THE PROPOSED ERGO REPROCESSING PROJECT OF TAILINGS DUMPS 4L3, 4L4 and 4L6, CITY DEEP, JOHANNESBURG, GAUTENG PROVINCE

Heritage Impact Assessment

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PGS HERITAGE

+ 27 (0) 12 332 5305 | +27 (0) 86 675 8077 | contact@pgsheritage.co.za | PO Box 32542, Totiusdal, 0134

Offices in South Africa, Kingdom of Lesotho and Mozambique

Head Office:
906 Bergarend Streets
Waverley, Pretoria,
South Africa

Directors: HS Steyn, PD Birkholtz, W Fourie

Declaration of Independence

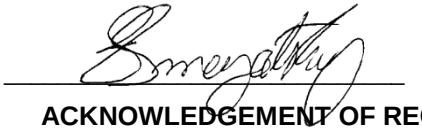
I, Ilan Smeyatsky, declare that –

- General declaration:
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting heritage impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

HERITAGE CONSULTANT: PGS Heritage (Pty) Ltd
CONTACT PERSON: Ilan Smeyatsky - Archaeologist
Tel: +27 (0) 12 332 5305
Email:Ilan@pgsheritage.co.za

SIGNATURE: 

ACKNOWLEDGEMENT OF RECEIPT

Report Title	*THE PROPOSED ERGO REPROCESSING PROJECT OF TAILINGS DUMPS 4L3, 4L4 and 4L6, CITY DEEP, JOHANNESBURG, GAUTENG PROVINCE*		
Control	**Name**	**Signature**	**Designation**
Author	**Ilan Smeyatsky**		**Archaeologist/ PGS Heritage**
Reviewed	**Wouter Fourie**		**Principal Heritage Specialist**
Reviewed	**Ashleigh Blackwell**		**Kongiwe Envronmental**

CLIENT: Kongiwe Environmental

CONTACT PERSON: Ashleigh Blackwell
Tel: +27 (10) 140 6508
E-mail: ablackwell@kongiwe.co.za

SIGNATURE: _____

The heritage impact assessment report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**
1.(1) (a) (i) Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to **Appendix D**
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	Section 1.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.1
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3.6
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3.6 and **Appendix B**
(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;	Section 3.6 and 5
(g) An identification of any areas to be avoided, including buffers	Section 5
(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;	Section 3.6
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(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	Section 5
(k) Any mitigation measures for inclusion in the EMPr	Section 5
(l) Any conditions for inclusion in the environmental	Section 5

authorisation	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 5
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 5 and 6
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(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	Section 6
(o) A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice 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.	Section 38(3) of the NHRA

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Kongiwe Environmental (Pty) Ltd (Kongiwe) to undertake a heritage impact assessment (HIA) which will serve to inform the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed Ergo Reprocessing Project of tailings dumps 4L3, 4L4 and 4L6, in City Deep, southeast of Johannesburg, Gauteng.

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant. This report focusses specifically on the newly proposed tailings reprocessing project and associated infrastructure, other management measures as listed and required in other HIA's conducted in the area must still be implemented for other heritage features identified in the larger Johannesburg area.

The HIA has shown that the study area and surrounding area has some heritage resources situated within the proposed development boundaries. Through data analysis and a site investigation the following issues were identified from a heritage perspective.

- Archaeology

The data analysis has enabled the identification of possible heritage sensitive areas that included:

- Dwellings;
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas (based on historical descriptions); and
- Structures.

The fieldwork for the HIA identified four heritage sites with different heritage significance ratings. These sites consist of four historical sites. Of these four resources, only one with heritage significance (**CTY004)** will be directly impacted by the project activities.

The impact significance before mitigation on the heritage resources LOW negative (**CTY004**). Implementation of the recommended mitigation measures will modify this impact rating to an acceptable LOW negative in the case of **CTY004**.

The management and mitigation measures as described in Section 6 of this report have been developed to minimise the project impact on heritage resources.

- **Palaeontology**

The proposed City Deep Dumps and pipeline in Johannesburg, Gauteng Province is underlain by the Turffontein and Johannesburg Subgroups (Zero Palaeontological Sensitivity).

It is thus recommended that no further palaeontological assessments will be required and the proposed development may be authorised from a palaeontological perspective.

- General

It is the author's considered opinion that overall impact on heritage resources is LOW and **after** the implementation of the recommended mitigation measures is acceptably low or can be totally mitigated to the degree that the project can be approved from a heritage perspective.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age between 700 000 and 3 300 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

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

Table 1 – List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIA practitioner	Environmental Impact Assessment Practitioner
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LCTs	Large Cutting Tools
LIA	Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

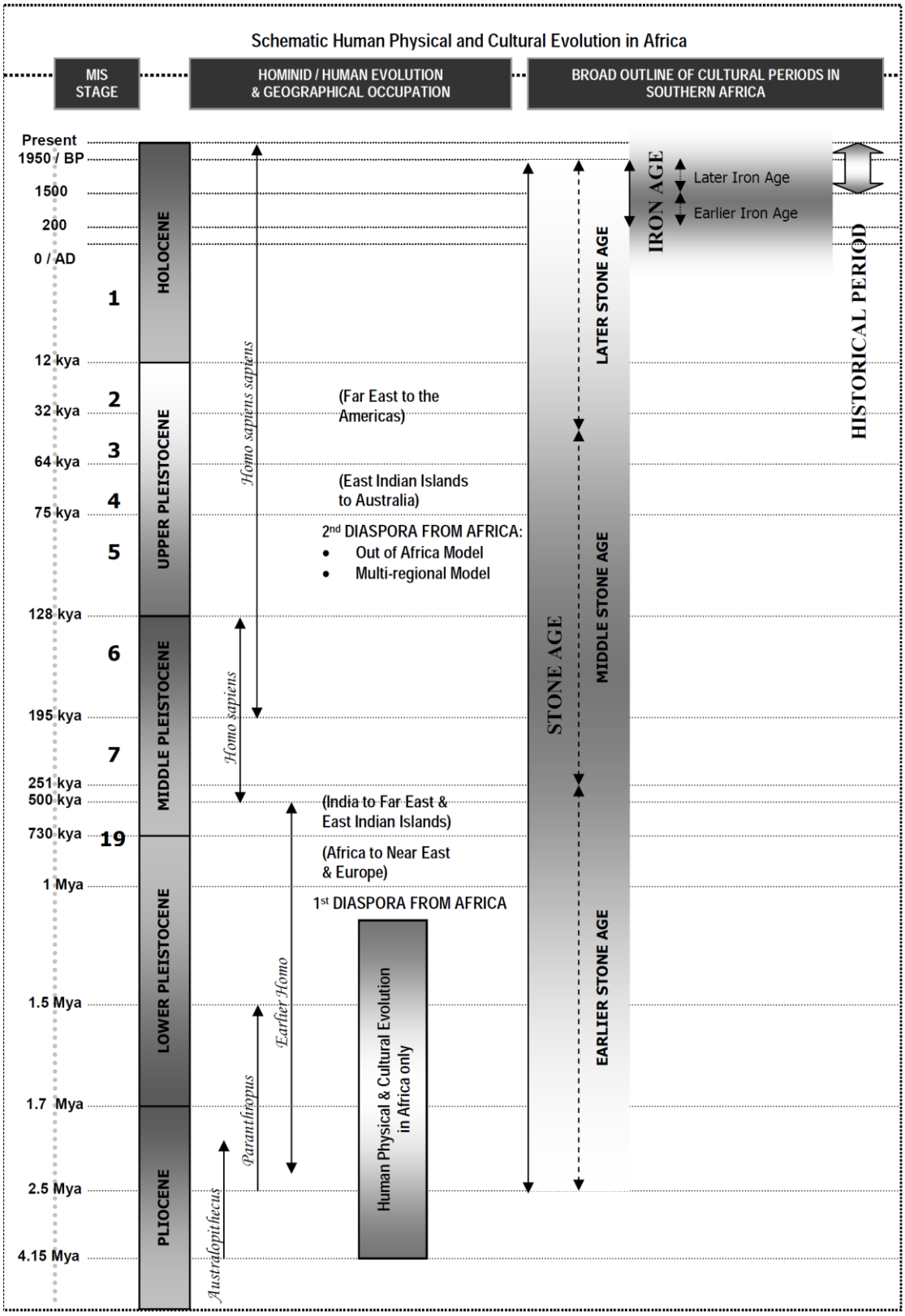


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Kongiwe Environmental (Pty) Ltd (Kongiwe) to undertake a heritage impact assessment (HIA) which will serve to inform the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for the proposed Ergo Reprocessing Project of tailings dumps 4L3, 4L4 and 4L6, in City Deep, southeast of Johannesburg, Gauteng.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The HIA aims to inform theEIA in the development of a comprehensive EMPr to assist the project applicant in managing the identified heritage resources in a responsible manner in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Impact Assessment was compiled by PGS Heritage (PGS).

The staff at PGS have a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Mr. Ilan Smeyatsky, graduated with his Master's degree (MSc) in Archaeology; is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA) and is accredited as a Field Supervisor.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the research undertaken, it is necessary to realise that the heritage resources located during the desk research do not necessarily represent all the possible heritage resources present within the area. A detailed

inventory of the heritage resources found within the project area will be provided in a fieldwork report.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA), Act 107 of 1998
- National Heritage Resources Act (NHRA), Act 25 of 1999
- Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- National Environmental Management Act (NEMA) Act 107 of 1998 – Environmental Impact Assessment Regulations 326 (7 April 2017) GN R982 of 8 December 2014, as amended
    - Basic Environmental Assessment (BEA) – Appendix 1 s (2)(d)
    - Environmental Scoping Report (ESR) – Appendix 1 s (3)(h)(iv) and Appendix 2 s(2)(g)(iv)
    - Environmental Impact Assessment (EIA) – Appendix 3 s (3)(h)(iv)/
- National Heritage Resources Act (NHRA) Act 25 of 1999
    - Protection of Heritage Resources – Sections 34 to 36; and
    - Heritage Resources Management – Section 38
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

2 SITE LOCATION AND DESCRIPTION

2.1 Locality

The study area is located in City Deep, situated approximately 5.5 km southeast of Johannesburg CBD (See, **Figure 2**).

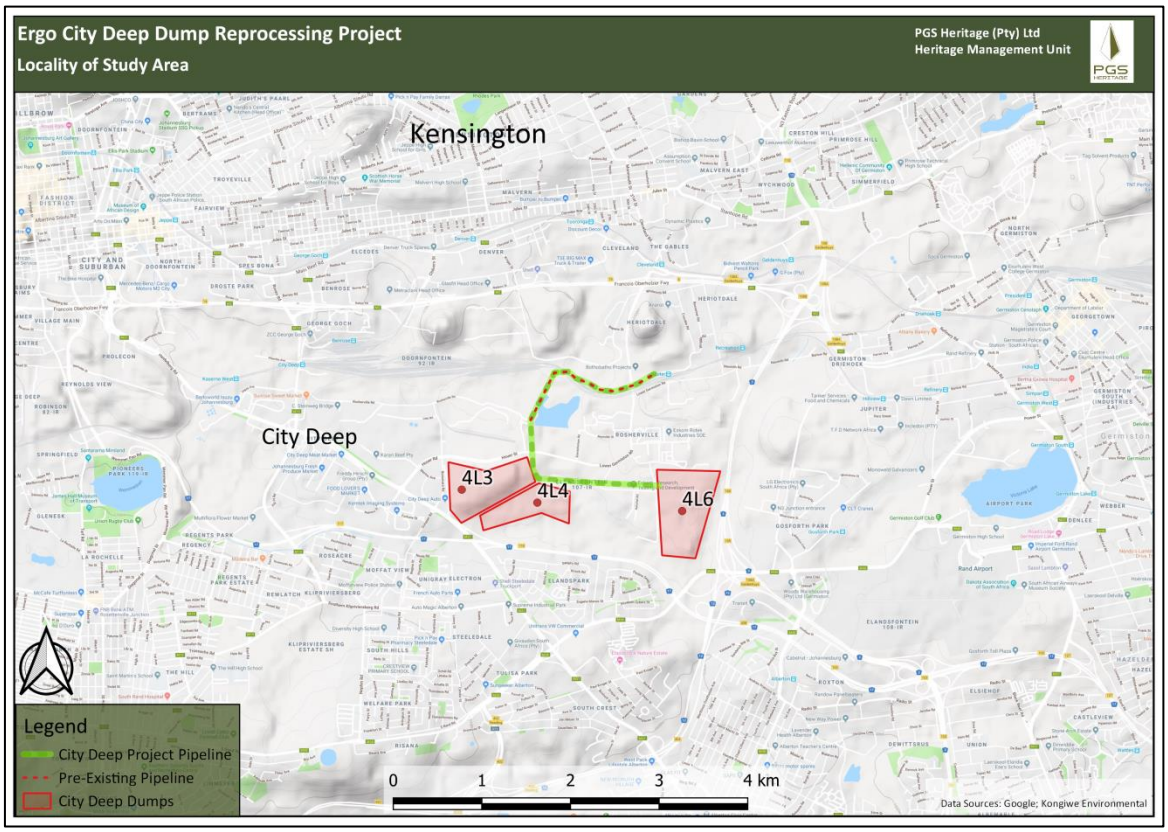


Figure 2 - The proposed development area within its local context

2.2 Technical Project Description

The following background information has been provided by Kongiwe:

Ergo Mining (Pty) Ltd (Ergo))a wholly owned subsidiary of Ergo Mining Operations (Pty) Limited which in turn is a subsidiary of DRDGOLD Limited)within which the Group's surface retreatment assets are consolidated, intends to reprocess and reclaim gold from the existing City Deep Dumps (slimes) 4L3, 4L4 and 4L6 (The dumps).

Ergo is the largest gold tailings retreatment company in South Africa. The surface deposits controlled by Ergo are waste products created from the historical processing of gold and uranium ores of the Witwatersrand Supergroup. The deposits consist of gold, uranium and sulphur bearing

sand dumps and slimes dams, and the composition reflects the major constituents of the Witwatersrand Basin: quartz (70%-80%), mica (10%), chlorite and chloritoid (9%-18%) and pyrite (1%-2%).

Ergo holds various Mining Rights (MR) in respect of slimes dams and sand dumps extending 65 km from western Johannesburg to eastern Ekurhuleni with most activities occurring on the central and eastern sections of the Witwatersrand mining belt. Under Ergo ownership is the Ergo Beneficiation Plant, City Deep Gold Plant, Knights Gold Plant, the Brakpan/Withok Tailings Storage Facility (TSF), the Daggafontein TSF and various other movable and immovable assets.

2.2.1 Locality

The 4L3 and 4L4 dumps cover an area of approximately 88.37 hectares (Ha) and the 4L6 dump covers an extent of approximately 61.60 Ha over various properties in ward 57 within the City of Johannesburg Metropolitan Municipality. The site is approximately 5.5km from the centre of the Johannesburg CBD (**Figure 3**).

2.2.2 Project description

Ergo intends to reprocess and reclaim gold from the City Deep Dumps (slimes) 4L3, 4L4 and 4L6. The dumps will be reprocessed though the Ergo Plant with ultimate deposition taking place on the Brakpan/Withok TSF. The reclamation process will be undertaken as follows:

Step 1: Gold will be reclaimed from the City Deep Dumps by means of hydraulic mining method. This method entails using high pressure water cannons. The water cannons will be directed onto the face of the slimes dams to break up the material and turn it into slurry as it mixes with the runoff water.

Step 2: The slurry will flow via slurry trenches to a penstock, feeding a satellite pump station/reclamation station, at the low end of the site and will then be pumped to the 4/A/8 tank farm.

Step 3: Two coarse finger screens will be used to screen the slurry from vegetation, lumps of tailings and other waste. The finger screen underflow slurry will report to a satellite screen (vibrating screen). The coarse screen overflow will report to the trash bay. The trash material will be stockpiled adjacent to the satellite pump station and thereafter removed.

Step 4: Underflow from the vibrating screen at the satellite pump station will be pumped to a reception tank at the 4/A/8 pump station; from there it will be pumped via a series of transfer pumps to the Ergo Plant. This pump station will be capable of processing the slimes.

Step 5: The slurry received from 4/A/8 pump station is pumped to the City Deep Plant where it flows over two linear screens which will remove the plus 1 mm grit. The grit is stockpiled on site and the linear screen underflow will report to a mechanically agitated tanks for pre-conditioning.

The pre-conditioned slurry will then be pumped, via an existing pipeline, to the Ergo Plant for beneficiation.

Step 6: Thereafter the tailings will be treated for gold recovery at the Ergo Plant. The waste tailings material will be pumped to the Brakpan/Withok tailings facility which has the capacity to handle the residue material.

2.2.3 Proposed infrastructure

- Mobile tracked hydraulic monitors / High-pressure water cannons;
- Trenches, Penstocks and various other stormwater systems;
- Collection sump;
- Reclamation Station;
- Contingency Dam;
- Above-ground slurry pipeline (considered existing);
- Return water pipeline (considered existing);
- Access roads (some considered as existing); and
- Temporary offices, change houses and portable ablution facilities.

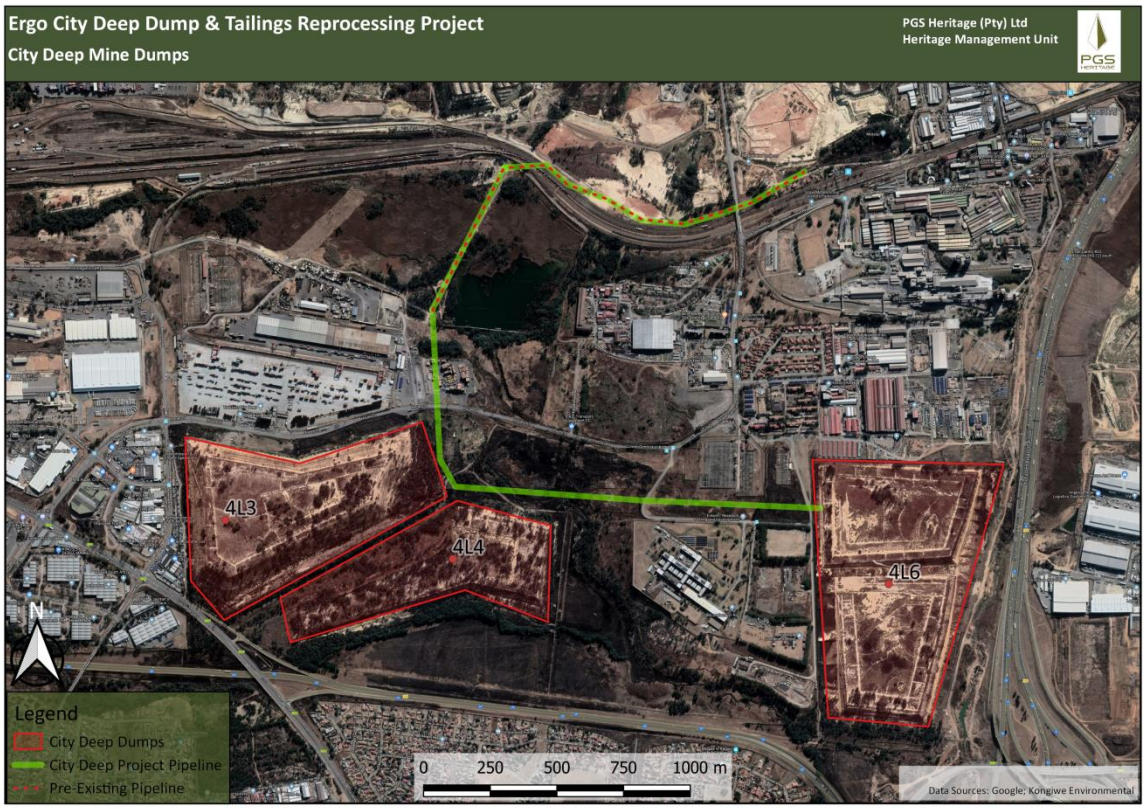


Figure 3 - City Deep mine dumps and 4L3 Pipeline

3 CURRENT STATUS QUO

The section below outlines the assessment methodologies utilised in the study.

3.1 Site Description

The Ergo City Deep Tailings Project situated approximately 7km from the centre of the Johannesburg CBD (**Figure 3**). It is situated in an industrial area under the City of Johannesburg Metropolitan Municipality.

The study area consists of a combination highly developed industrial areas and relatively undisturbed grassland areas and wetlands (**Figure 4 & Figure 5**). As a result, the vast majority of the Ergo City Deep Tailings Project footprint overlays highly disturbed developed terrain with some portions of the study area consisting of undulating grassland hills and rivers (**Figure 8 & Figure 9**). There is also evidence of illegal mining and dumping activities over the footprint of the proposed pipeline (**Figure 6 & Figure 7**). Where not developed, the area consists of Grassland biome vegetation, which is dominated by various species of grasses growing on undulating hills (**Figure 9)**. Overall, the site was mostly accessible by foot and site detection visibility was good.

Figure 4 – View of mine dump in background more or less undeveloped land in foreground

Figure 5 – Developed nature of parts of the study area

Figure 6 – View of debris of covering certain parts of the study area

Figure 7 – View of highly disturbed nature of parts of the study area due to past illegal mining activities

Figure 8 – View of illegal dumping areas

Figure 9 – View of relatively undisturbed wetland areas

3.2 Overview of Study Area and Surrounding Landscape

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Early Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.
250 000 to 40 000 years ago	The Middle Stone Age (MSA) is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.
40 000 years ago to the historic past	The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths.
AD 450 – AD 750	The Mzonjani facies of the Kwale Branch of the Urewe Ceramic Tradition represents the earliest known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by punctates on the rim as well as spaced motifs on the shoulder (Huffman, 2007).
AD 1450 – AD 1650	The Ntsuanatsatsi facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the second known Iron Age period within the

	surroundings of the study area. The decoration on the ceramics from this facies is characterised by a broad band of stamping in the neck, stamped arcades on the shoulder and appliqué. Huffman (2007) suggest that the Ntsuanatsatsi facies can be directly linked to the early Bafokeng who were the first Mbo Nguni people to leave present-day KwaZulu-Natal.
AD 1500 - AD 1700	The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the third Iron Age facies to be identified within the surroundings of the study area. The Olifantspoort facies can likely be dated to between AD 1500 and AD 1700. The key features of the decoration used on the ceramics from this facies include multiple bands of fine stamping or narrow incision separated by colour (Huffman, 2007). The type site for this facies is located on the farm Olfantspoort 328 JQ, near Rustenburg in the North West Province. The Olifantspoort facies holds an important position in the sequence of the Moloko or Sotho-Tswana group. The earliest facies to be associated with the Moloko is the Icon facies (AD 1300 – 1500), with sites found across large sections of what is today the Limpopo Province. The Icon facies resulted in three different and parallel Iron Age facies, namely the Madikwe facies (AD 1500 – 1700) (which in turn led to the Buispoort facies between AD 1700 and 1850), the Letsibogo facies (AD 1500 – 1700) and thirdly the Olifantspoort facies. The Olfantspoort facies developed into the Thabeng facies (AD 1700 – 1850) (Huffman, 2007). It is therefore evident that the Olifantspoort facies represents a key pillar in our understanding of the origins and sequence of the Sotho-Tswana people of today (Huffman, 2007).
AD 1650 – AD 1850	The Uitkomst facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the third Iron Age period to be identified for the surroundings of the study area. This facies can likely be dated to between AD 1650 and AD 1820. The decoration on the ceramics associated with this facies is characterised by stamped arcades, appliqué of parallel incisions, stamping and cord impressions and is described as a mixture of the characteristics of both Ntsuanatsatsi (Nguni) and Olifantspoort (Sotho) (Huffman, 2007). The type-site Uitkomst Cave, was excavated by Professor R.J. Mason of the University of the Witwatersrand as part of a project to excavate five cave sites (Glenferness, Hennops River, Pietkloof, Zwartkops and Uitkomst) in the Witwatersrand-Magaliesberg area. Uitkomst was chosen as the type site for the particular Iron Age material excavated at these sites, as its deposit was found to be well stratified and the site "...illustrates the combination of a certain kind of pottery with evidence for metal and food production and stone wall building found at the open sites..." (Mason, 1962:385).

	The Uitkomst pottery is viewed as a combination of Ntsuanatsatsi and Olifantspoort, and with the Makgwareng facies is seen as the successors to the Ntsuanatsatsi facies. The Ntsuanatsatsi facies is closely related to the oral histories of the Early Fokeng people and represents the earliest known movement of Nguni people out of Kwazulu-Natal into the inland areas of South Africa. Regarding this theory, the Bafokeng settled at Ntsuanatsatsi Hill in the present-day Free State Province. Subsequently, the BaKwena lineage had broken away from the Bahurutshe cluster and crossed southward over the Vaal River to come in contact with the Bafokeng. As a result of this contact a Bafokeng-Bakwena cluster was formed, which moved northward and became further 'Sotho-ised' by coming into increasing contact with other Sotho-Tswana groups. According to this theory, this eventually resulted in the appearance of Uitkomst facies type pottery which contained elements of both Nguni and Sotho-Tswana speakers (Huffman, 2007). Huffman states that that the Uitkomst facies is directly associated with the Bafokeng (Huffman, 2007). However, it worth noting that not all researchers agree with this preposition of the Bafokeng origins. In their book on the history of the Bafokeng, Bernard Mbenga and Andrew Mason indicate that the research of Prof. R.J. Mason and Dr. J.C.C. Pistorius "...would indicate that the Bafokeng originated from the Bahurutshe-Bakwena-Bakgatla lineage cluster. Tom Huffman holds a different view..." (Mbenga & Mason, 2010).
AD 1700 – AD 1840	The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the next phase to be identified within the greater Witwatersrand area. It is most likely dated to between AD 1700 and AD 1840. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).It is believed that the Madikwe facies developed into the Buispoort facies. The Buispoort facies is associated with sites such as Boschhoek, Buffelshoek, Kaditshwene, Molokwane and Olifantspoort (Huffman, 2007).

3.3 Previous Archaeological and Heritage Studies in and around the Study Area

- VAN SCHALKWYK, J. 2002. A Survey of Cultural Resources for the CDT - IDZ Study Area, City Deep, Johannesburg. – **The study uncovered several historical heritage sites and recommended that if not avoidable, then the sites would require relevant mitigation measures.**
- NEL, J. 2010. Heritage Scoping Survey for the amendment of the existing City Deep EMP for the reclamation of Slimes Dam 3/L/42 and 3/L/40. – **The study**

uncovered a lack of heritage resources save for the possible heritage value of the slimes dams under investigation.

- NEL, J. 2011. Heritage Scoping Assessment for the Amendment of the City Deep EMP for the inclusion of Dump 4/L/2. – **No heritage sites were uncovered during this study.**
- PELSER, A. 2014. Phase 1 HIA Reports for the Proposed Township Development (City Deep Ext. 29) on the Remaining Extent of Klipriviersberg 106IR City of Johannesburg Metropolitan Municipality, Gauteng APAC014/10. – **Historical heritage resources were uncovered in this study.**

3.4 Historical Background

3.4.1 City Deep

After the discovery of the Main Reef at Witwatersrand in 1886, various mines were established. The mining method during these early years was labour intensive, while only the surface areas of the gold-bearing reefs were exploited. Lionel Phillips was one of the first mine magnates to realise the potential of deep-level mining. As part of the company of Hermann Eckstein, Phillips managed to acquire large numbers of claims which were considered of low value as they were located some distance away from the Main Reef. As a result he bought these claims for very reasonable prices, and started implementing the concept of deep level mining on some of these claims.

These steps resulted in the proclamation of various deep-level mines, including Nourse Deep, Jumpers Deep, Glen Deep, Crown Deep (City Deep forming part of this complex),, Rose Deep, Village Deep, Geldenhuis Deep as well as Ferreira Deep. In 1893 the company of H. Eckstein formed the company Rand Mines Ltd, which took over the administration of these and other mines (Cartwright, 1965). Russell (n.d.) indicates that Rand Mines was established with start-up capital of £400,000, and was one of the earliest companies formed specifically for mining deep levels. The company quickly acquired 1,729 deep level claims. Lionel Phillips' foresightedness earned him the respect of his pears, as well as the position of chairman for Rand Mines, a company that soon became the "…*biggest mining finance company in the world*." (Cartwright, 1965).

A map dating to 1895 (**Figure 10**), was surveyed in January 1895, and shows that the whole farm was originally granted to Jacob Smit on 25 July 1859 (Pelser 2014).

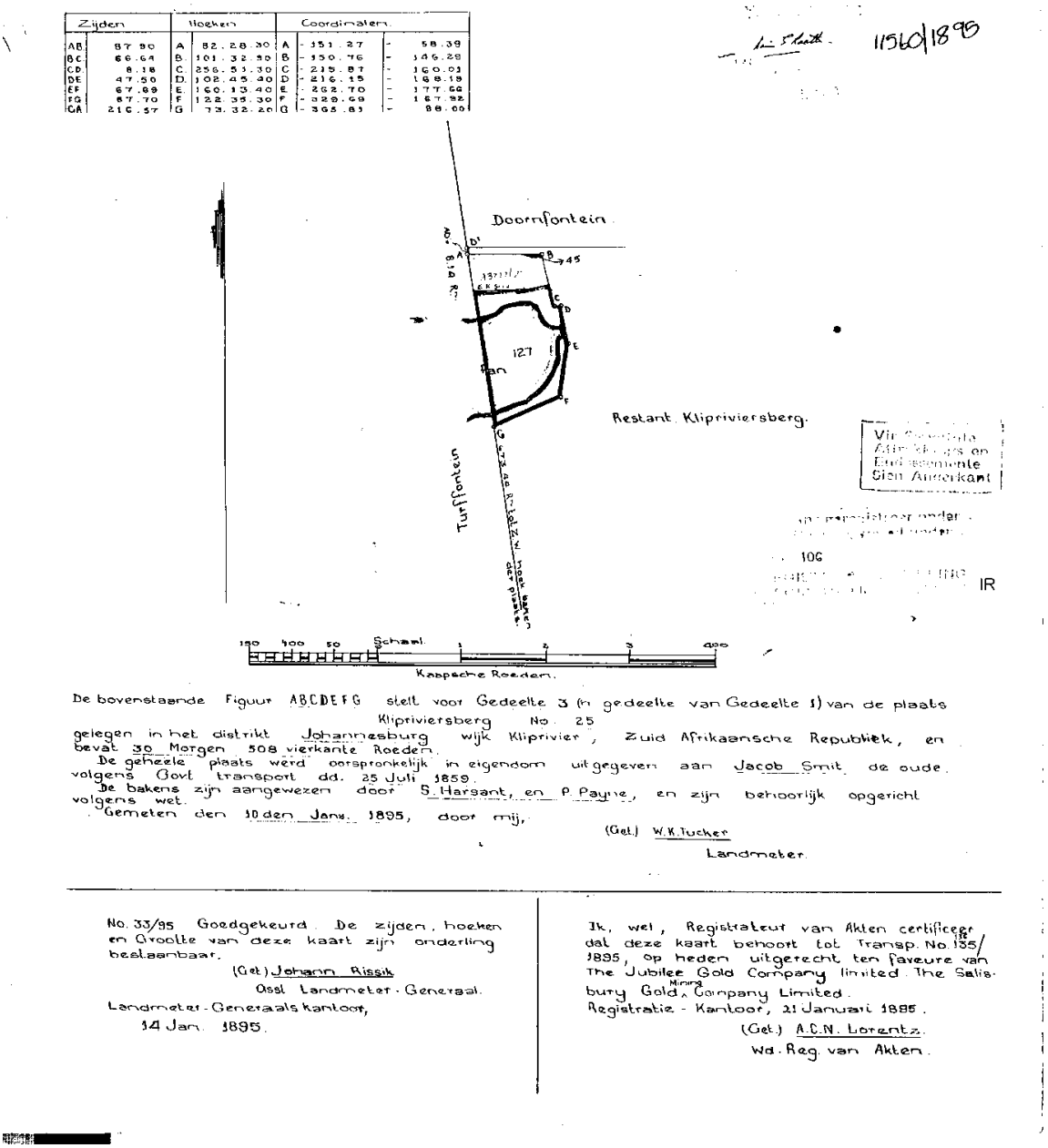


Figure 10 – 1895 map showing farms Turffontein, Doorfontein and Klipriviersberg (Pelser 2014)

A number of deep level mines, including City Deep, South City, Suburban Deep, Wolhuter Deep, South Wolhuter and Klip Deep, were floated prior to the Anglo-Boer War (1899-1902) as offshoots of the Klipriviersberg Estate (Gold Mining Company Limited) (Praagh 1906: 574). City Deep Limited also possessed a mining lease on Klipriviersberg 106IR in 1925 (Pelser 2014).

3.4.2 Rosherville Power Station & Dam

The Rosherville Power Station was built in 1911 by the Rand Mines Power Supply Company (RMPS) to supply the gold mines of the Witwatersrand with electricity and compressed air. This was at a time when South Africa's mining industry was increasing in size rapidly and the only way

for it to maintain that growth was for it to use electricity. Overall, the Roserville Power Station had a life span of fifty-five years, from 1911 to 1966 (Conradie & Messerschmidt 2000).

The Rosherville Power Station was built halfway between Johannesburg and Germiston on the banks of the Rosherville Dam, which was originally built by Nourse Mines (part of the Rand Mines Group) in 1905. The dam contained, when it was full held approximately 820 million gallons (3690 million litres) and had a surface area of 215 acres, which was adequate for the needs of the power station. The construction began in 1909 and ended in 1911, by which time it was able to deliver electricity and compressed air to the 17 mines of the Rand Mines and the Corner House Group (Conradie & Messerschmidt 2000).

Figure 11 - Rosherville Power Station in the foreground and the Rosherville Dam in the Background

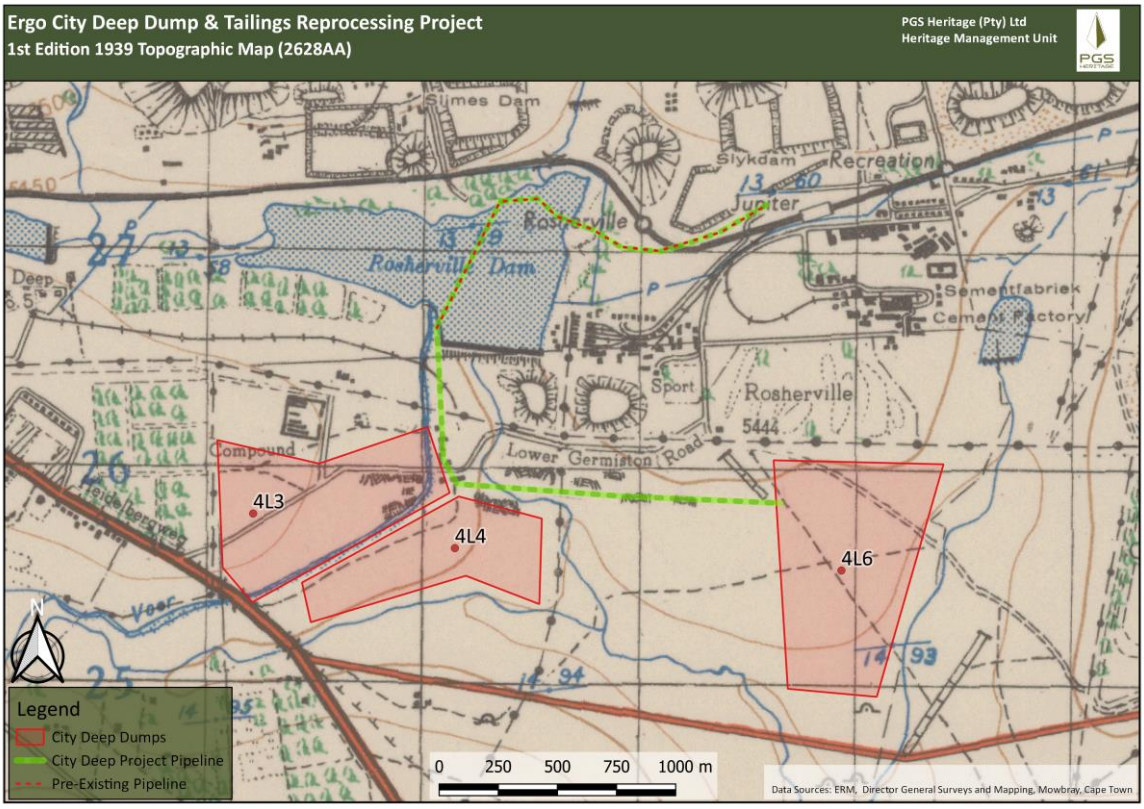


Figure 12 – 1st Edition 1939 Topographic Map (2628AA)

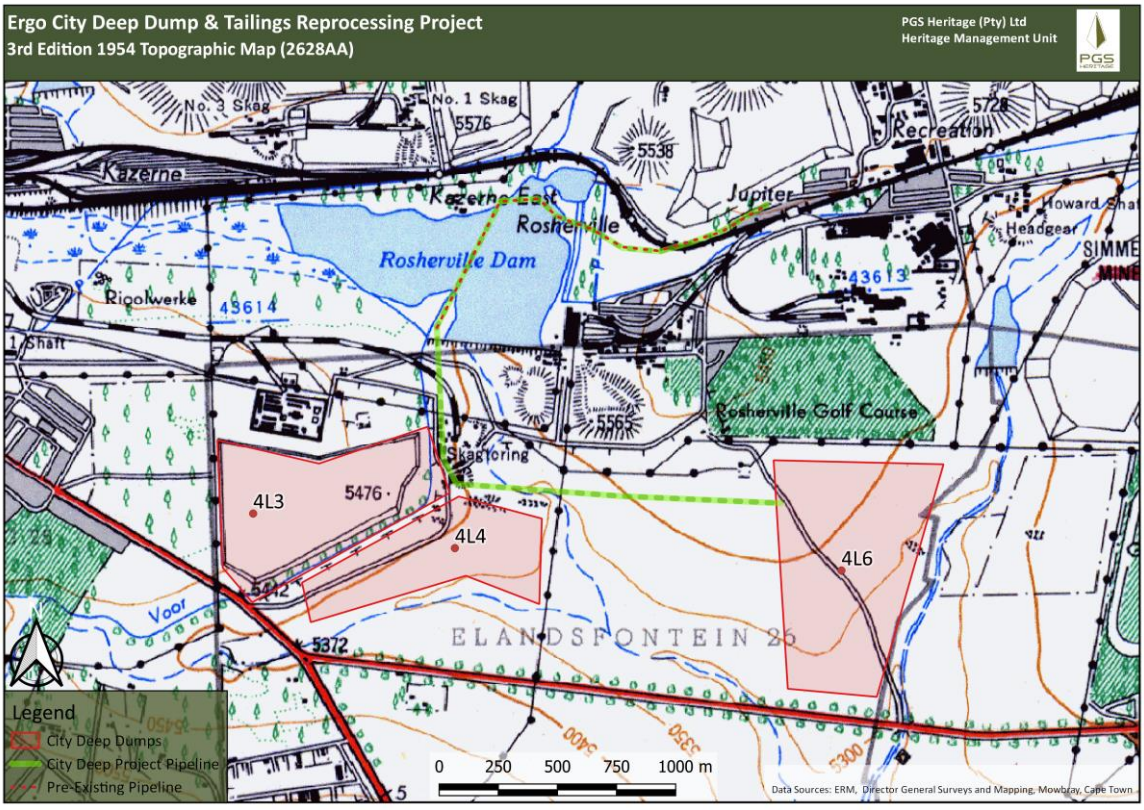


Figure 13 – 3rd Edition 1954 Topographic Map (2628AA)

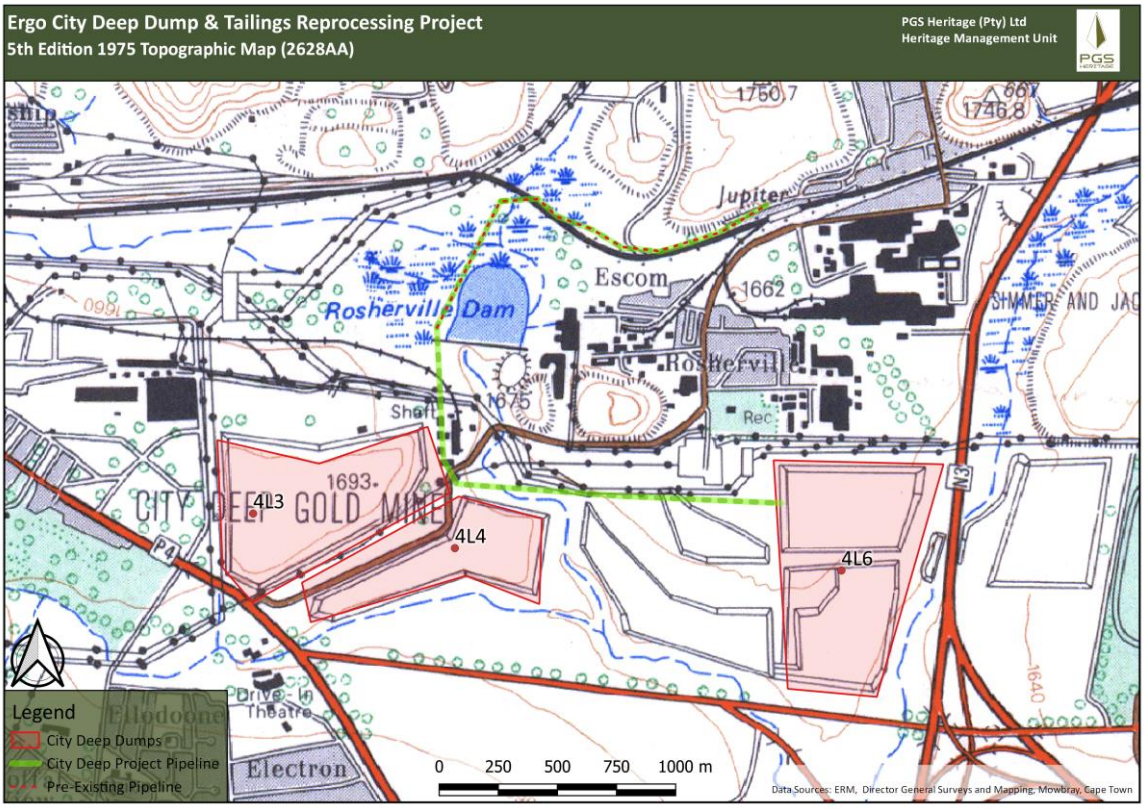
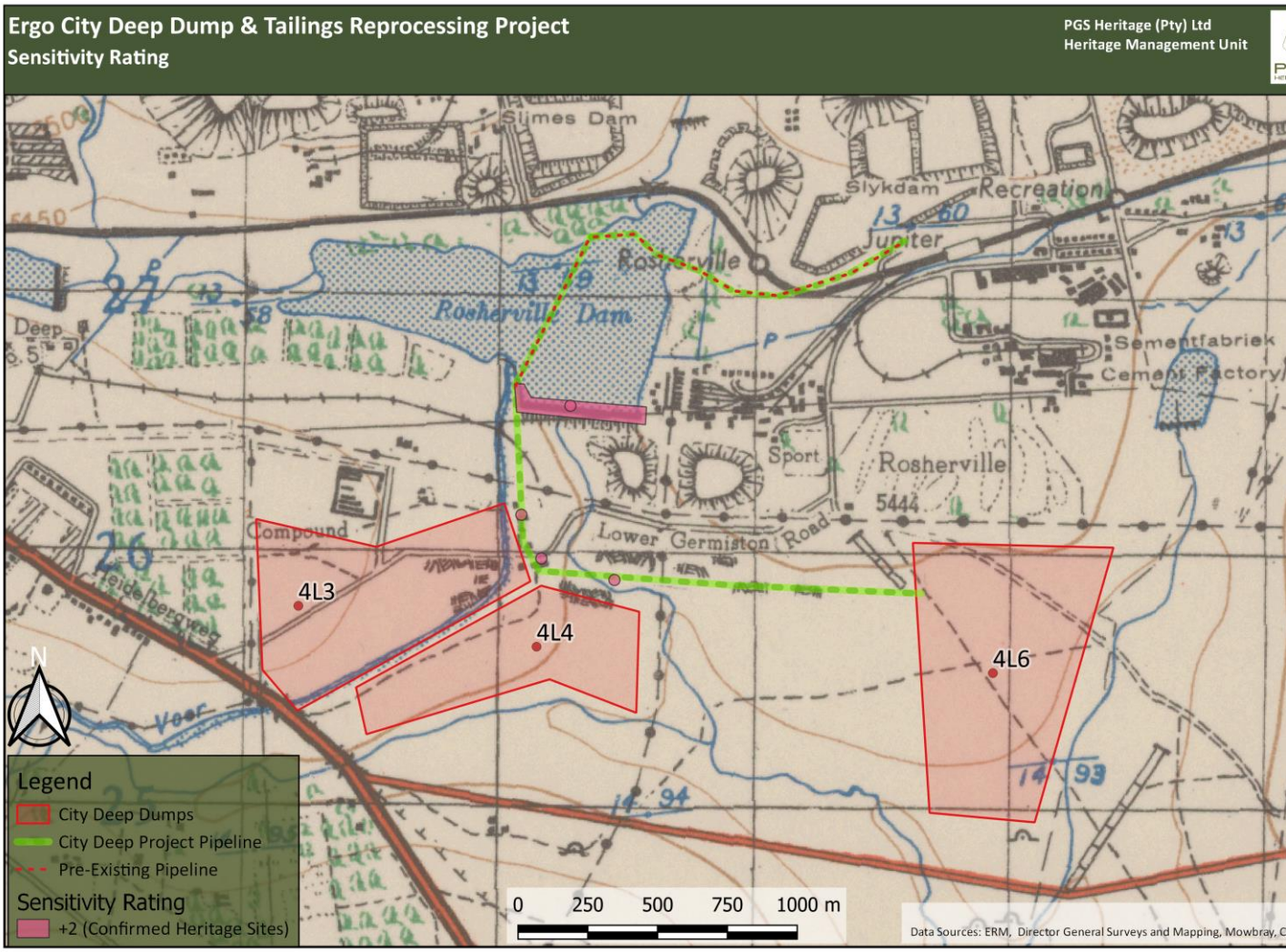


Figure 14 – 5th Edition 1975 Topographic Map (2628AA)

3.5 Findings of heritage screening

The findings can be compiled as follows and have been combined to produce a heritage sensitivity map for the project based on the desktop assessment (**Figure 15**).



3.5.1 Heritage

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps; and
- First edition Topographical Maps dating from the 1960's.

This enabled the identification of possible heritage sensitive areas that included:

- Dwellings;
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas; and
- Structures/Buildings.

By superimposition and analysis it was possible to rate these structure/areas according to age and thus their level of protection under the NHRA. Note that these structures refer to possible tangible heritage sites as listed in ***Table 2***.

Table 2 -Tangible heritage site in the study area

Name	Description	Legislative protection
Archaeology - Iron Age Sites	Older than 100 years	NHRA Sect 3 and 35
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34

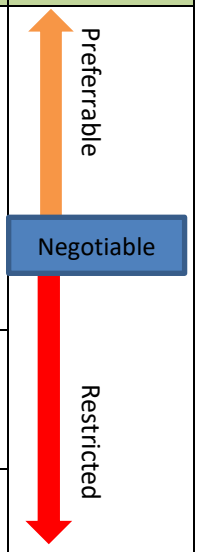
Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 3**.

Table 3: Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Watering holes/pans/rivers	LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements
Forested areas	LIA sites

Based on the analysis and possible extent of the mitigation that could be required to enable development in the areas of heritage sensitivity, a sensitivity rating was given to each area (**Figure 16**). This rating scale is based on **Table 3** & **Table 4**.

Table 4 - Sensitivity ratings and weighting

Sensitivity Rating	Description	Weighting	Preference
Least Concern	The inherent feature status and sensitivity is already degraded. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1	
Low/Poor	The proposed development will have not have a significant effect on the inherent feature status and sensitivity.	0	
High	The proposed development will negatively influence the current status of the feature.	+1	
Very High	The proposed development will negatively significantly influence the current status of the feature.	+2	

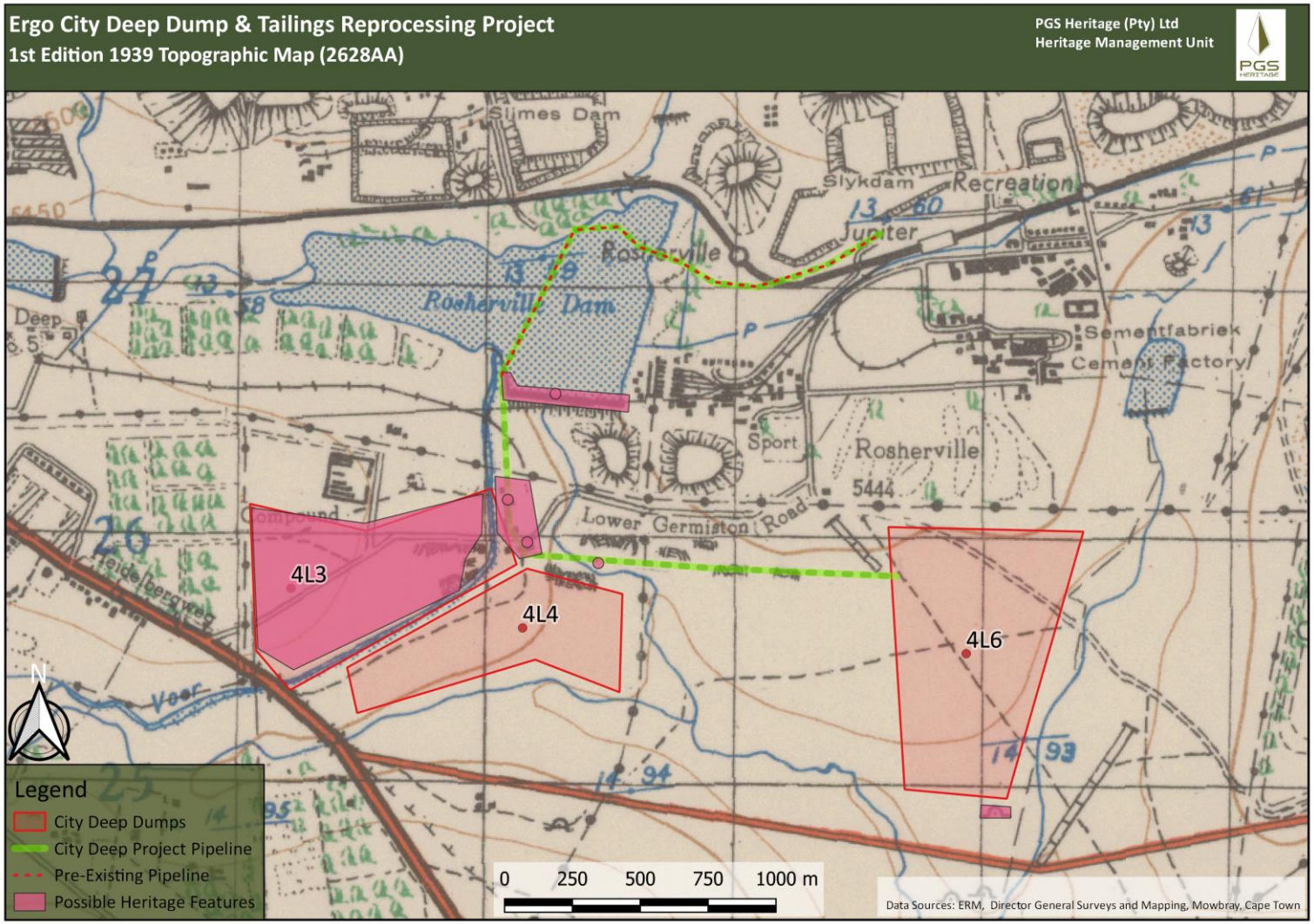


Figure 15 – Heritage sensitivity map indicating possible sensitive areas for City Deep area

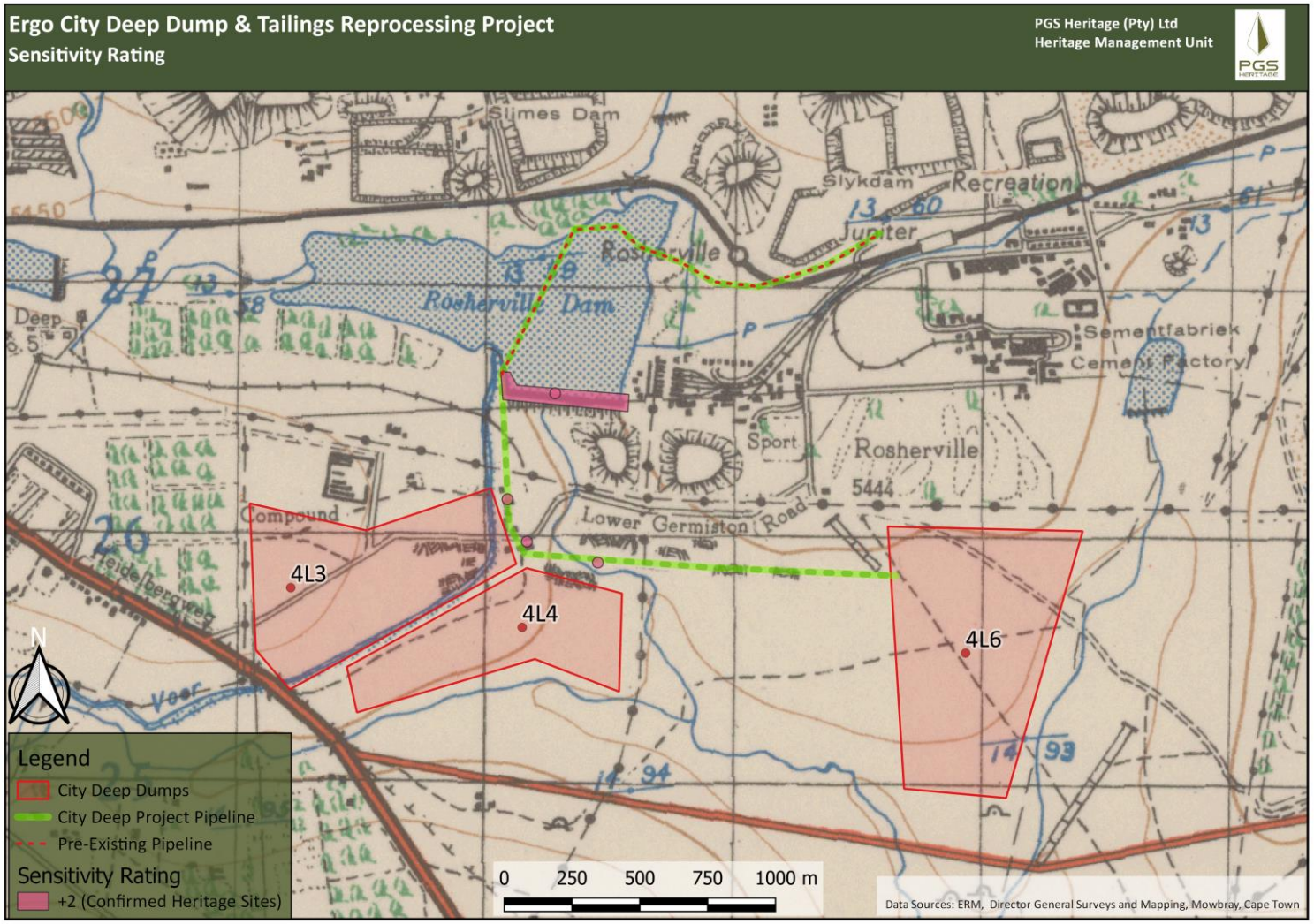


*Figure 16 – Heritage sensitivity map indicating sensitivity rating for City Deep area. The sensitivity rating is based on historical and field data, thus the 1st Ed 1939 Topographic Map is shown here to indicate the location of the Rosherville Dam wall. *Note: Features represented on the 1st Ed Map may have changed up to present-day.*

4 FIELDWORK AND FINDINGS

A controlled surface survey was conducted on foot and vehicle over a period of one day by one archaeologist from PGS. The fieldwork was conducted on the 7th November 2018. The track logs (in orange) for the survey are indicated in **Figure 17**.

Heritage resources identified during the fieldwork component of this HIA is described in **Table 5** and their positions shown in **Figure 29.**

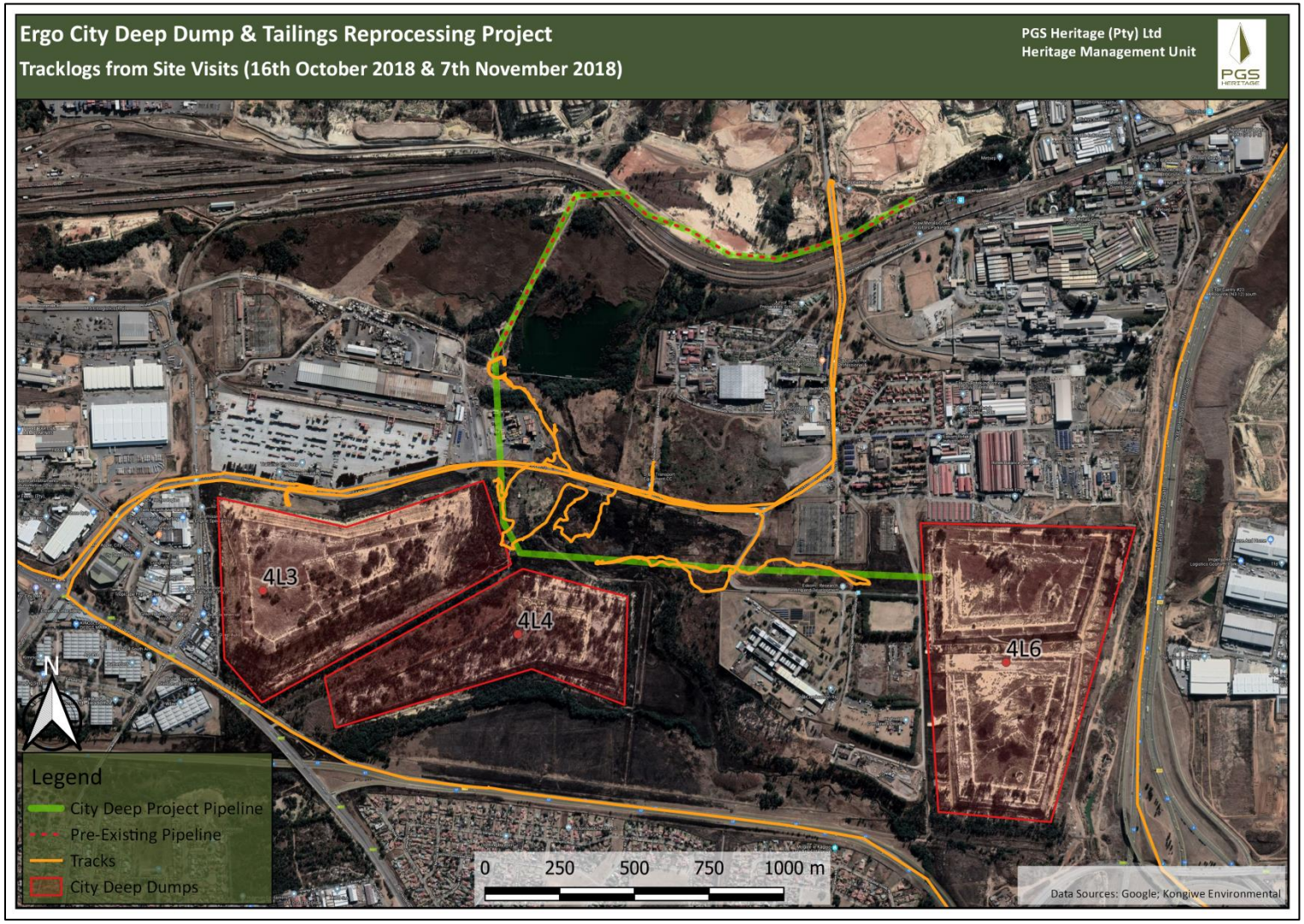


Figure 17 – Track log recordings from site visits (16th October 2018 & 7th November 2018). Note that portions of the proposed pipeline were not surveyed due to inaccessibility and the fact that parts of it already existed

Table 5 - Sites identified during heritage survey

Site[1] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
CTY001	S 26.22981°	E 28.10450°	The site comprises the remains of a structure, consisting of some buried brickwork and an underground pipeline, most likely forming part of an old mining compound or related dormitories as shown on the historical topographic maps. **The structure measures 10m x 10m.**	Low	GP.C

Figure 18 – Remains of structure at CTY001

[1] *Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.*

Site[2] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
CTY002	S 26.22841°	E 28.10379°	The site comprises the remains of a structure, consisting of a concrete foundation and gravel, most likely forming part of an old mining compound or related dormitories as shown on the historical topographic maps. **The structure measures 10m x 10m.**	Low	GP.C

Figure 19 – Remains of structure at CTY002

Site[3] number	Lat	Lon	Description	Heritage Significance	Heritage Rating

[2] *Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.*

[3] *Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.*

Site[1] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
CTY003	S 26.22490°	E 28.10555°	The site comprises stone-built wall of the Rosherville Dam that formed part of the Rosherville Power Station, built between 1909 - 1911. The Rosherville Dam and its associated infrastructure is clearly visible on the 1st Edition Topographic map dated to 1939. The dam wall is still in incredibly good condition and is currently in use as the retaining wall for the Rosherville Dam. New infrastructure has been incorporated into its design in the form of a pumping station that sits at its Western end. **The site measures approximately 350m in length.**	Medium/High	LS (3A)

Site[1] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
 *Figure 20 – View of portion of Rosherville Dam wall*			 *Figure 21 – Alternate view of Rosherville Dam wall*		

Site[1] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
 *Figure 22 – View of pumping station at western end of dam wall that is still in operation*			 *Figure 23 – View of inner side of dam wall*		

Site[1] number	Lat	Lon	Description	Heritage Significance	Heritage Rating

Figure 24 – View of Rosherville Dam spillway

Site[4] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
CTY004	S 26.23050°	E 28.10712°	The site comprises the remains of a stone walled structure combined with the remains of a stone walled kraal. The site most likely dates to the historic to recent past due to its shape and the construction materials employed. Looking at the dimensions of the former structure, it was most likely used as some kind of farming utility structure. **The structure measures 8m x 8m while the kraal measures 15mx6m.**	Low	GP.C

Figure 25 – View of the remains at CTY004

Figure 26 – Alternate view of the interior of portion of the stone walling

[4] *Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.*

Site[4] number	Lat	Lon	Description	Heritage Significance	Heritage Rating
 *Figure 27 – View of cattle kraal at CTY004*			 *Figure 28 – Alternate view of cattle kraal at CTY004*		

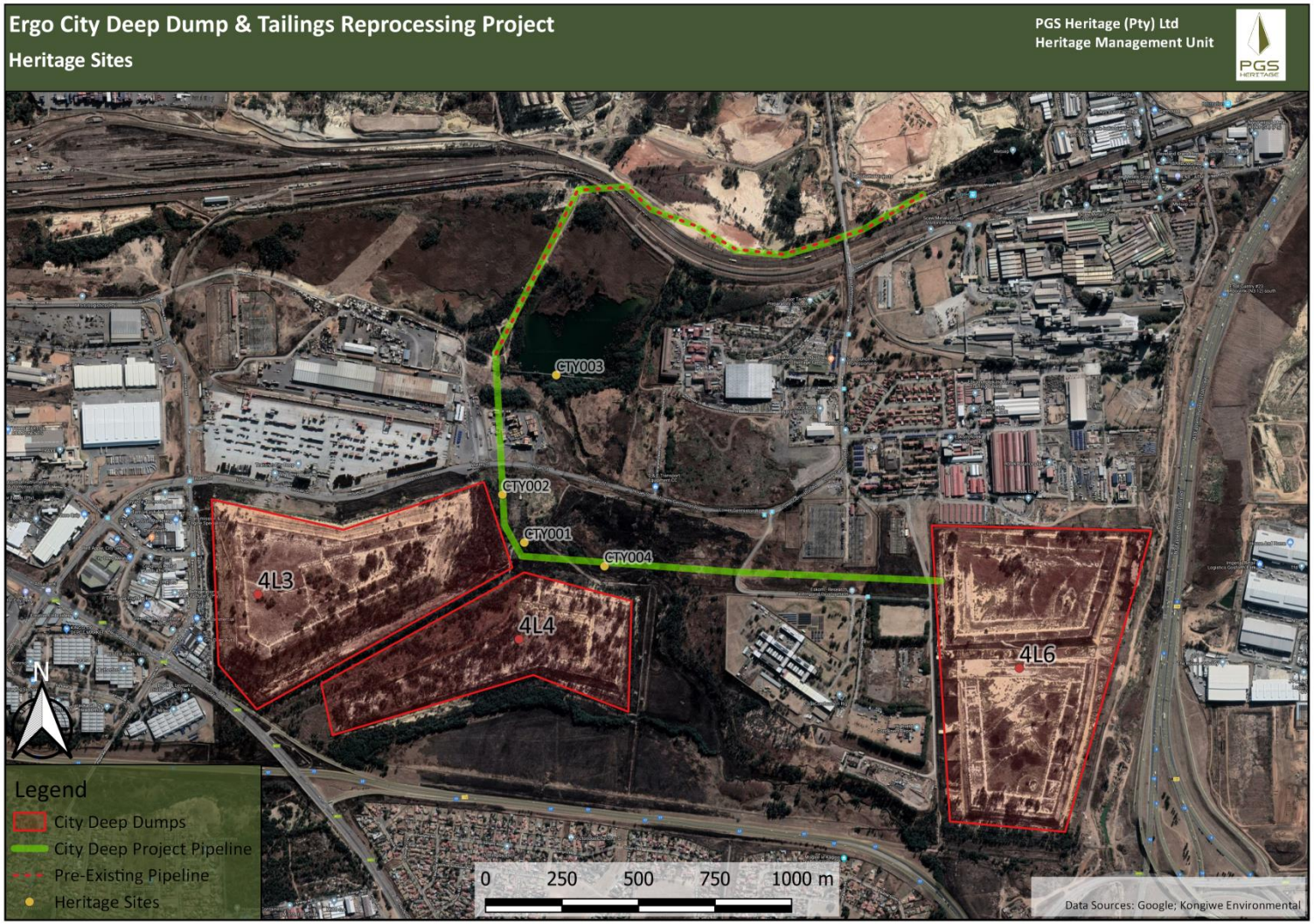


Figure 29 - Heritage sites identified during field survey

5 PALAEONTOLOGY

Banzai Environmental was appointed to do a Palaeontological Desktop Assessment and found that:

The proposed City Deep Dumps and pipeline in Johannesburg, Gauteng Province is underlain by the Turffontein and Johannesburg Subgroups (Zero Palaeontological Sensitivity) (**Figure 30**)

Table 6 - Underlying geology of proposed study area

Supergroup	Group	Subgroup	Formation	Palaeontological Sensitivity
Karoo				Zero
Karoo	Ecca		Vryheid	High
Karoo	Dwyka			Moderate
Transvaal Supergroup	Chuniespoort Group	Malmani		High
Witwatersrand	Central Rand	Turffontein		Zero
Witwatersrand	Central Rand	Johannesburg		Zero
Ventersdorp	Klipriviersberg			Zero

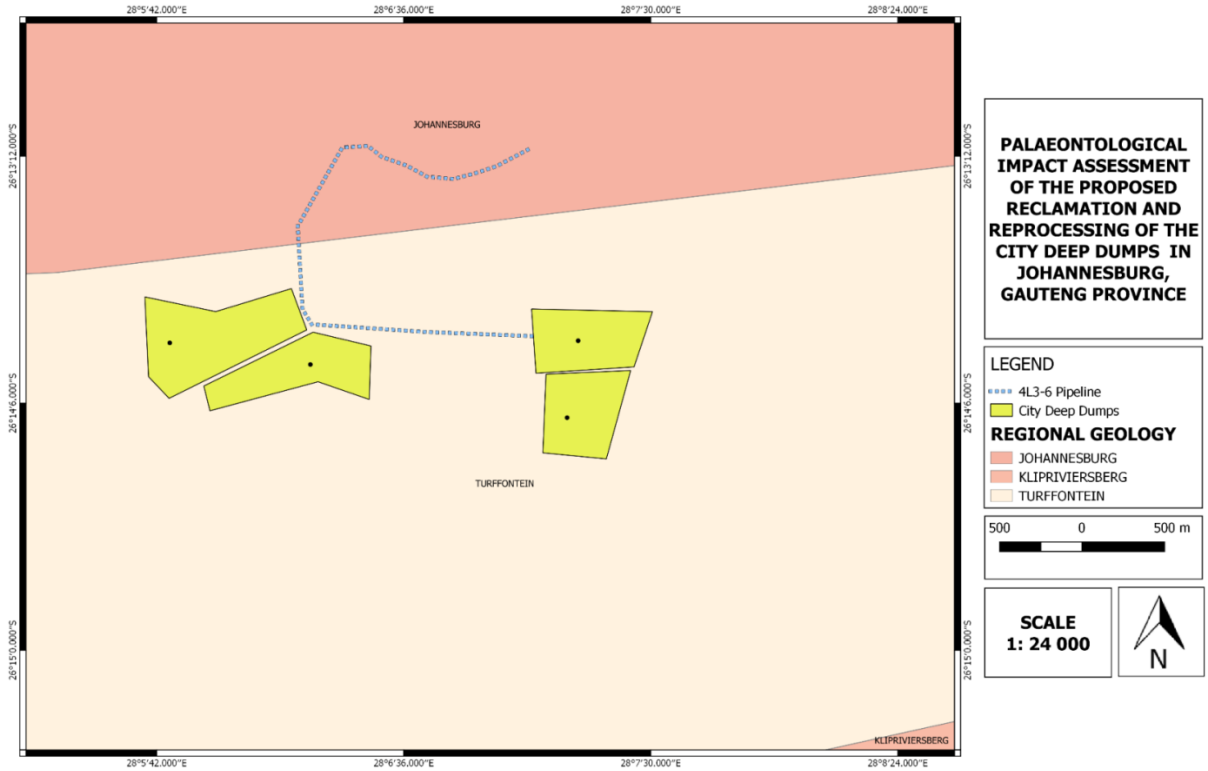


Figure 30 - Surface geology of the proposed City Deep Dumps in Johannesburg, Gauteng Province. The proposed development is underlain by the Turffontein and Johannesburg Subgroups. Map drawn by QGIS Desktop 2.18.18.

It is thus recommended that no further palaeontological assessments will be required, and the proposed development may be authorised from a palaeontological perspective.

6 IMPACT ASSESSMENT

The following section provides the impact of the proposed development on identified heritage resources.

6.1 Heritage Impacts

6.1.1 Pipeline

Considering the fact that a large portion of the pipeline already exists, and that the proposed pipeline will avoid the Rosherville Dam entirely because it will only be joining up at the pumping station at its western end, only sites **CTY002** & **CTY004** will be affected by the proposed pipeline. Site **CTY002** will not require any mitigation measures.

However, the following recommendations are made for site **CTY004**:

- A minimum of a 20m buffer zone should be implemented around the site;
- If this buffer zone is not able to be maintained, then appropriate mitigation measures will need to be implemented.

While site **CTY003** will not be directly impacted by the pipeline, a 50m buffer should be maintained around the length of the dam as a deterrent.

6.1.2 Mine Dumps

Even though mine dump 4L3 is represented on the historical topographic map of 1954 and thus older than 60 years, it is the author's considered opinion that this fact alone should not warrant its classification as a heritage site and subsequent protection privileges associated with that classification.

6.2 Palaeontological Impacts

Due to the nature of the geology of the area, there are no potential impacts on palaeontological resources.

6.3 Impact Assessment Table

Table 7 - Impact Assessment Table

No.	Affected Environment	Activity	Impact Description	BEFORE MITIGATION						Cumulative Impact	Mitigation measures / Recommendations	AFTER MITIGATION				
				Magnitude	Duration	Spatial Scale	Consequence	Probability	SIGNIFICANCE			Magnitude	Duration	Spatial Scale	Consequence	Probabili
	Construction															
1	CTY004	Construction	Destruction of heritage	*Minor -*	*Long Term > 5 years*	*Site or Local*	Low	*Possible*	Low	No	- Implement 20m buffer around site - If buffer zone cannot be maintained then appropriate mitigation measures will need to be enacted	*Minor -*	*Long Term > 5 years*	*Site or Local*	Low	*Definite*
2	CTY003	Construction	Destruction of heritage	*Major -*	*Long Term > 5 years*	*Site or Local*	High	*Unlikely*	Medium	No	- Implement a 50m buffer zone around site	*Minor -*	*Long Term > 5 years*	*Site or Local*	Medium	*Unlikely*

6.4 Management recommendations and guidelines

6.4.1 Construction phase

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camp areas and small-scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, however foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure, such as construction camps and laydown areas, is often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

6.4.2 Chance find procedure

- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

6.5 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 8** gives guidelines for lead times on permitting.

Table 8 - Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	2 month
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

6.6 Heritage Management Plan for EMPr implementation

Table 9 - Heritage Management Plan for EMPr implementation

Area and site no.	Mitigation measures	Phase	Timeframe	Responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
City Deep	Implement chance find procedures in case where possible heritage finds are uncovered	Construction	During construction	Applicant ECO Heritage Specialist	ECO (weekly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report
CTY004	Implement design elements to exclude the site with a 30m metre buffer. If this is not possible, a detailed mitigation process must be implemented as required under the NHRA. This includes application for relevant destruction permits from SAHRA including the possibility of compulsory destruction monitoring. Basic archival research on CTY004 before destruction	Construction	During construction	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report
CTY003	Implement design elements to exclude the site with a 50-metre buffer. • Considering the nature of the proposed pipeline	Construction through to Operational	During construction	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38	ECO Monthly Checklist/Report

Area and site no.	Mitigation measures	Phase	Timeframe	Responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
	development, which will simply be built to join the up with the pre-existing pipeline at the pre-existing pumping station (situated at the western end of the dam wall), an exception to the buffer zone will be made in this case. • However, the utmost care needs to be taken during the construction phase of the project so as to avoid the existing dam wall by any means necessary.					of NHRA	

7 CONCLUSIONS

The HIA has shown that the study area and surrounding area has some heritage resources situated within the proposed development boundaries. Through data analysis and a site investigation the following issues were identified from a heritage perspective.

7.1 Archaeological Heritage

The data analysis has enabled the identification of possible heritage sensitive areas that included:

- Dwellings;
- Clusters of dwellings (homesteads and farmsteads);
- Archaeological Sensitive areas (based on historical descriptions); and
- Structures.

The fieldwork for the HIA identified four heritage sites with different heritage significance ratings. These sites consist of four historical sites. Of these four resources, only one with heritage significance (**CTY004)** will be directly impacted by the project activities.

The impact significance before mitigation on the heritage resources LOW negative (**CTY004**). Implementation of the recommended mitigation measures will modify this impact rating to an acceptable LOW negative in the case of **CTY004**.

The management and mitigation measures as described in Section 6 of this report have been developed to minimise the project impact on heritage resources.

7.2 Palaeontology

The proposed City Deep Dumps and pipeline in Johannesburg, Gauteng Province is underlain by the Turffontein and Johannesburg Subgroups (Zero Palaeontological Sensitivity). It is thus recommended that no further palaeontological assessments will be required and the proposed development may be authorised from a palaeontological perspective.

7.3 General

It is the author's considered opinion that overall impact on heritage resources is LOW and **after** the implementation of the recommended mitigation measures is acceptably low or can be totally mitigated to the degree that the project can be approved from a heritage perspective.

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Appendix A

Heritage Assessment Methodology

The applicable maps, tables and figures are included, as stipulated in the NHRA (Act No 25 of 1999) and NEMA (Act No 107 of 1998). The HIA process consisted of three steps;

Step I – Literature Review - The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey - A physical survey was conducted predominantly by foot within the proposed areas by two qualified archaeologists, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of identified heritage sites are based on four main criteria -

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    - Low - <10/50m2
    - Medium/High - 10-50/50m2
    - High - >50/50m2
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows -

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate development activity position;
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site.

Impacts on these sites by the development will be evaluated as follows -

Site Significance

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report (Table A 1).

Table A 1 - Site significance classification standards as prescribed by SAHRA.

Field rating	Grade	Significance	Recommended mitigation
National Significance (NS)	Grade 1		Conservation; National Site nomination
Provincial Significance (PS)	Grade 2		Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)		High / Medium/High Significance	Mitigation before destruction
Generally Protected B (GP.B)		Medium/High Significance	Recording before destruction
Generally Protected C (GP.C)		Low Significance	Destruction

Appendix B

The Significance Rating Scales for the Proposed Prospecting Activities on Heritage Resources

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

Significance;
Spatial scale;
Temporal scale;
Probability; and
Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **(Table A 2)**

Part A: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/ population and duration;
Part B: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
Part C: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.

Table A 2 - Significance Rating Methodology

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE ***Use these definitions to define the consequence in Part B***		
Impact characteristics	**Definition**	**Criteria**
MAGNITUDE	Major -	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded
	Moderate -	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded
	Minor -	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded
	Minor +	Minor improvement; change not measurable; or threshold never exceeded
	Moderate +	Moderate improvement; within or better than the threshold; or no observed reaction
	Major +	Substantial improvement; within or better than the threshold; or favourable publicity
SPATIAL SCALE OR POPULATION	Site or local	Site specific or confined to the immediate project area
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic
	National/ International	Nationally or beyond
DURATION	Short term	Up to 18 months.
	Medium term	18 months to 5 years
	Long term	Longer than 5 years

PART B: DETERMINING CONSEQUENCE RATING ***Rate consequence based on definition of magnitude, spatial extent and duration***					
			SPATIAL SCALE/ POPULATION		
			Site or Local	**Regional**	**National/ international**
MAGNITUDE					
Minor	**DURATION**	**Long term**	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	**DURATION**	**Long term**	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium
Major	**DURATION**	**Long term**	High	High	High
		Medium term	Medium	Medium	High
		Short term	Medium	Medium	High

PART C: DETERMINING SIGNIFICANCE RATING ***Rate significance based on consequence and probability***				
		CONSEQUENCE		
		Low	**Medium**	**High**
PROBABILITY (of exposure to impacts)	**Definite**	Medium	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

Appendix D

Project team CV's

ILAN SMEYATSKY

Professional Archaeologist

Personal Details

- **Name:** Ilan
- **Surname:** Smeyatsky
- **Identity Number:** 9109275072080
- **Date of Birth:** 27-09-1991
- **Citizenship:** South African
- **Gender:** Male
- **Marital Status:** Single
- **Languages Spoken**: English

Education History

2010-2013: **BSc Bachelors Degree**

University of the Witwatersrand, Johannesburg, South Africa

- Archaeology
- Psychology
- Statistics
- Research Design and Analysis
- 67% Pass (**2:1 Qualification**)

2014: **BSc (Hons) in Archaeology**

AWARDS:

- Received the 2014 Center of Excellence in Palaeoscience award - **Bursary to the value of ZAR 30000 ≈ $2500**
- Received the Post-Graduate Merit Award in 2015 for academic merit for my Honours academic results - **Bursary to the value of ZAR 25000 ≈ $1800**

University of the Witwatersrand, Johannesburg, South Africa

- Archaeology
- Excavation techniques
- Theory
- 69% Pass (**2:1 Qualification**)
- **Distinction** received for thesis entitled: "Stylistic variation in Later Stone Age tanged arrowheads: a pilot study using geometric morphometrics"

2015-2017: **MSc by Research (Archaeology)**

University of the Witwatersrand, Johannesburg, South Africa

- Archaeology
- Statistical analysis
- GIS (Geographic Information Systems)
- Thesis entitled: "Discerning and explaining shape variations in Later Stone Age tanged arrowheads, South Africa"

Aug 2016 –
Jan 2017: **Semester of Archaeology Masters**

AWARD: Received the 2016 AESOP+ full Masters scholarship to study at Uppsala University, Uppsala, Sweden – **Scholarship to the value of ZAR 160,000 ≈ $11,000**
Uppsala University, Uppsala, Sweden

- Archaeological theory
- GIS (Geographic Information Systems)
- Invitational research

Employment History
Part time employment as a student:

- **2009-2013**: Part-Time Electrician Apprentice: Assisting in home electrical repair jobs.
- **2014-2015:** Lab Research Assistant: Analysing and classifying lithic artefacts, Data capturing, Mentoring trainee research assistants.

Experience in the field of archaeology:

- **2013-2015: Fieldwork/Excavator - Responsibilities:** Feature detection, excavation, sieving, sorting, analysis, soil sampling, field documentation, 'dumpy' operation , Total Station operation, DGPS operation, rock art tracing and photography, engraving tracing and photography.
    - South African excavations:
        - Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (1 Week – August 2015)
        - Pig cadaver exhumation as part of forensic experiment near Pretoria, Gauteng (1 Week – December 2014) - Praised for having the determination of returning for each subsequent excavation day as it was performed on a purely volunteer basis and the work conditions were particularly strenuous - Dr. Coen Nienaber

- Iron Age excavation at Komati Gorge, Mpumalanga (1 Week – August 2014) - Praised for being exceptionally “methodical and proficient” with my excavation techniques – Dr. Alex Schoeman
- Rock art fieldwork at Komati Gorge, Mpumalanga (1 Week – August 2014)
- Underwater archaeology site mapping Komati Gorge, Mpumalanga (1 Week – August 2014)
- Early Stone Age excavation at Maropeng World Heritage Site in Gauteng (2 Weeks - September 2013) - Personally uncovered some of the only stone tools (~1.8 million years old) found during that digging season.

- **2016: Excavation Supervisor - Responsibilities:** Supervision of two junior excavators, site detection, decision of excavation grid placement, excavation, sieving, sorting, soil sampling, field documentation.
    - Historical (farm site) excavation at Graaff-Reinet, Eastern Cape, South Africa (2 Weeks)
    - Completed dig 1 week ahead of schedule aided by my efficient direction, drive and support to the excavators under my supervision.
- **April 2017 – April 2018:** Intern Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.
- **April 2018 – PRESENT:** Archaeologist – PGS Heritage: Heritage Impact assessments, background research, report writing, permit applications, collections management, stakeholder engagement and grave relocation.

Professional Body Membership:

- Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member
- CRM Accreditation (ASAPA) -
    - Field Supervisor – Stone Age, Iron Age & Grave Relocations

WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave "rescue" excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
    - Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
    - Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age
- Accredited with Amafa KZN

Key Work Experience

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique, Malawi, Mauritius and the Democratic Republic of the Congo