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PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT

for the Proposed Breyten Colliery S102 Project on Portion 7 of the Farm Bankfontein 215 IS, Breyten, Mpumalanga

For:
Eco Elementum (Pty) Ltd

Project Ref:
23-2370-AUTH (Breyten Colliery S102)

Date:
11/09/2023

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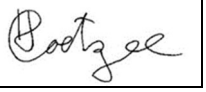
Project Ref:	23-2370-AUTH (Breyten Colliery S102)
Report No:	EE-0409231
Report Version:	2

I, Tobias Coetzee, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Breyten Colliery S102 Project 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
Tobias Coetzee	MA (Archaeology – UP)	tcoetzee.heritage@gmail.com	11/09/2023	

Executive Summary

The author was appointed by Eco Elementum (Pty) Ltd to undertake a Phase 1 Archaeological Impact Assessment for the proposed Breyten Colliery S102 project on Portion 7 of the Farm Bankfontein 215 IS near Breyten in the Mpumalanga Province. The proposed mining development is located approximately 10 km northwest of Breyten and falls within the Msukaligwa Local Municipality. The aim of the study is to determine the scope of archaeological resources that could be impacted by the proposed construction of a wash plant, co-disposal facility and two pollution control dams.

Eastern proposed pollution control dam

The area has been disturbed by a combination crop cultivation in the past and contemporary mining activities. Since no potential heritage sites were noted within the demarcated boundary, the area is not considered to be sensitive from a heritage perspective.

Proposed co-disposal facility

Two sites associated with historical buildings exceeding 60 years of age (Sites B01 & B02) were identified on historical aerial imagery. These sites are located along the southern border of the proposed co-disposal facility, but have been demolished and are no longer associated with surface remains. Although demolished, subsurface material remains might exist and the sites are therefore considered to be potentially sensitive from a heritage perspective and care should be exercised when developing within the demarcated boundaries. Since no potential heritage sites were noted on the remainder of the area demarcated for the construction of the co-disposal facility and due to the area being impacted by the cultivation of crops in the past and by contemporary mining activities, the remainder of the demarcated area is not considered to be sensitive from a heritage perspective.

Proposed wash plant

The area has been disturbed by crop cultivation in the past and no potential heritage sites were noted within the demarcated boundary. The area is therefore not considered to be sensitive from a heritage perspective.

Western proposed pollution control dam

The area has been disturbed by crop cultivation in the past and no potential heritage sites were noted within the demarcated boundary. The area is therefore not considered to be sensitive from a heritage perspective.

General

Subject to adherence to the recommendations and approval by the South African Heritage Resources Agency, the proposed Breyten Colliery S102 project as per the indicated boundaries may continue. Should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage and Resources Act, 25 of 1999 section 36 (6)). Also, should culturally significant material be discovered during the course of the said development, all activities must be suspended pending further investigation by a qualified archaeologist.

List of Abbreviations

AIA – Archaeological Impact Assessment

CRM – Cultural Resource Management

DMRE – Department of Mineral Resources and Energy

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

PCD – Pollution Control Dam

SAHRA – South African Heritage Resources Agency

WMA – Water Management Area

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1. Project Background

1.1 Introduction

Eco Elementum (Pty) Ltd appointed the author to undertake a Phase 1 Archaeological Impact Assessment (AIA) for the proposed Breyten Colliery S102 project on Portion 7 of the Farm Bankfontein 215 IS (**Table 1**) near Breyten in the Mpumalanga Province (**Figures 1 – 3**). The proposed coal mining development falls within the Msukaligwa Local Municipality and is located approximately 10 km northwest of Breyten. The purpose of this study is to examine the demarcated development footprints 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.

In the following report, the implications for the proposed Breyten Colliery S102 project on the demarcated portion with regard to heritage resources are discussed: Four development footprints on Portion 7 of the Farm Bankfontein 215 IS. The development will consist of a wash plant, co-disposal facility, and Pollution Control Dams (PCD's). 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.

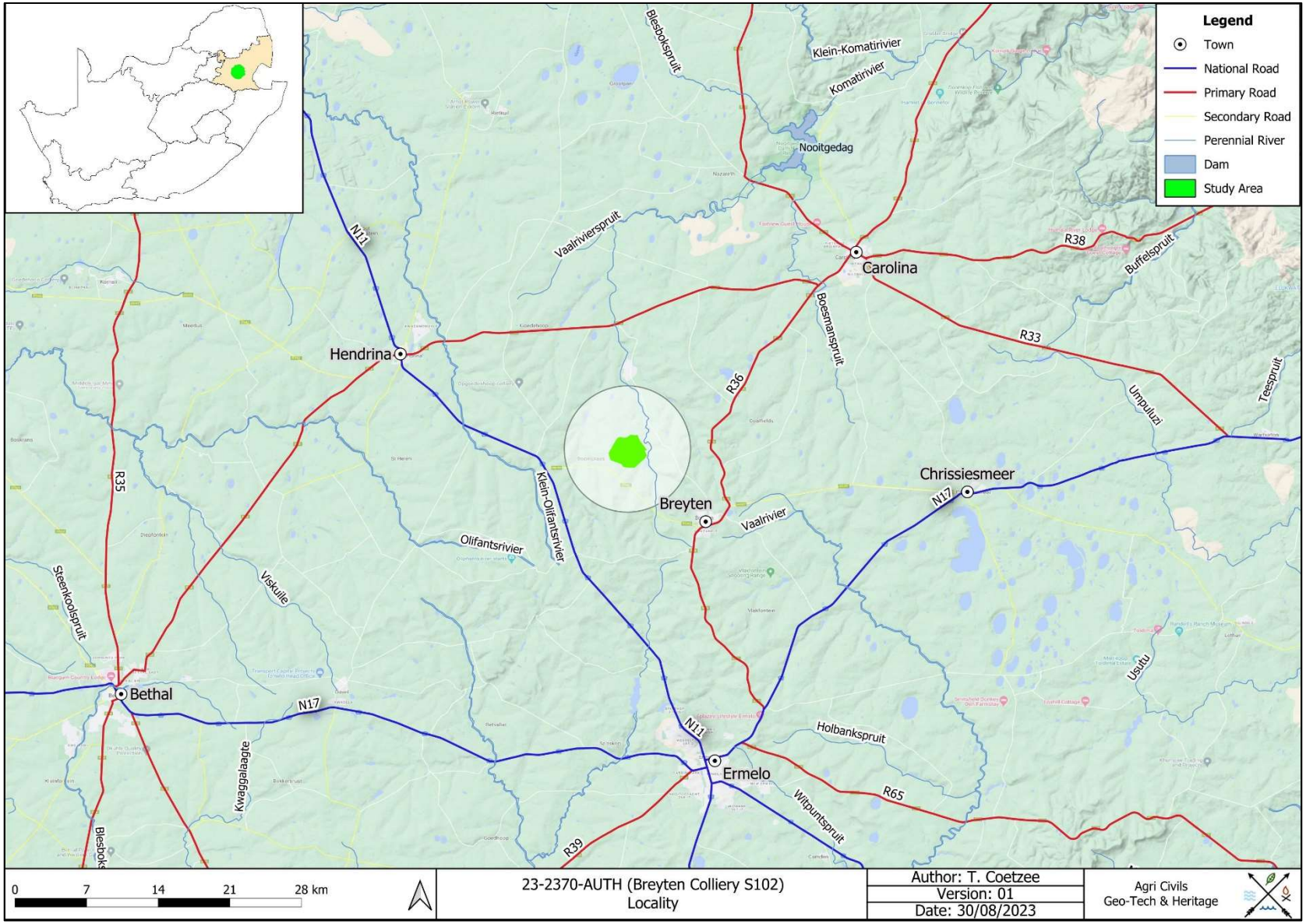

Figure 1: Regional and Provincial location of the study area.

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 EIA (Environmental Impact Assessment) and AIA processes

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

All Archaeological Impact Assessment reports should include:

a. Location of the sites that are found;

b. Short descriptions of the characteristics of each site;

c. Short assessments of how important each site is, indicating which should be conserved and which mitigated;

d. Assessments of the potential impact of the development on the site(s);

e. In some cases a shovel test, to establish the extent of a site, or collection of material, to identify the associations of the site, may be necessary (a pre-arranged SAHRA permit is required); and

f. Recommendations for conservation or mitigation.

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

a. Whether or not it has objections to a development;

b. What the conditions are upon which such development might proceed;

c. Which sites require permits for mitigation or destruction;

d. Which sites require mitigation and what this should comprise;

e. Whether sites must be conserved and what alternatives can be proposed to relocate the development in such a way as to conserve other sites; and

f. What measures should or could be put in place to protect the sites which should be conserved.

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

1.2.2 Legislation regarding archaeology and heritage sites

National Heritage Resource Act No.25 of April 1999

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

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

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

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

and

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

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites."(35. [4] 1999:58)

and

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

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals." (36. [3] 1999:60)

On the development of any area the gazette states that:

"…any person who intends to undertake a development categorised as:

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

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

i. exceeding 5000m² in extent; or

ii. involving three or more existing erven or subdivisions thereof; or

iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10000m² in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development." (38. [1] 1999:62-64)

and

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

(a) The identification and mapping of all heritage resources in the area affected;

(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(c) an assessment of the impact of the development on such heritage resources;

(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) plans for mitigation of any adverse effects during and after the completion of the proposed development." (38. [3] 1999:64)

Human Tissue Act and Ordinance 7 of 1925

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 Breyten Colliery S102 project is situated to the northwest of Breyten. The proposed development extents and intersecting farm portion are listed below (**Table 1**):

Table 1: Study area & coordinates.

Development area	Farm Name	Farm Portion	Map Reference (1:50 000)	Lat	Lon	Farm Portion Extent (ha)	Estimated Development Extent (ha)
PCD (west)	Bankfontein 215 IS	7	2629 BB	-26.244560	29.912844	514.7	0.9
Wash plant	Bankfontein 215 IS	7	2629 BB	-26.244248	29.913956		2.2
Co-disposal facility	Bankfontein 215 IS	7	2629 BB	-26.243625	29.917048		9.0
PCD (east)	Bankfontein 215 IS	7	2629 BB	-26.242485	29.919327		1.0
Total							**13.1**

The study area is located 10 km northwest of Breyten, while Hendrina is located roughly 23 km to the northwest and Carolina 29 km to the northeast (**Figure 1**). The study area falls within the Gert Sibande District Municipality and the Msukaligwa Local Municipality in the Mpumalanga Province. In terms of vegetation, the study area falls within the Grassland Biome, which is typically associated with summer rainfall regions. This Biome covers approximately 28% of South Africa. According to the vegetation classification by Mucina & Rutherford (2006) the study area falls within the Eastern Highveld Grassland vegetation unit.

Eastern Highveld Grassland's conservation status is considered to be endangered with a conservation target of 24%. Only a small portion is conserved in statutory and private reserves. This vegetation unit consists of the plains between Belfast / eMakhazeni in the east and the eastern side of Johannesburg in the west and also extends towards Bethal, Ermelo and to the west of Piet Retief / eMkhondo. This vegetation type is associated with slightly to moderately undulating plains and includes low hills and pan depressions. The general vegetation is short dense grassland with small, scattered rocky outcrops and some woody species. About 44% of this

vegetation unit has been transformed by cultivation, plantations, mines, urbanisation and the building of dams. Although no serious alien invasions are reported, Acacia mearnsii may become dominant in disturbed areas. Erosion associated with this vegetation unit is considered to be low (Mucina & Rutherford 2006).

The average elevation for Eastern Highveld Grassland varies between 1520 and 1780 Metres Above Sea Level (MASL). The average elevation of the project area is 1698 MASL and is associated with an undulating landscape.

The study area falls within the summer rainfall region and the average annual rainfall is roughly 791 mm. The average annual temperature is 14.6 ºC, the average summer temperature 17.9 ºC, and the average winter temperature 8.8 ºC (Climate-data.org accessed 31/08/2023).

The study area falls within the X11A Quaternary Catchment of the Inkomati Usuthu Water Management Area (WMA). The closest perennial river to the study area is the Vaalwaterspruit that flows 1.3 km to the east of the study area, while a non-perennial offshoot is located 230 m to the north. Several perennial and non-perennial pans are also found in the general area.

When the surrounding environment is considered, the region is associated with extensive crop cultivation, livestock farming and mining activity. Access to the demarcated portion is via a local mine road turning from a secondary road to the south of the study area (**Figures 2 & 3**). On a local scale, the demarcated development footprints are located on open veldt and areas disturbed by mining development. However, the entire extent of the demarcated PCD and wash plant areas, as well as the majority of the co-disposal facility used to be cultivated in the past.

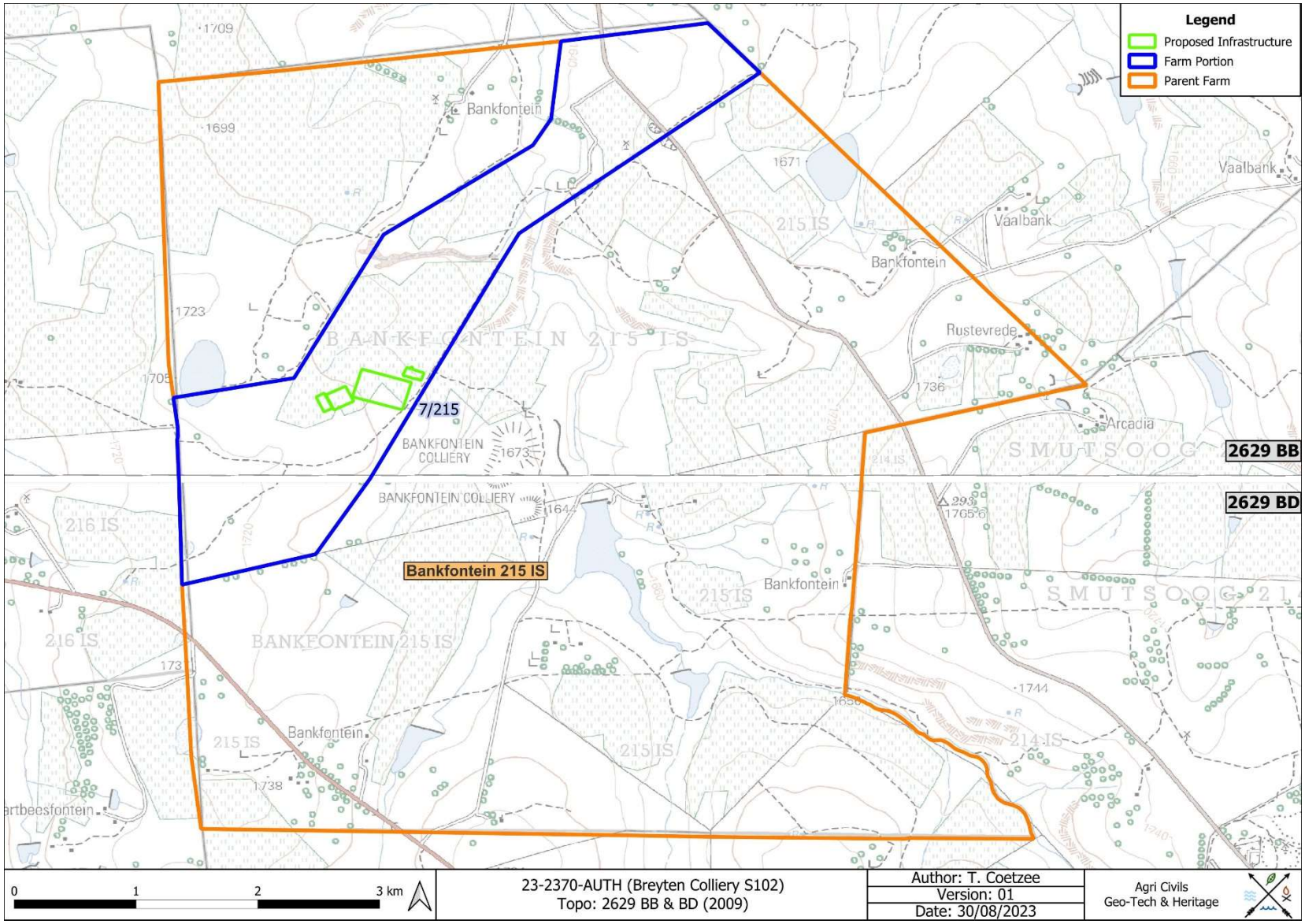

Figure 2: Segment of SA 1: 50 000 2629 BB & BD indicating the study area.

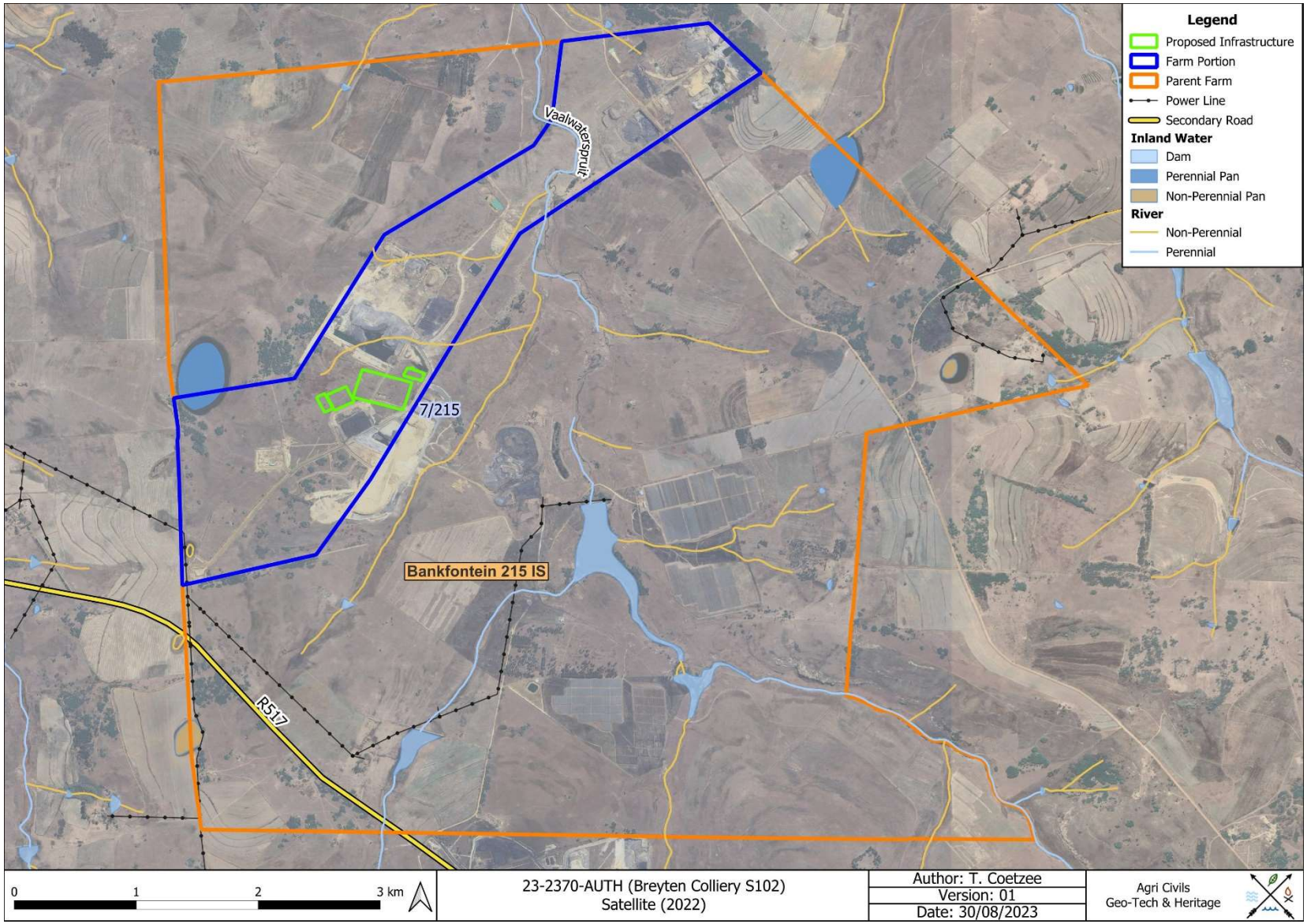

Figure 3: Study area portrayed on a 2022 satellite image.

2.2 Project Description

The farm portion measures 514.7 ha, while the proposed infrastructure for the mining of coal measures approximately 13.1 ha (**Figure 4**). The proposed infrastructure and activities include:

- PCD (west)
- PCD (east)
- Wash plant
- Co-disposal facility

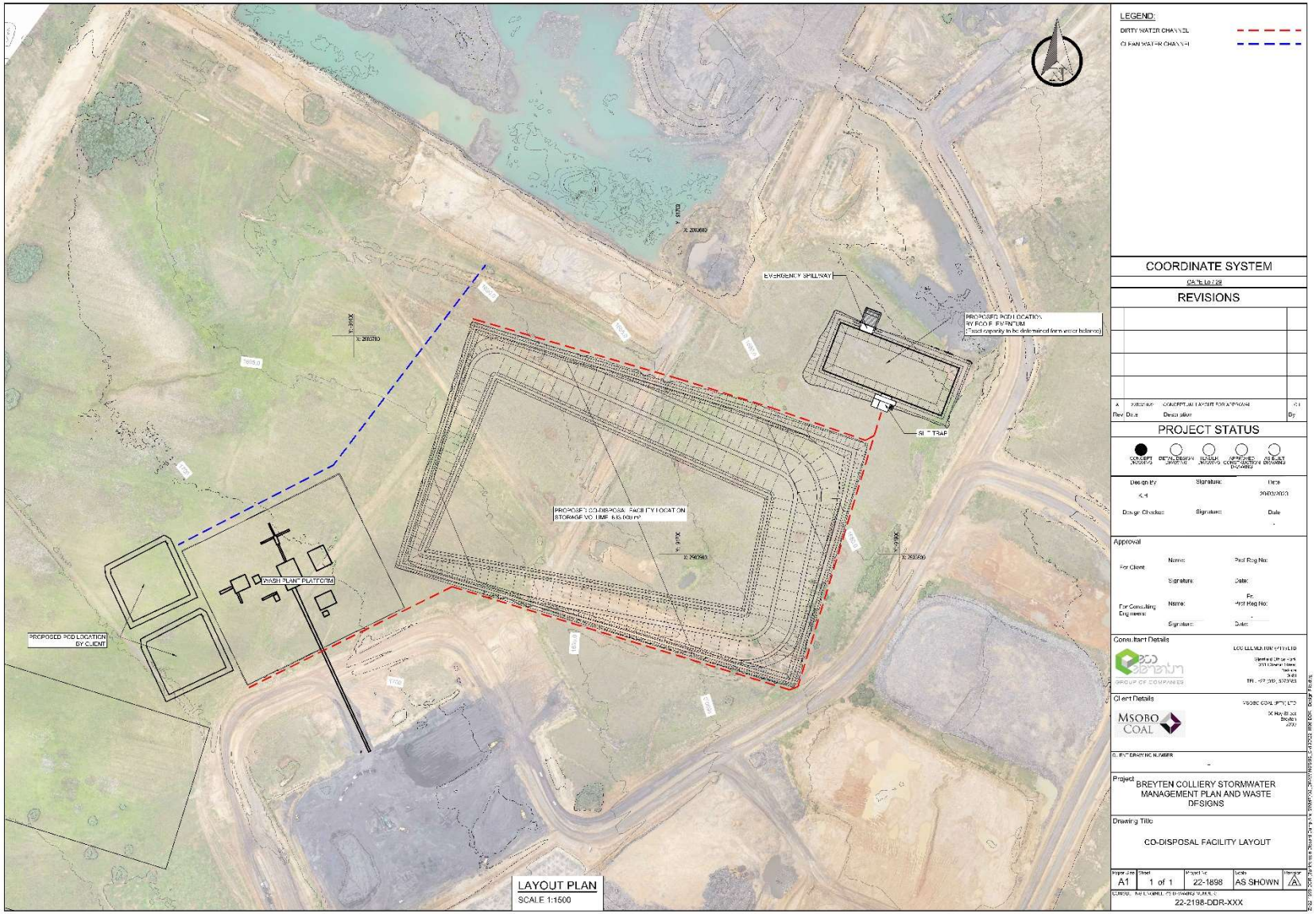

Figure 4: Proposed infrastructure at the Breyten Colliery (Supplied by Eco Elementum 2023).

3. Methodology

Archaeological reconnaissance of the study area was conducted during August 2023 through a systematic pedestrian survey of the proposed impact areas (**Figure 5**). The transects were spaced between 40 m and 60 m apart and general site conditions were recorded via photographic record (**Figures 6 – 21)**. Also, the project area was inspected beforehand on Google Earth, historical topographical maps and aerial imagery in order to identify potential heritage remains (**Appendix A**). The historical topographical datasets dating to 1966, 1984, 1996 and 2009, as well as the historical aerial images dating to 1956, 1968, 1977, and 2005, proved useful in terms of providing an indication of potential heritage sites and past land uses associated with the study area. Two potential sites associated with buildings were identified on the 1956 aerial image (Sites B01 & B02), while no sites were identified during the pedestrian survey (**Table 2**). The total area inspected was 13.1 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. Areas previously/currently associated with cultivated land that intersect the demarcated development footprints were traced and plotted as shown on topographical maps and aerial imagery, indicating disturbed areas that are less sensitive from a heritage perspective (**Figure 5**).

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	Farm Portion	Intersecting Development
B01	2629BB-B01	-26.244411	29.916045	Building	Historical	Demolished – No surface remains	0.7 ha	Aerial 1956	7	Yes
B02	2629BB-B02	-26.245306	29.918025	Building	Historical	Demolished – No surface remains	1.3 ha	Aerial 1956	7	Yes

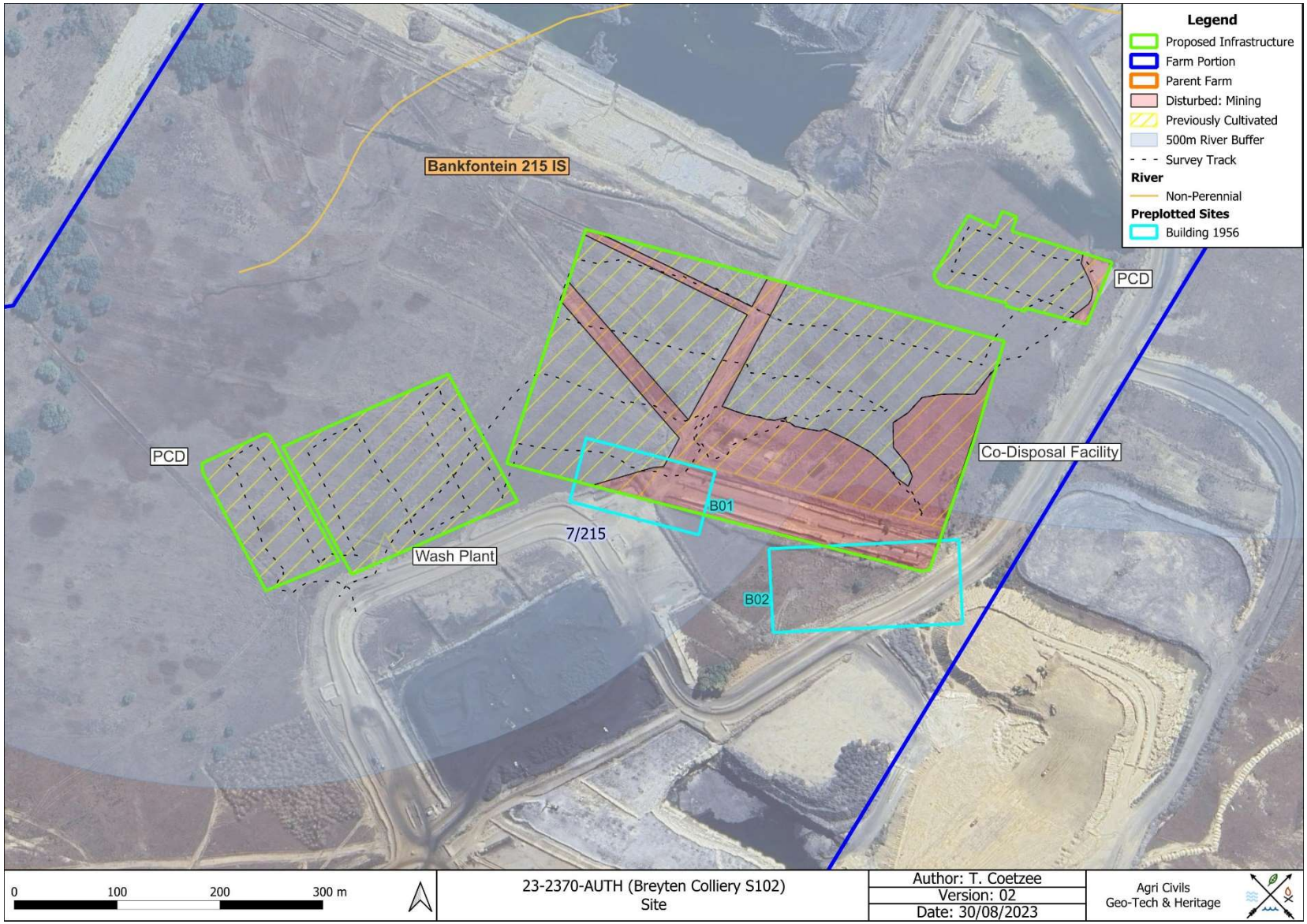

Figure 5: Study area with survey track, river buffer and disturbed areas portrayed on a 2022 satellite image.

Figure 6: South-western section of the proposed western PCD.

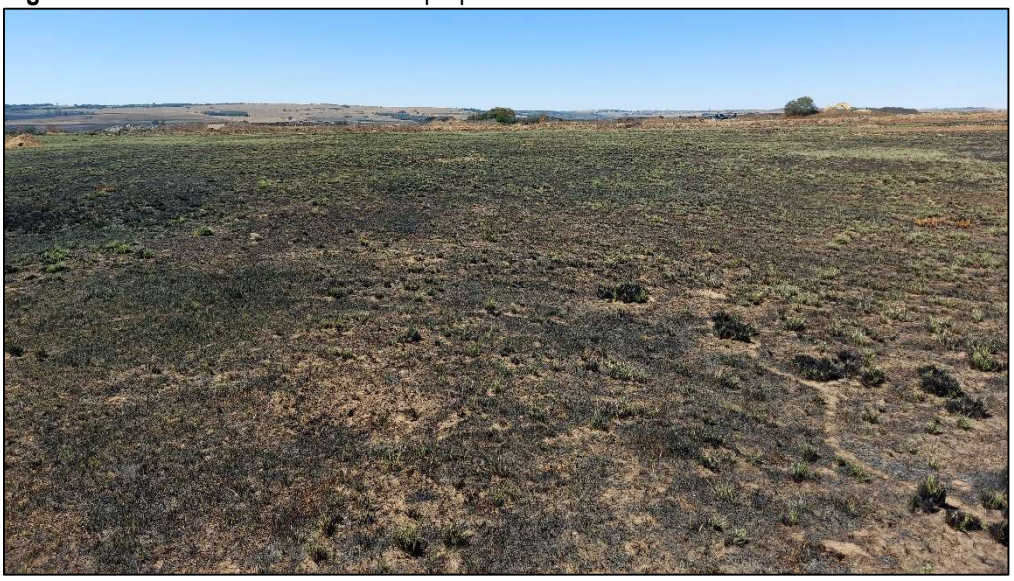

Figure 7: North-western section of the proposed western PCD.

Figure 8: North-eastern section of the proposed western PCD.

Figure 9: South-eastern section of the proposed western PCD.

Figure 10: Southern section of the proposed wash plant.

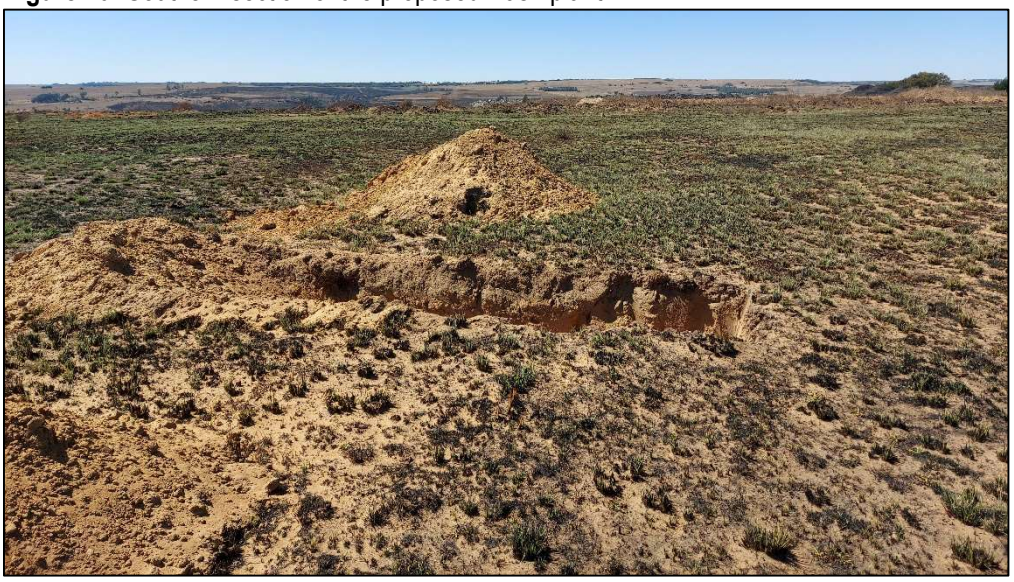

Figure 11: Western section of the proposed wash plant.

Figure 12: Northern section of the proposed wash plant.

Figure 13: Eastern section of the proposed wash plant.

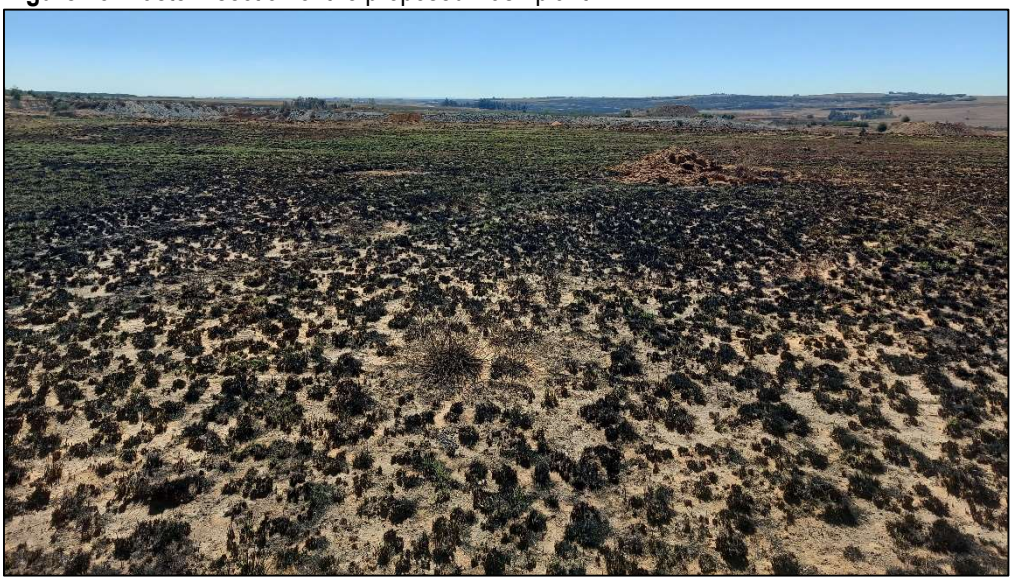

Figure 14: Western section of the proposed co-disposal facility.

Figure 15: Northern section of the proposed co-disposal facility.

Figure 16: Eastern section of the proposed co-disposal facility.

Figure 17: Disturbed southern section of the proposed co-disposal facility.

Figure 18: Proposed eastern PCD: Westen section.

Figure 19: Proposed eastern PCD: Northern section.

Figure 20: Proposed eastern PCD: Eastern section.

Figure 21: Proposed eastern PCD: Southern section.

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.

Additional sources consulted include an inspection of historical aerial images and historical topographical maps, previous heritage studies conducted in the general area, and the South African Heritage Resources Information System (SAHRIS) database.

3.1.1 Previous Heritage Studies

Kwazanele Ext. 5 Township Development

A Heritage Impact Scoping Report was conducted for the Kwazanele Ext. 5 township development on Portion 1 of the Farm Klipstapel 243 IS. The township development is located roughly 11 km southeast of the proposed Breyten Colliery S102 project area. The archaeological survey of the site, conducted by the National Cultural History Museum, recorded no sites of heritage significance within the demarcated project boundary, but noted the presence of stone-walling possibly dating to the historical period just outside of the boundary. Rock paintings on the adjacent farms were also mentioned (Van Schalkwyk 2006).

Voorslag Siding

A Phase 1 Heritage Impact Assessment was conducted by Archaeology Africa for the construction of Voorslag siding on Portions 5 and 10 of the Farm Voorslag 274 IS. Voorslag siding is located 15 km south-southwest of the proposed Breyten Colliery S102 project area. No sites of heritage importance were recorded during the study (Birkholtz 2007).

Lothier Siding

Archaeology Africa conducted a Phase 1 Heritage Impact Assessment for the proposed Lothier siding on Portion 6 of the Farm Leliefontein 136 IT. The Lothier study area is located roughly 39 km south-southeast of the proposed Breyten Colliery S102 project area. The study did not record any sites of heritage importance, but noted the presence of an informal cemetery falling just outside of the demarcated project area (Birkholtz 2008).

3.1.2 Historical topographical maps & aerial images

Table 3 indicates the identified preplotted sites, the date of the aerial images, topographical maps and satellite imagery on which the sites are visible, as well as the date range during which the sites were constructed and demolished. Two building sites dating to historical times were identified (B01 & B02). Both sites, however, have been demolished.

1956 Aerial Image

The earliest aerial image of the study area dates to 1956 (**Appendix A: Figure 30**) and shows the eastern proposed PCD area, as well as the majority of the proposed co-disposal facility to be cultivated. The western proposed PCD and wash plant areas appear to have consisted of open veldt at this stage. Buildings are also noted along the southern boundary of the proposed co-disposal facility (Sites B01 & B02).

1966 Topographical Map

The earliest topographical map of the study area dates to 1966 (**Appendix A: Figure 31**). The map shows the same details noted on the 1956 aerial image (**Appendix A: Figure 30**). Sites B01 and B02, however, are indicated as huts.

1968 Aerial Image

Apart from the western PCD and western half of the proposed wash plant areas being cultivated, the 1968 aerial image (**Appendix A: Figure 32**) shows the same detail as the 1966 topographical map (**Appendix A: Figure 31**).

1977 Aerial Image

The aerial image dating to 1977 (**Appendix A: Figure 33**) shows the same areas being cultivated as the 1968 aerial image (**Appendix A: Figure 32**). The buildings at Sites B01 and B02, however, are no longer visible.

1984 Topographical Map

When the 1984 topographical map is inspected (**Appendix A: Figure 34**), the same detail is observed as on the 1977 aerial image (**Appendix A: Figure 33**).

1996 Topographical Map

Compared to the 1984 topographical map (**Appendix A: Figure 34**), the 1996 topographical map (**Appendix A: Figure 35**) shows the same cultivated areas on the western proposed PCD and wash plant areas, while the eastern section of the proposed co-disposal facility and the entire extent of the eastern proposed PCD areas are no longer shown to be cultivated.

2005 Aerial Image

The 2005 aerial image (**Appendix A: Figure 36**) shows the same detail as the 1996 topographical map (**Appendix A: Figure 35**).

2009 Topographical Map

The 2009 topographical map (**Appendix A: Figure 37**) shows an increase in cultivated land. Accordingly, the entire extent of the proposed was plant, eastern and western proposed PCD's, as well as the majority of the proposed co-disposal facility are shown to be cultivated.

2022 Satellite Image

Satellite imagery dating to 2022 (**Figure 5**) shows the demarcated development footprints to consist of a combination of open veldt and mining activities.

Table 3: Preplotted site age & type as identified on historical aerial images and topographical maps.

Site No	1956 Aerial	1966 Topo	1968 Aerial	1977 Aerial	1976 Topo	1984 Topo	1996 Topo	2005 Aerial	2009 Topo	2022 Satellite	Constructed	Demolished
B01	Building	Hut	Building	None	None	None	None	None	None	None	<=1956	1968-1977
B02	Building	Hut	Building	None	None	None	None	None	None	None	<=1956	1968-1977

3.1.3 Personal communication

According to Mr André, an employee at Breyten Colliery, he is not aware of any potential heritage sites within the demarcated development boundaries (André, pers. Comm. 2023).

3.1.4 SAHRIS Database

The databases containing the declared and graded heritage sites were exported from SAHRIS on 30/05/2023 and plotted on the site map in order to determine the presence of previously recorded sites within the project area. Accordingly, no graded heritage sites intersect the demarcated study area, while the nearest declared provincial heritage sites are the Tafelkop Iron Age site 26 km to the southwest and a natural rock bridge 32 km to the southeast.

3.2 Limitations

The pedestrian survey (August 2023) confirmed that the study area consists of a combination of open veldt and mining related activities (**Figure 22**). Movement was generally not hampered and visibility was considered to be good.

Figure 22: Areas disturbed by mining related activities.

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

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

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

One of the earliest Voortrekker families to settle in the vicinity of Ermelo was the Jacobsz family. Willem Hendrik Jacobsz moved from the Graaff-Reinet area to the Ermelo district after the Cape government allegedly placed a price of £2000 on his head for masterminding the battle of Boomplaats in Natal. Willem's son, Jan-Hendrik, settled in the Ermelo district in 1863 and bought the farms Tweefontein and Uitsig (Paulsen & Stone 2001:40). These farms are located about 20 km southwest of the town of Ermelo and border Tafelkop. Accordingly, the Jacobsz family had a 5 km stone wall constructed around Tafelkop to protect their horses during the summer months from midges carrying horse sickness (Paulsen & Stone 2001:40). Following Paulsen & Stone (2001) the farm locations were partially selected for its proximity to the Natal – Pretoria trade route. It is

therefore possible that the people who settled on Tafelkop, selected the site not only on grounds of a favourable defensive position, but might have had an interest in trade as well. This might be true since many later trade routes were based on early trade footpaths.

The corbelled huts on top of Tafelkop, consisting of approximately 100 corbelled stone huts that formed part of an extensive Iron Age site, suggests the presence of Sotho clans in the eastern Transvaal before and during the 18th and 19th Centuries. Such sites, generally associated with Sotho settlements, occurred in an area roughly delineated by the towns of Vredefort, Ladybrand Bethlehem and Ermelo. According to Taylor (cited in Delius 2007), the huts on top of Tafelkop were roughly circular with an internal dimeter of about 1.8 m. The maximum height of a hut was 1.15 m and had a single entrance with lintel which resulted in a restricted opening measuring about 0.5 m by 0.6 m. Taylor (cited in Delius 2007) suggests that the huts were too small for human occupation and that the huts might have been used to house small or young stock, possibly to protect them from predators or cold highveld winters (Delius 2007: 63). Evidence for human habitation in and around corbelled huts, however, have been produced by Maggs (Maggs 1976 cited in Delius 2007: 63).

4.2.2 The South African War

According to Von der Heyde (2013), no major battles took place in the direct vicinity of the study area.

4.2.3 Breyten General History

The town of Breyten was established in December 1905 on the Farm Bothasrust by its owner, Nicholas Jacobus Breytenbach. The establishment of the town coincided with the completion of the railway line between Springs and Breyten (Praagh 1906 cited in Birkholtz 2007). The area is associated with maize production and coal mining.

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

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

With the rich coal deposits in Mpumalanga, it was only a matter of time before its value was realised and the coal extracted. Coal mining is Mpumalanga's most important industrial activity and produces about 80% of South Africa's coal. The earliest coal mining in the area dates to 1868 when farmers extracted coal for personal use in the Middelburg district. Large-scale coal mining around eMalahleni, however, only started after the discovery of gold on the Witwatersrand in 1886. Due to the discovery of coal in the Brakpan and Springs surroundings in 1887

and no railway linking eMalahleni with the Rand, these early eMalahleni coal mines closed down. It was more cost effective to exploit the closer Brakpan and Springs coal deposits than the coal found at eMalahleni (Schirmer 2007: 316).

After the construction of the railway line between the Rand and eMalahleni the deposits were exploited on large scale again. The coal fields, which are about 40 km wide, are concentrated around eMalahleni and run towards Belfast in the east. The first collieries around eMalahleni were Douglas, Transvaal and Delagoa Bay, Witbank and Landau and are of a higher quality compared to the coal found at Brakpan and Springs. During the 1890s some of the coal was exported via Delagoa Bay. In addition, the coal was readily accessible as the deposits occurred at a depth of 100 m or less (Schirmer 2007: 316-317). It should also be noted that the railway line between Pretoria and Lorenço Marques (Maputo) was completed on 2 November 1894 and the connection between eMalahleni and Johannesburg during the 1910s (Heydenrych 1999).

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

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

5. Archaeological and Historical Remains

5.1 Stone Age Remains

No Stone Age archaeological remains were located within the demarcated development footprints.

Although no Stone Age archaeological remains were located, such artefacts may occur in the general area. These artefacts are often associated with rocky outcrops or water sources. **Figures 23 – 25** below are examples of stone tools often associated with the Early, Middle and Later Stone Age of southern Africa.

The heritage studies conducted by Birkholtz (2007 & 2008) and Van Schalkwyk (2006) also did not locate Stone Age artefacts. However, Van Schalkwyk (2006) did mention the presence of rock paintings on farms in the area.

According to Bergh (1999: 4), the nearest Stone Age sites to the study area are Welgelegen Shelter and Groenvlei. Welgelegen Shleter is an LSA site located in the vicinity of Ermelo approximately 40 km to the south, while the Groenvlei LSA site is located near Carolina approximately 26 km to the northeast. Since such sites are often associated with water sources, Stone Age material is more likely to be encountered within the 500 m river buffer zone of the study area

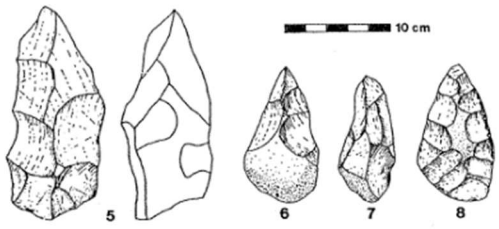

Figure 23: ESA artefacts (Volman 1984).

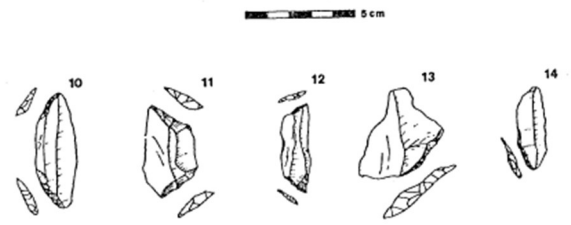

Figure 24: MSA artefacts (Volman 1984).

Figure 25: LSA scrapers (Klein 1984).

5.2 Iron Age Farmer Remains

No Iron Age Farmer remains were located within the demarcated development footprints.

The heritage studies conducted by Birkholtz (2007 & 2008) and Van Schalkwyk (2006) also did not locate Iron Age sites, while Bergh (1999: 7) indicated the presence of 220 LIA sites approximately 15 km to the southwest of the study area. The Tafelkop provincial heritage site is located in this area.

5.3 Historical Remains

Two potential sites (B01 & B02) consisting of buildings were observed on the 1956 aerial image (**Table 4, Appendix A: Figure 30**). Site B01 is located on the southern border of the proposed co-disposal facility, while site B02 partially intersects the southern corner. Sites B01 and B02 are also shown as huts on the 1966 topographical map (**Appendix A: Figure 31**) and are visible on the 1968 aerial image (**Appendix A: Figure 32**). However, the sites are not indicated on any of the subsequent topographical maps and are not visible on any of the remaining aerial images. Sites B01 and B02 were therefore constructed prior or during 1956 and were demolished between 1968 and 1977. Based on the inspection of historical aerial images, topographical maps and field observations, it was confirmed that the majority of Site B01 was cultivated in the past and is currently mostly associated with mining related activities (**Figures 26 & 27**). The section of Site B02 that intersects the demarcated development footprint was not cultivated in the past, but has been disturbed by contemporary mining activities (**Figure 28**). No surface remains were observed at either of the sites.

The heritage study conducted by Van Schalkwyk (2006) noted the presence of stone-walling that might date to the Historic Period.

Table 4: Historical Sites.

Site No	Site Type	Current Status	Age	Extent/Quantity	Farn Portion	Lat (y)	Lon (x)
B01	Building	Demolished	Historical	0.7 Ha	7	-26.244411	29.916045
B02	Building	Demolished	Historical	1.3 Ha	7	-26.245306	29.918025

Figure 26: Western section of Site B01.

Figure 27: Eastern section of Site B01.

Figure 28: Environment associated with Site B02.

5.4 Contemporary/Natural Remains

No contemporary remains were located within the demarcated development footprints.

The heritage studies conducted by Birkholtz (2007 & 2008) and Van Schalkwyk (2006) also did not locate contemporary sites.

5.5 Graves/Burial Sites

No graves or burial sites were located within the demarcated development footprints.

The heritage study conducted by Birkholtz (2008) recorded the presence of one informal cemetery.

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 (Act No. 25 of 1999), while other historical and cultural significant sites, places and features, are generally determined by community preferences.

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

6.1 Field Ratings

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

Table 5: 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 6: Individual site ratings.

Site / Survey Point Name	Type	Rating	Field Rating/Grade	Significance	Recommendation
2629BB-B01	Demolished Building	General Protection C	4 C	Low	No recording necessary
2629BB-B02	Demolished Building	General Protection C	4 C	Low	No recording necessary

7. Statement of Significance & Recommendations

7.1 Statement of Significance

As can be seen from previous research done in the area, the general region is significant from a heritage perspective. Heritage sites are likely to include cemeteries / graves, as well as Stone Age, Iron Age, rock art and historical sites.

The study area: The Proposed Breyten Colliery S102 project

Two sites associated with buildings were noted along the southern border of the proposed co-disposal facility (**Figure 29**). The majority of the study area also falls within 500 m of a river, an area generally considered to be sensitive from a heritage perspective (**Figure 5**). However, according to historical aerial imagery and topographical maps, the majority of the demarcated development footprints used to be cultivated in the past and a significant section has been disturbed by mining activities that significantly lower the sensitivity in terms of heritage resources.

- **Eastern proposed PCD**

No sites of heritage significance were observed within the demarcated boundary and the entire area has been disturbed by crop cultivation in the past. A small section along the eastern border has also been disturbed by mining activities. The area is therefore not considered to be sensitive from a heritage perspective.

- **Co-disposal facility**

Two sites associated with historical buildings exceeding 60 years of age (Sites B01 & B02) were noted along the southern border of the proposed co-disposal facility (**Figure 29**). Both sites were identified on the 1956 aerial image (**Appendix A: Figure 30**), but appear to have been demolished between 1968 and 1977. The majority of Site B01 has been disturbed by the cultivation of crops in the past and by contemporary mining activities, while the section of Site B02 that intersects the proposed co-disposal facility has been disturbed by contemporary mining activities. Also, no surface remains were noted during the pedestrian survey. Although demolished, subsurface material remains might exist and the sites are therefore considered to be potentially sensitive from a heritage

perspective. The remainder of the demarcated co-disposal facility is associated with previously cultivated land and contemporary mining activities and is therefore not considered to be sensitive from a heritage perspective.

- **Wash plant**

No sites of heritage significance were observed within the demarcated boundary and the entire area has been disturbed by crop cultivation in the past. The area is therefore not considered to be sensitive from a heritage perspective.

- **Western proposed PCD**

No sites of heritage significance were observed within the demarcated boundary and the entire area has been disturbed by crop cultivation in the past. The area is therefore not considered to be sensitive from a heritage perspective.

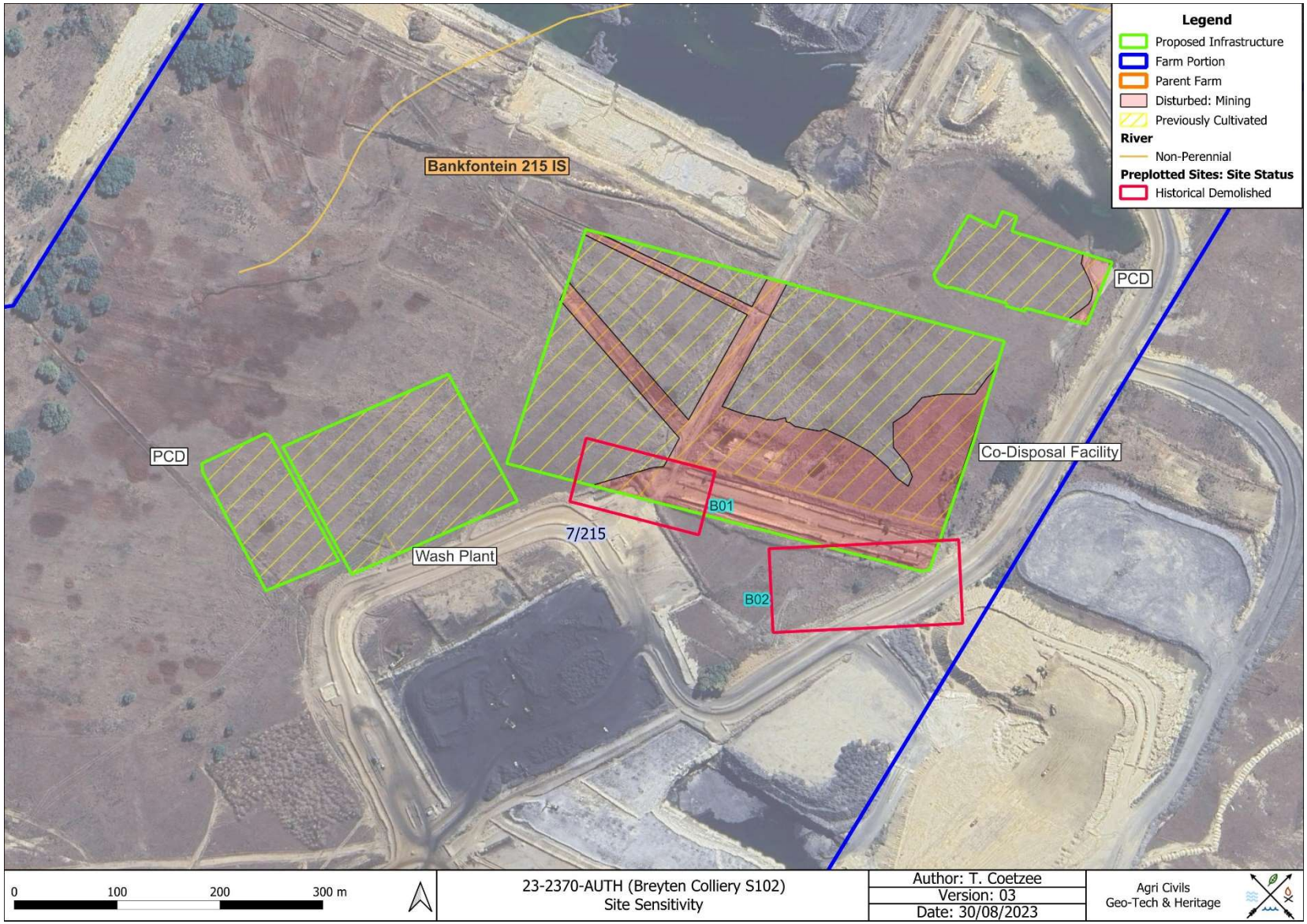

Figure 29: Study area and potentially sensitive areas portrayed on a 2022 satellite image.

7.2 Recommendations

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

- Sites B01 & B02 are located along the southern border of the proposed co-disposal facility and used to be associated with buildings dating to the Historic Period. The buildings, however, have completely been demolished and no surface indications are present. However, the demarcated areas are considered to be potentially sensitive since significant subsurface cultural material might be unearthed at the sites. Care should therefore be exercised when developing within the demarcated boundaries.

- The remainder of the proposed co-disposal facility, as well as the proposed wash plant and eastern and western proposed PCD's, have been disturbed by the cultivation of crops in the past and by contemporary mining activities. Additionally, no potential heritage sites were noted on historical aerial imagery, topographical maps, or during the pedestrian survey. These areas are therefore not considered to be sensitive from a heritage perspective.

- The recommendations above are based on the specific project activities and extents as indicated by the figures in this report. Should the proposed surface impact areas be altered, a qualified archaeologist must inspect the new areas and amend the report accordingly.

- 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 construction phase, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, No. 25 of 1999 section 36 (6)).

- From a heritage point of view, the proposed Breyten Colliery S102 project may continue, subject to the abovementioned conditions, recommendations and approval by the South African Heritage Resources Agency.

8. Conclusion

The proposed Breyten Colliery S102 project consists of surface infrastructure and activities impacting approximately 13.1 ha of mostly previously cultivated land and areas affected by contemporary mining activities. The majority of the demarcated footprints are therefore not considered to be sensitive from a heritage perspective. Although the two historical sites (B01 & B02) that intersect the area demarcated for the construction of the co-disposal facility have been demolished, it should be kept in mind that significant subsurface cultural material might still be present at the sites. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed Breyten Colliery S102 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 selvage 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

Birkholtz, P.D. 2007. Phase 1 Heritage Impact Assessment as part of the Scoping Report for the proposed Voorslag siding for SA Coal Mining Holdings on the farm Voorslag 274 IS portion 10, portion 5 in the vicinity of local municipality: Msukaligwa local municipality, district municipality: Gert Sibande district municipality South Africa

Birkholtz, P.D. 2008. Phase 1 Heritage Impact Assessment for the proposed Lothier siding for Golfview Mining (Pty) Ltd on the farm Leliefontein 136 IT portion 6 in the vicinity of Ermelo, Mpumalanga Province, South Africa

Climate-Data.org. Breyten Climate https://en.climate-data.org/africa/south-africa/mpumalanga/breyten-189552/. Accessed 31-08-2023.

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

De Wit, M. 2007. A History of Deep Time. In: Delius, P. (ed.) Mpumalanga History and Heritage: 27-38. Scottsville: University of KwaZulu-Natal Press.

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

Heydenrych, D. H. 1999. Mynbou-, landbou-en spoorwegontwikkeling in die 19de en 20ste eeu. In: Bergh, J. (ed.) *Geskiedenisatlas Van Suid-Afrika: Die Vier Noordelike Provinsies*: 327-332. Pretoria: J. L. van Schaik Uitgewers

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

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

Maggs, T. 1976. *Iron Age Communities of the Southern Highveld*. Pietermaritzburg: Natal Museum.

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 Swazil*and. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Paulsen, C. H. & Stone, J. D. 2001. Johannesburg: Ermelo Mine Services.

Praagh, L.V. 1906. The Transvaal and its Mines. Praagh & Lloyd.

Schirmer, S. 2007. Enterprise and Exploitation in the 20th Century. In: Delius, P. (ed.) *Mpumalanga History and Heritage*: 291-346. Scottsville: University of KwaZulu-Natal Press

Toth, N. & Schick, K. 2007. *Handbook of paleoanthropology*. Berlin: Springer A venture into the unknown: The Challenge that was Ermelo Mines.

Van Schalkwyk, J. 2006. Heritage Impact Scoping Report: Kwazanele Ext. 5 Township. Pretoria: National Cultural History Museum.

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

Von der Heyde, N. 2013. Field Guide to the Battlefields of South Africa. Century City: Struik Travel & Heritage.

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

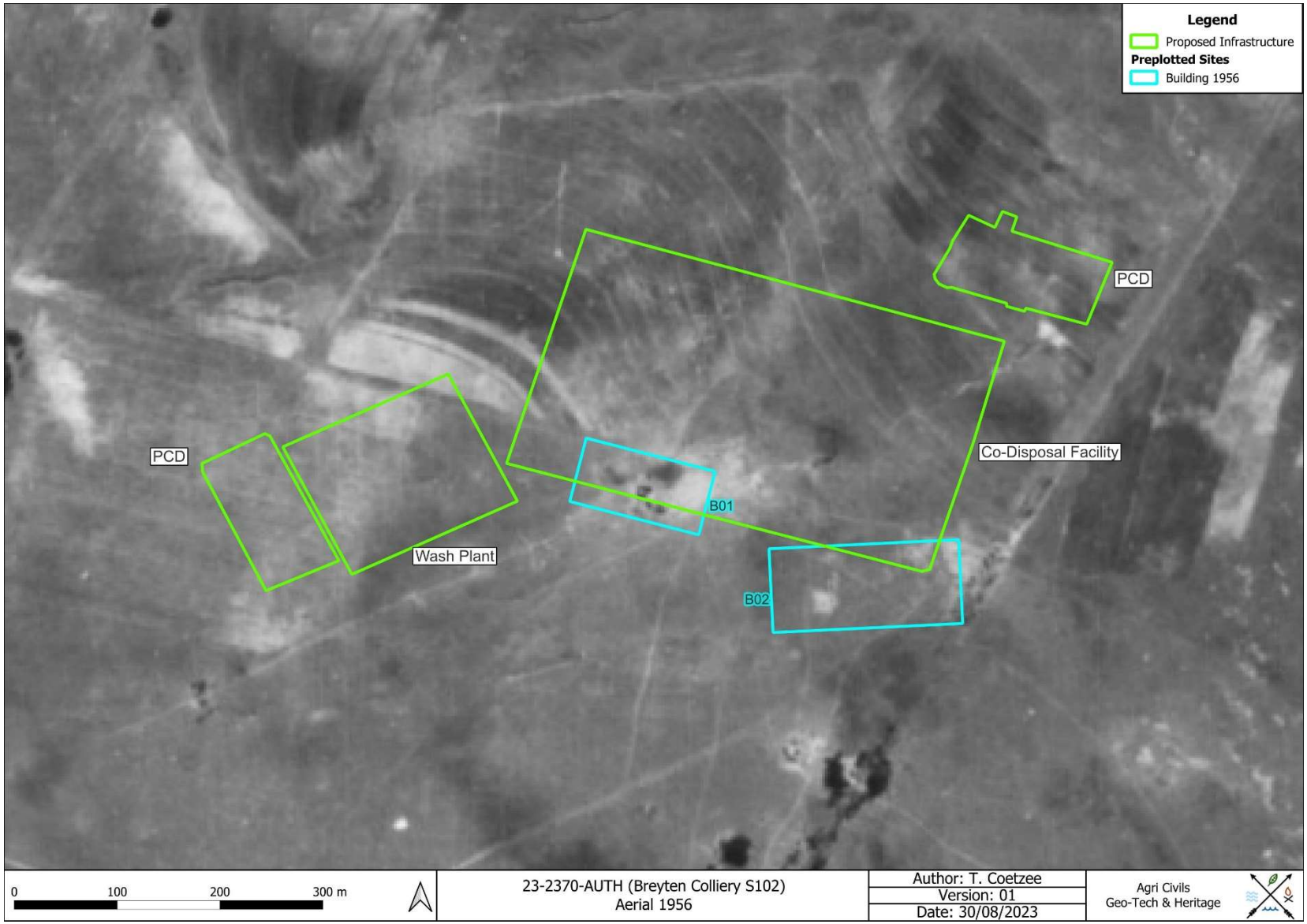

Figure 30: Study area superimposed on a 1956 aerial image.

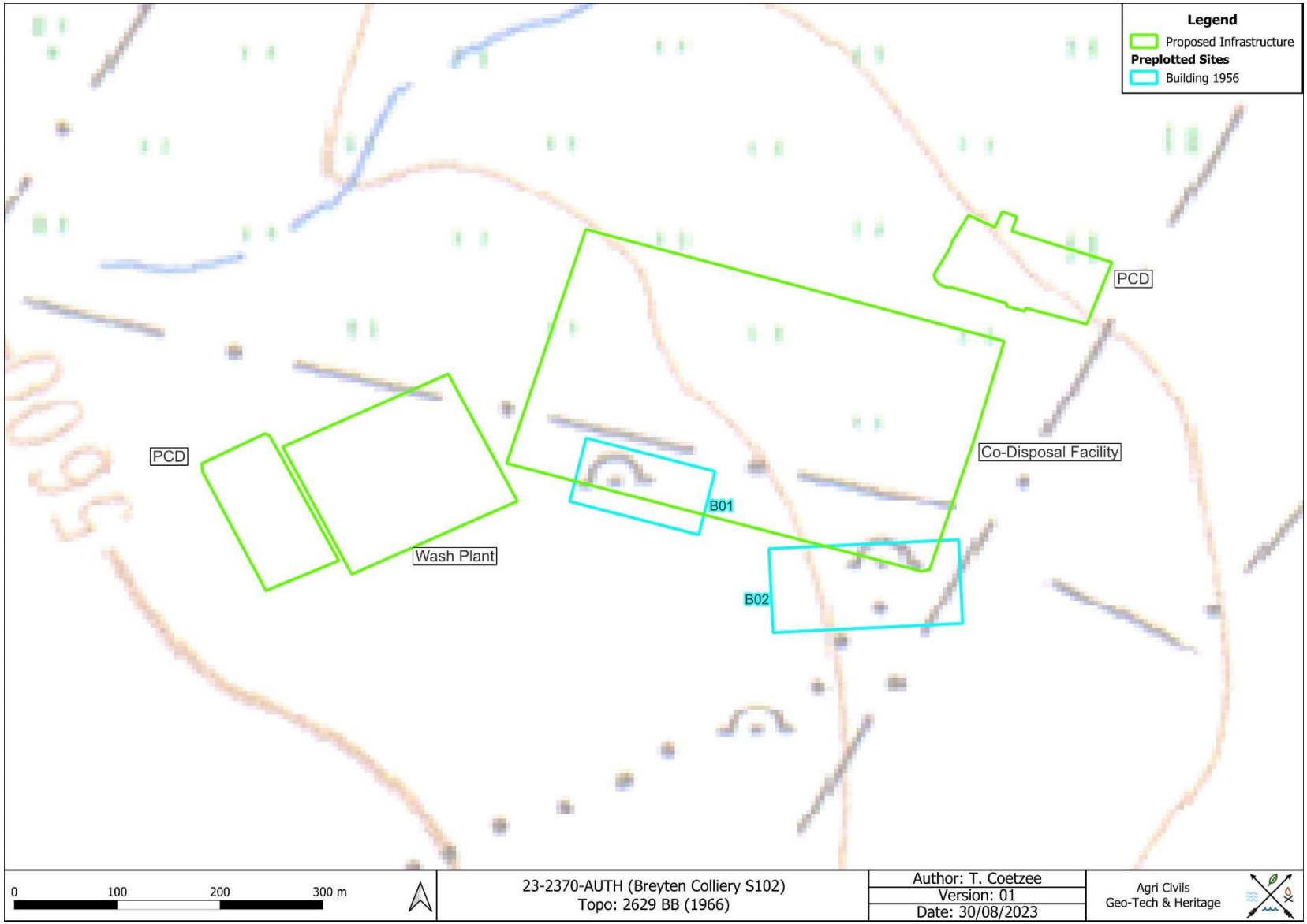

Figure 31: Study area superimposed on a 1966 topographical map.

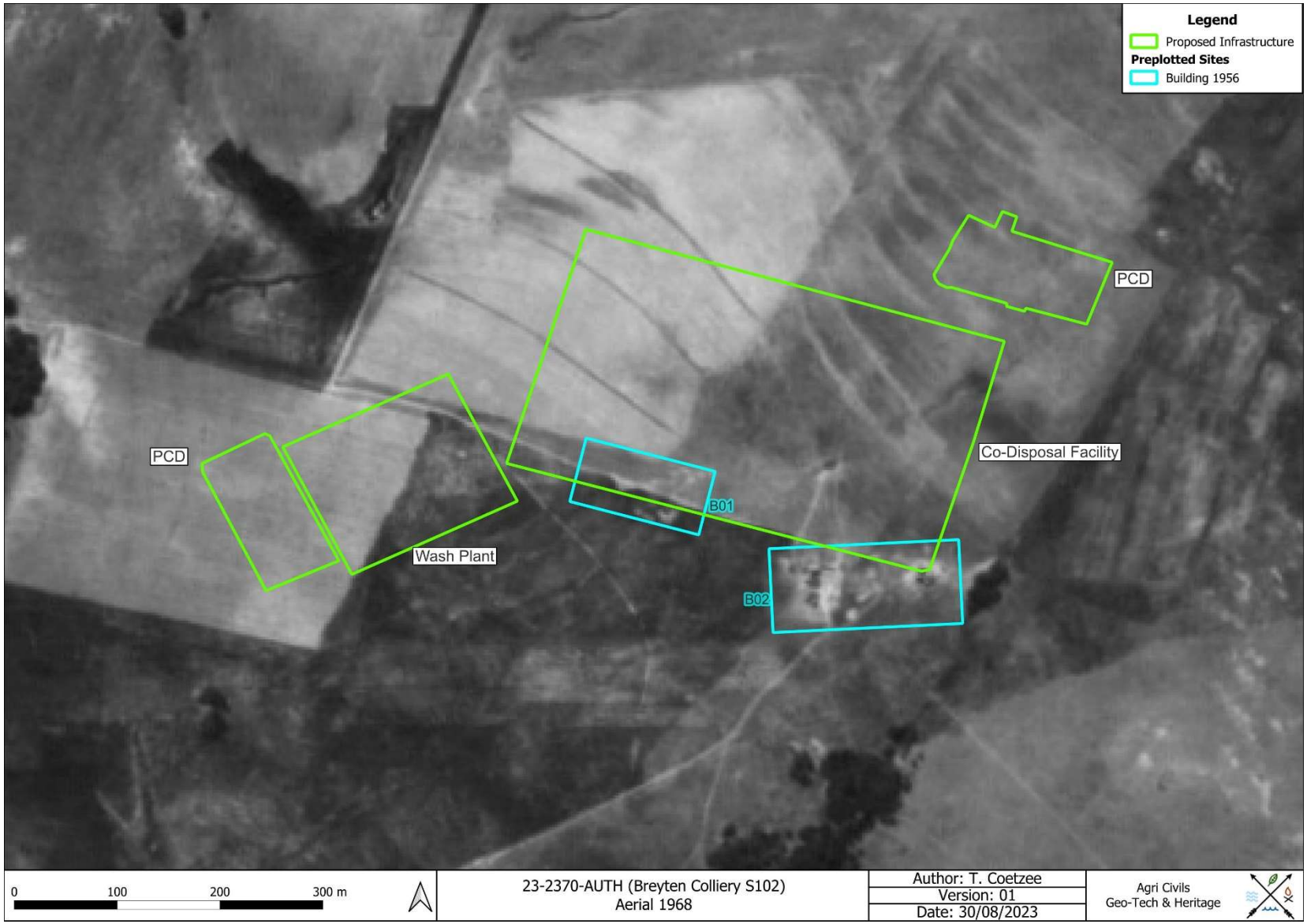

Figure 32: Study area superimposed on a 1968 aerial image.

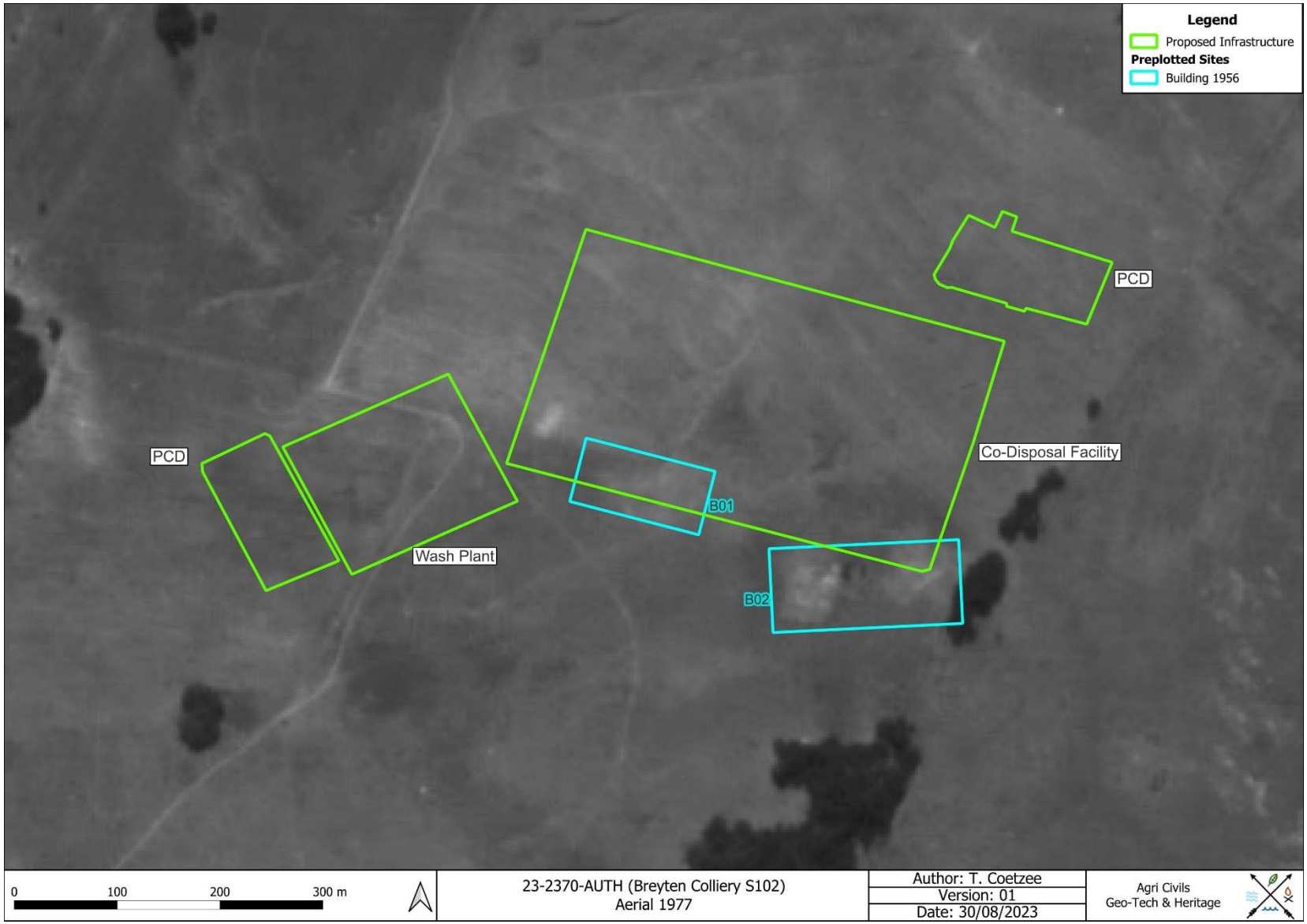

Figure 33: Study area superimposed on a 1977 aerial image.

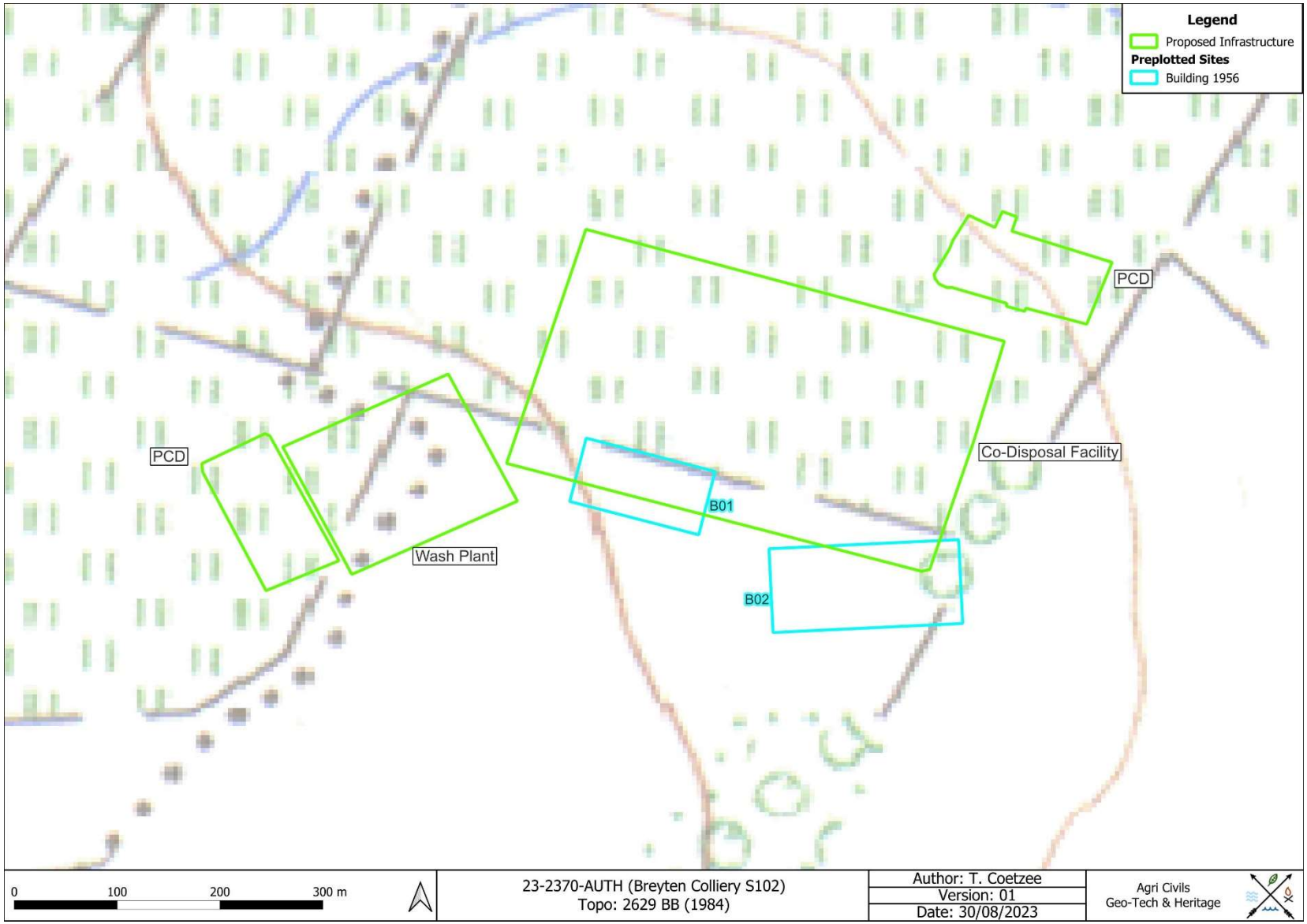

Figure 34: Study area superimposed on a 1984 topographical map.

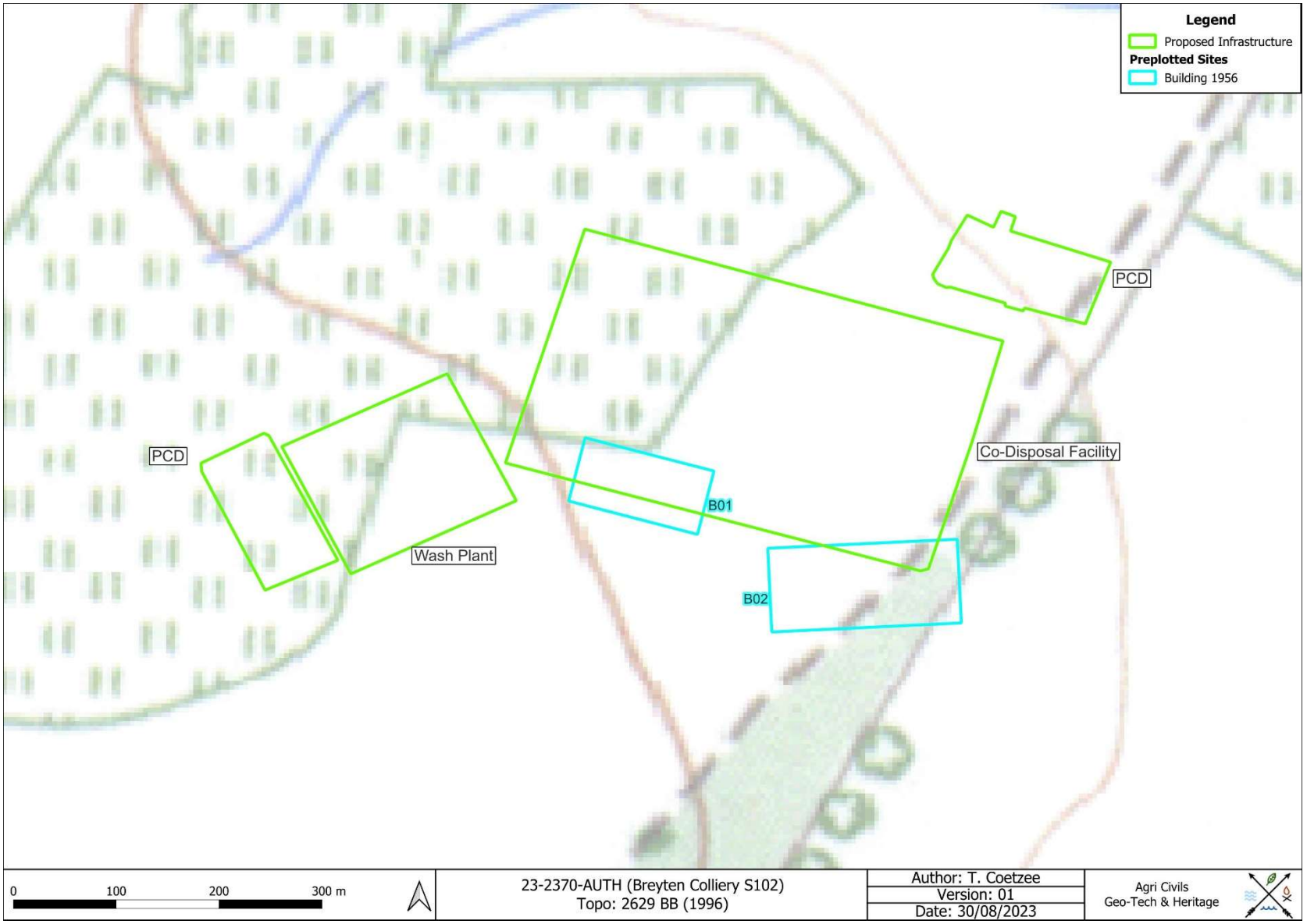

Figure 35: Study area superimposed on a 1996 topographical map.

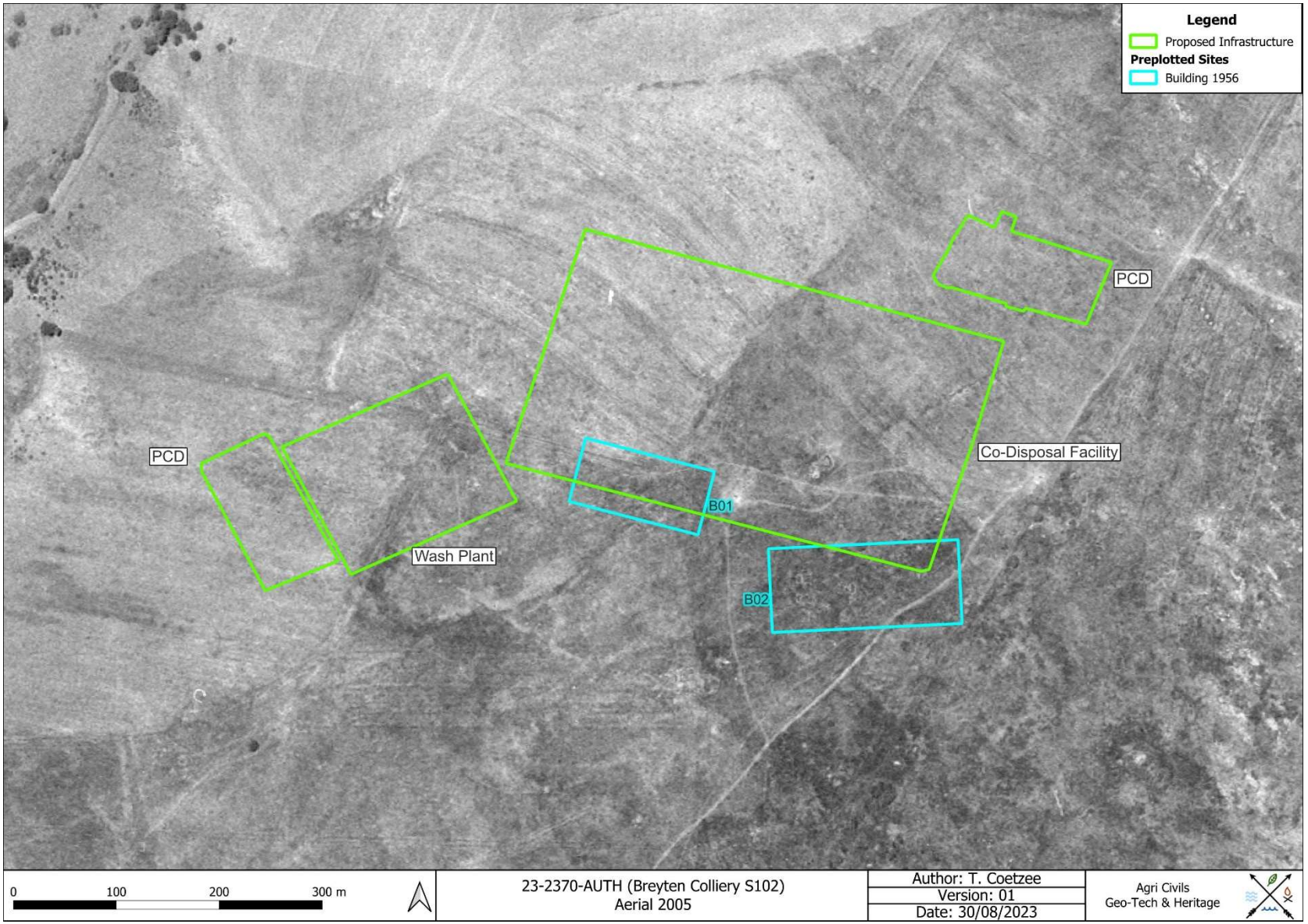

Figure 36: Study area superimposed on a 2005 aerial image.

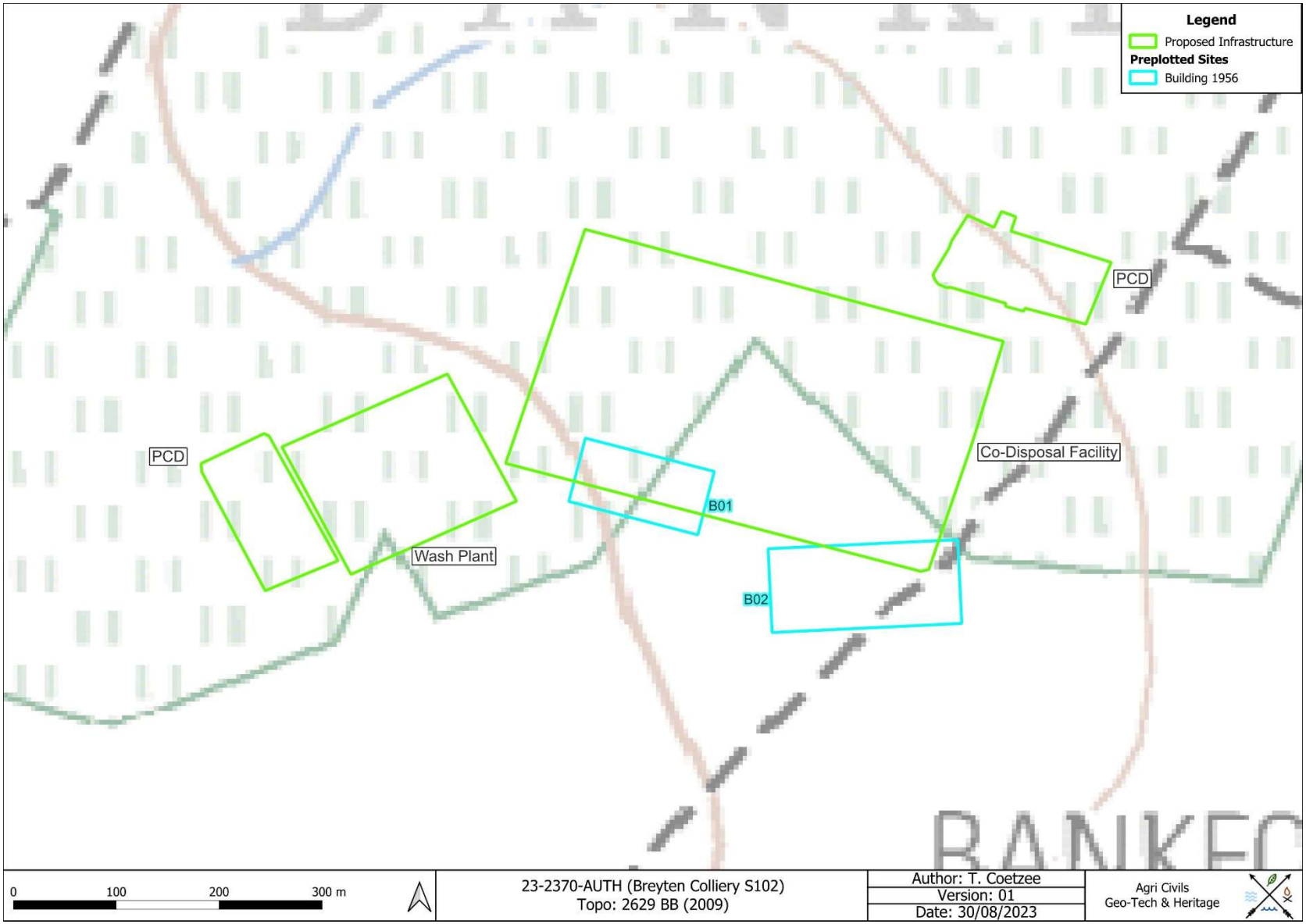

Figure 37: Study area superimposed on a 2009 topographical map.