (an ecosystem, habitat for threatened species, ecological corridor or area that provides essential ecosystem services) is of conservation value or importance, it is best to plan to avoid or prevent impacts altogether by changing the location, siting, method or processes of the mining activities and related infrastructure.

Minimising impacts

Minimising impacts of mining is a mitigation measure that deals with the environment in general. In areas where the biodiversity is to be affected is of conservational value or importance, then every effort should be made to minimise those impacts that cannot be avoided or prevented. Mining companies should strive to minimise impacts on biodiversity to ensure environmental protection. Section 2 of NEMA contains environmental management principles that resonates with minimising the impact rather than stopping at mitigation, this is imperative in the mining sector.

Rehabilitating impacted areas

Rehabilitation is the measures that are undertaken to “as far as it is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which aligns to the generally accepted principle of sustainable development. A closure plan is an essential part of rehabilitation and must be developed based on the establishment of the closure objectives and criteria.

Biodiversity offsets

Biodiversity offsets are measurable conservation gains that help to balance any significant biodiversity losses that remain after actions to avoid, minimise and restore negative impacts have been taken. They are the last stage of mitigation and should be considered after appropriate avoidance, minimisation, and rehabilitation/restoration measures have been applied already.

When dealing with management, impact management outcomes must:

- be set for the expected activity-based impacts;
- describe the desired outcome of the management measure/s prescribed or the standard to be achieved (environmental objective);
- be clearly documented and identified per project phase as in the impact identification and significance rating process (this must be aligned to the mines closure objectives, and must therefore include predicted long-term result of the applied management measures);
- be measurable to determine compliance, which includes time frames and schedule for the implementation of the management measures; responsibilities for implementation and long-term maintenance of the management measures; financial provision for long-term maintenance; and monitoring programmes to be implemented;
- be informed by stakeholder expectations; and
- ensure legal compliance;

Finally, the impact assessment must refer to the residual and latent impact after successful implementation of the management measure

