



PGS

HERITAGE

***HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED LANSERIA
OUTFALL SEWER, JOHANNESBURG***

Phase 1 – Heritage Impact Assessment

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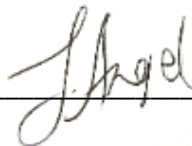
Declaration of Independence

The report has been compiled by PGS Heritage (Pty) Ltd, an appointed Heritage Specialist for Nemaï Consulting for the proposed Lanseria Outfall Sewer. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process

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EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Nemai Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Report (EIA) for the proposed development of the Lanseria Outfall Sewer, Johannesburg, Gauteng.

A total of five heritage sites were identified within the proposed development area. These include the remains of stone walled structures (**LAN 002** and **LAN 004** both of Low heritage significance), most likely old farm buildings. Three burial grounds, **LAN 001** consists of four graves, **LAN 003** is a possible single grave and **LAN 005** consists of approximately 15 graves (these three sites are of High heritage significance).

All of the proposed development routes present possible impacts on the heritage resources identified. The identified burial grounds and graves are rated as a having High/Medium Heritage Significance as well as being Generally Protected A (GP.A). Mitigation measures and permits are therefore required before they may be affected or moved/destroyed, thus the sites identified are considered as “no go” areas until further mitigation is implemented.

As the informal burial grounds (LAN 001 and LAN 005) occur where Layout options overlap, from a heritage perspective all of the five layout options will be impacted equally. However, if mitigation measures are followed, all layout options will have a LOW impact on heritage resources and development can proceed.

Extent of mitigation

Mitigation will only be required for LAN 001, LAN 003 and LAN 005 (burial grounds)

- Demarcate the site as a no go area, with a 20-meter buffer and a fence.
- It is also recommended that the Environmental Control Officer (ECO) monitor construction at these locations.
- If the graves will be disturbed in any way during construction or operation, and a buffer is not possible, a grave relocation process will need to take place.

Palaeontology

A paleontological Impact Assessment was conducted by Banzai Environmental (Pty) Ltd.

All the proposed development routes are completely underlain by the Halfway House Granite Dome. The Halfway House Granite is a coarse-grained plutonic igneous rock type which was formed by crystallisation directly from a liquid magma deep within the Earth's crust. The potential for any fossil materials occurring within this rock unit is thus zero.

The proposed development is thus unlikely to pose a substantial threat to local fossil heritage. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development. Any of the five proposed routes are accepted as suitable options.

This report has been compiled taking into account the National Environmental Management Act (NEMA) Appendix 6 requirements for specialist reports as indicated in the table below.

NEMA Regs (2017) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vitae	Section 1.2 – refer to Appendix B
A declaration that the person is independent in a form as may be specified by the competent authority	Page 2 of the report
An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 5
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 3
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3.2, 4.1- 4.2
An identification of any areas to be avoided, including buffers	Section 4.1
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;	
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
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
Any mitigation measures for inclusion in the EMPr	Section 6
Any conditions for inclusion in the environmental authorisation	Section 6
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 6
If the opinion is that the proposed activity 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	
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.
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.
Any other information requested by the competent authority.	Not applicable.

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1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Nema Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Report (EIA) for the proposed development of the Lanseria Outfall Sewer, Johannesburg, Gauteng.

A total of five heritage sites¹ was identified within the proposed development area. These include the remains of stone walled structures (LAN 002 and LAN 004), most likely old farm buildings, and three burial grounds. LAN 001 consists of four graves, LAN 003 is a possible single grave and LAN 005 consists of approximately 15 graves.

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 and as a result help determine if the proposed layout is viable. The HIA aims to inform the EIA in the development of a comprehensive EMP to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop the heritage resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 80 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes and will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

¹ **Heritage site** as used in this report refers to a place/locality where a heritage resource occurs and not a declared heritage site as contemplated by s2 of the NHRA. “s2(xviii) *heritage site*” means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority;

Jessica Angel holds a Masters degree in Archaeology and is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA).

Mr. 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).

Refer to **Appendix B** for CV's.

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the development area. Various factors account for this, including the subterranean nature of some archaeological sites. As such, should any heritage features and/or objects not included in the present inventory, be located or observed, a heritage specialist must immediately be contacted.

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, which also applies to graves and burial grounds. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

Access to certain areas of the alignment was hampered by dense vegetation, while general access through the numerous properties intersected was challenging.

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 -

- i. National Environmental Management Act (NEMA) Act 107 of 1998
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
- iii. Minerals 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.

- i. National Environmental Management Act (NEMA) Act 107 of 1998
 - a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
 - b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
 - c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
 - d. Environmental Management Plan (EMP) – Section (34)(b)
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
 - a. Protection of Heritage Resources – Sections 34 to 36; and
 - b. Heritage Resources Management – Section 38
- iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
 - a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority, and that an HIA will be required if a development triggers any of the development types listed in s38 of the NHRA. s34-36 further stipulates the protections afforded to structures older than 60 years, archaeological, palaeontological, meteorites, graves and burial grounds, as well as the process to be followed if these resources need to be disturbed.

NEMA states that an integrated EMP should, (23 -2 (b)) “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”. In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive legally compatible AIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

This includes -

- i. 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;

- ii. 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;
- iii. 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;
- iv. 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 -

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

Earlier Stone Age

The archaeology of the Stone Age, between 400 000 and 2500 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.

Holocene

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

Later 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 1800s, associated with people who carried out 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.

<i>Abbreviations</i>	<i>Description</i>
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Later Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

Refer to **Appendix A** for further discussions on heritage management and legislative frameworks.

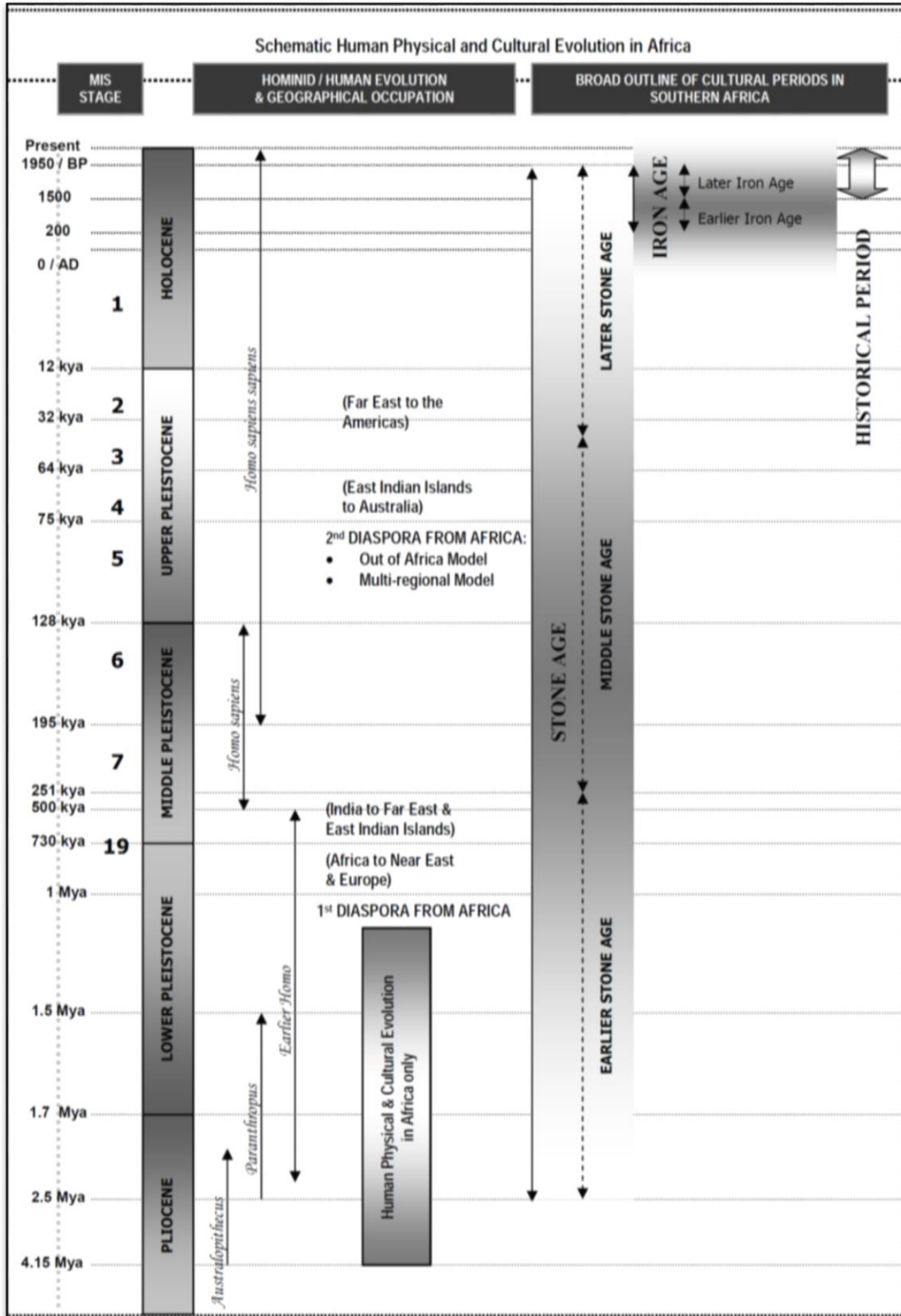


Figure 1: Human and Cultural Time line in Africa (Morris, 2008).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Project Description

The proposed Lanseria Outfall Sewer will be located in the Johannesburg Water (JW) Lanseria Sewage Drainage Basin, in the northern part of the City of Johannesburg Metropolitan Municipality. The upstream end of the Outfall Sewer will start at the existing Zandspruit Sewer Pump Station and run in a north-north-westerly direction to the site of the new Lanseria Waste Water Treatment Works (WwTW) (options are available to both site alternatives), following the Klein Jukskei and Jukskei Rivers.

The Lanseria Outfall Sewer will have a length of around 12.4 km. The upstream section of the pipe length (40% to 50% of the total pipe length) runs within an area which is characterized by smallholdings, low-density residential developments and small to large commercial concerns. This section of the pipeline is along the Klein Jukskei River. The remainder of the pipe length is characterised as mostly rural and located in the Northern Farm and Lanseria areas. This area has some industrial developments, notably the Lion Park Quarry and the Lanseria Airport.

As part of the EIA Process, Nema Consulting will be considering alternative route alignments for the outfall sewer as follows:

Route to Site 1 (Figure 2):

- Alternative 1 - Gravitational Route
- Alternative 2 - Gravitational Route

Route to Site 2 (Figure 3):

- Alternative 1 - Gravitational Route
- Alternative 2 - Pumped and Gravitational Route
- Alternative 3 - Tunnelled Route (planned to go underneath the Lanseria Airport)

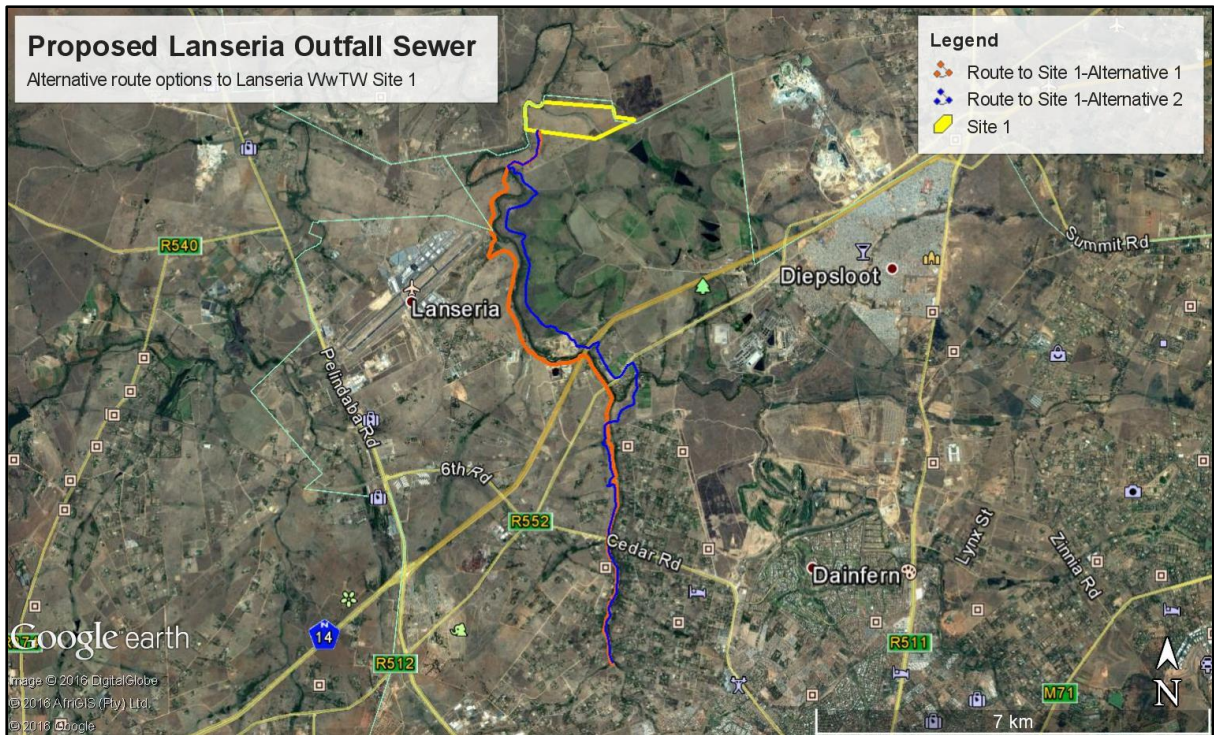


Figure 2: Google Earth image of the proposed outfall sewer pipeline routes to the future WwTW (Site 1) (Map provided by Nema Consulting, 2017).

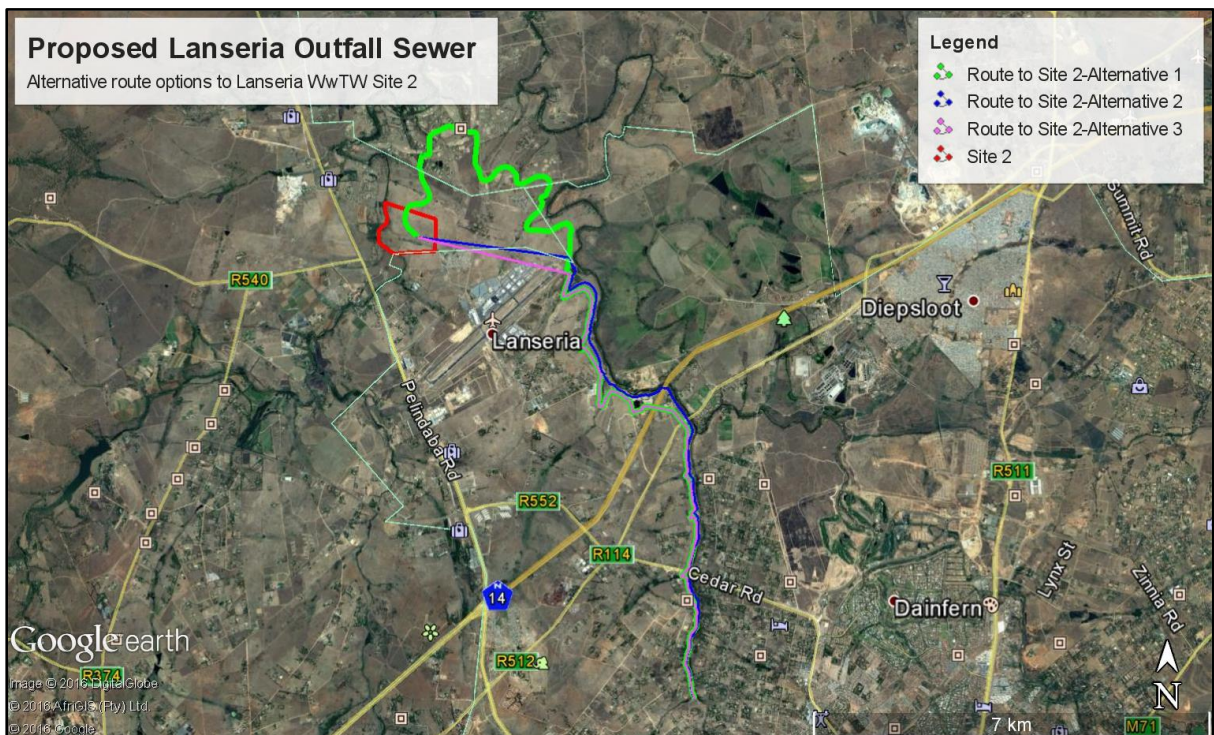


Figure 3: Google Earth image of the proposed outfall sewer pipeline routes to the future WwTW (Site 2). (Map provided by Nema Consulting, 2017).

2.2 Site Description

The proposed site occurs to the east of the R512 and is diverse, ranging from residential country estates at the northern side of the development area to open grasslands (Figure 8) and equestrian farms on the southern side. The development area crosses over the Jukskei and the Crocodile Rivers where the vegetation is thicker (Figure 9). There are farm houses scattered throughout the area (Figure 4 and Figure 5). The development area also intercepts the Lanseria airport (Figure 6). Most the area has been disturbed or previously developed.

The area is typical of the Highveld and is characterised by a relatively flat topography. The area consists of relatively flat topography with slight undulations, containing a mixture of grasslands and old agricultural fields with pockets of trees here and there. The Land Types of the general region are defined as grasslands and woodland with several plant communities typical of the relevant ecosystems (Eloff, 2010). The terrain of the research area is mainly grassland with exotic tree plantings near houses and industrial developments.

This agricultural landscape is located in close proximity to urban and peri-urban areas and is subject to a variety of activities and land utilisation including quarrying, roads, railways, agro-industry (poultry) and buildings. Although the area is predominantly rural, several light and service industries have been established in the area. Commercial and shopping centres have also been established in the area. Moreover, the area under review is in relative close proximity to the Cradle of Humankind UNESCO World Heritage site and also falls within the Transition Zone, one of the three management zones of the Magaliesberg Biosphere Reserved listed by UNESCO in June 2015.



Figure 4: View of a residential farm near the Lanseria airport



Figure 5: View of an abandoned farm house



Figure 6: Lanseria Airport



Figure 7: View of the water treatment facility



Figure 8: View of general vegetation



Figure 9: General view along one of the tributaries

3 ASSESSMENT METHODOLOGY

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

3.1 Methodology for Assessing Heritage Site Significance

The applicable maps, tables and figures are included, as stipulated in NHRA and NEMA. The HIA process consists 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 vehicle and on foot along the proposed area by a qualified archaeologist, 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 the 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 - 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 1: Site significance classification standards as prescribed by SAHRA.

FIELD RATING		GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National (NS)	Significance	Grade 1		Conservation; National Site nomination
Provincial (PS)	Significance	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 (GP.A)	A		High / Medium Significance	Mitigation before destruction
Generally Protected (GP.B)	B		Medium Significance	Recording before destruction
Generally Protected (GP.A)	C		Low Significance	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. 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 summarised explanation of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in *Table 2*.

Table 2: Impact Assessment Criteria

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	Negative	Negative impact on affected biophysical or human environment.
	Positive	Benefit to the affected biophysical or human environment.
Type	Direct	Are caused by the action and occur at the same time and place.
	Indirect or Secondary	Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
Spatial Extent over which impact may be experienced	Cumulative	Is the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
	Site	Immediate area of activity incorporating a 50m zone which extends from the edge of the affected area.
Duration of impact	Local	Area up to and/or within 10km of the 'Site' as defined above.
	Regional	Entire community, drainage basin, landscape etc.
	National	South Africa.
	Short-term	Impact would last for the duration of activities such as land clearing, land preparation, fertilising, weeding, pruning and thinning. Quickly reversible.
Severity	Medium-term	Impact would after the project activity such as harvesting. Reversible over time.
	Long-term	Impact would continue beyond harvesting/ extraction of the trees.
	Permanent	Impact would continue beyond decommissioning.
	Low, Medium, High Negative	Based on separately described categories examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning or slightly alters the environment itself.
Low, Medium, High Positive		
Reversibility	Completely Reversible	The impact can be completely reversed with the implementation of correct mitigation and rehabilitation measures.
	Partly Reversible	The impact can be partly reversed providing mitigation measures are implemented and rehabilitation measures are undertaken

Irreplaceable Loss	Irreversible	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures.
	Resource will not be lost	The resource will not be lost or destroyed provided mitigation and rehabilitation measures are implemented.
	Resource may be partly destroyed	Partial loss or destruction of the resource will occur even though all management and mitigation measures are implemented.
	Resource cannot be replaced	The resource cannot be replaced no matter which management or mitigation measures are implemented.
Probability of occurrence	Unlikely	<40% probability.
	Possible	40% probability.
	Probable	>70% probability.
	Definite	>90% probability.
Mitigation Potential [i.e. the ability to manage or mitigate an impact given the necessary resources and feasibility of application.]	High or Completely Mitigatable	<p>Relatively easy and cheap to manage. Specialist expertise or equipment is generally not required.</p> <p>The nature of the impact is understood and may be mitigated through the implementation of a management plan or through ‘good housekeeping’. Regular monitoring needs to be undertaken to ensure that any negative consequences remain within acceptable limits.</p> <p>The significance of the impact after mitigation is likely to be low or negligible.</p>
	Moderate or Partially Mitigatable	<p>Management of this impact requires a higher level of expertise and resources to maintain impacts within acceptable levels. Such mitigation can be tied up in the design of the Project.</p> <p>The significance of the impacts after mitigation is likely to be low to moderate.</p> <p>May not be possible to mitigate the impact entirely, with a residual impact(s) resulting.</p>
	Low or Unmitigatable	<p>Will not be possible to mitigate this impact entirely regardless of the expertise and resources applied.</p> <p>The potential to manage the impact may be beyond the scope of the Project.</p> <p>Management of this impact is not likely to result in a measurable change in the level of significance.</p>
Impact Significance	Negligible	-
	Low	Largely of HIGH mitigation potential, <u>after</u> considering the other criteria.
	Moderate	Largely of MODERATE or partial mitigation potential <u>after</u> considering the other criteria.
	Substantial	Largely of LOW mitigation potential <u>after</u> considering the other criteria.

4 ARCHIVAL AND DESKTOP RESEARCH FINDINGS

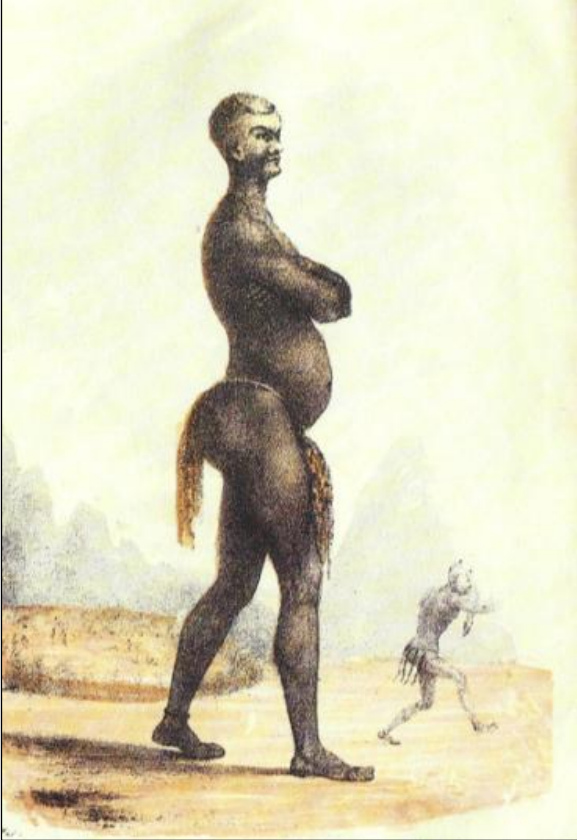
4.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during fieldwork, as summarised in **Table 3**.

Table 3: Summary of History of the study area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in South Africa’s archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan, which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago. Examples of such tools have been excavated from the sites of Sterkfontein and Coopers D in the ‘Cradle of Humankind’. The second technological phase in the earlier stone age of Southern Africa is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago and examples of this phase have been found at Swartkrans and in the river gravels of the ‘Cradle of Humankind’ (Hilton-Barber & Berger, 2002). Another archaeological site associated with the Earlier Stone Age from the general vicinity of the study area, is the Boulders site that was excavated by Professor R.J. Mason during 1997. Although the site has yielded artefacts primarily associated with the more recent past, the oldest levels revealed artefacts characteristic of the Earlier Stone Age. The site is preserved within the Boulders Shopping Centre, Midrand (Mason, 1997; Mason, 2000) and is located approximately 25 km south-east of the study area.</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age 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. Examples of such artefacts have been found in the ‘Cradle of Humankind’ at Swartkrans (Hilton-Barber & Berger, 2002).</p> <p>At least two more sites with material associated with the Middle Stone Age are known from the wider vicinity of the study area. The first of these is the site known as Boulders which, as indicated above, was excavated by Professor Mason in 1997. Here Mason excavated Middle Stone Age artefacts which he associated with similar material from the Cave of Hearths at Makapan and from Olieboompoort (Mason, 2000). The second example is the intact Middle Stone Age sealed cave context at Pietkloof Cave, located a short distance north of the Skurweberge. This cave is located roughly 19 km north east of the study area (Mason, 1951).</p>
40 000 years ago to the historic past	<p>The Later Stone Age is the third oldest phase identified in South Africa’s archaeological history. This phase in human history is associated with an abundance of very small stone artefacts known as microliths. A large number</p>

DATE	DESCRIPTION
	<p>of Later Stone Age sites are known from the 'Cradle of Humankind' (Hilton-Barber & Berger, 2002) and general surroundings of the study area. Some of these sites from the general surroundings include Boulders, Glenferness Cave, Pietkloof Cave and Hennops River Cave. Glenferness is a cave situated above the Jukskei River (roughly 17 km southeast of the study area), while Hennops River Cave is a south-facing dolomitic solution-cavity above the Hennops River (Mason, 1951; Mason, 2000).</p>
<p>AD 450 – AD 750</p>	<p>The Mzonjani facies of the Kwale Branch of the Urewe Ceramic Tradition is the earliest Iron Age presence for which archaeological evidence had been found in the surroundings of the study area. One of the well-known sites from this period in the direct surroundings of the study area, is the site known as Broederstroom, located on the farm of the same name roughly 13 km northwest of the present study area. The key features on the decoration of the ceramics from this facies comprise punctuates on the rim and spaced motifs on the shoulder of the vessel (Huffman, 2007).</p>
<p>AD 1500 - AD 1700</p>	<p>The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the next Iron Age facies to be identified within the surroundings of the study area. Some of the closest sites to the study area associated with this facies include Broederstroom (see above) and Ifafi. The latter site is located some 19 km northwest of the study area. 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).</p>
<p>AD 1650 - AD 1850</p>	<p>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. The type-site is Uitkomst Cave, located approximately 15 km west of the study area. The decoration on the ceramics associated with this facies is characterised by stamped arcades, appliqué of parallel incisions, stamping as well as cord impressions (Huffman, 2007).</p> <p>Based on the available archaeological and oral evidence from this period, the sixteenth and seventeenth centuries saw the movement of Sotho/Tswana communities from the lower lying Bushveld habitats in the north (where they had been settled since AD 1500) toward the higher, predominantly grassland areas to the south. By AD 1650, these communities had successfully settled in these areas (Hall, 2007).</p> <p>The excavations of Mason (1997, 2000) at Glenferness Cave and the Boulders site in the Midrand area have revealed that Late Iron Age people arrived in that area with clay pottery very similar to that excavated at Uitkomst Cave.</p>
<p>AD 1700 – AD 1840</p>	<p>The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the fourth Iron Age period to be identified within the surroundings of the study area. The key features found on the decorated ceramics from this facies include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007). A Late Iron Age stone-walled site was identified on the eastern portion of the farm Knoppieslaagte 385 JQ during a previous HIA survey and was subsequently documented and partially excavated (Boeyens,</p>

DATE	DESCRIPTION
	et al, 2005). This site is located roughly 18 km east of the study area. The site consisted of four separate settlement units. The pottery excavated displays characteristics of what is referred to as the Olifantspoort facies of the Moloko Branch. Stone-walled sites like this tend to be associated with the Late Moloko and post-date AD 1600 (Boeyens, et al, 2005).
1827	During the so-called Difaqane, the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi moved through the general vicinity of the study area in a northward direction toward the Magalies River and Commando Nek (Bergh, 1999).
 <p data-bbox="268 1556 1353 1641"><i>Figure 10: Historic image depicting King Mzilikazi of the Khumalo Ndebele, as published by Cornwallis Harris (Harris, 1839).</i></p>	
1830s to 1840s	The arrival and settlement of the first Voortrekker families in the area.
1855	The town of Pretoria was established in 1855 and, two years later, in 1857 the District of Pretoria was proclaimed (Bergh, 1999).
1852	J.H. Davis discovers gold on the farm Paardeplaats / Groot Paardekraal (Bergh, 1999).

DATE	DESCRIPTION
1880-1881	While the Anglo-Transvaal War of 1880 to 1881 is better known for battles and events which took place further afield, such as Schuinshoogte and Amajuba, one battle took place approximately 25 km east of the present study area on the farm Brakfontein 390 JR. The Battle of Rooihuiskraal (12 February 1881) entailed an attack by a British force under the command of Lieutenant-Colonel G.F. Gildea on a Boer position at the farmstead (known as 'rooi huis') of Erasmus Erasmus. A number of the British soldiers were wounded or killed and they were forced to withdraw back to Pretoria (Van Ewyk, 1986).



Figure 11: Historic group photograph, with Lieutenant Colonel G.F. Gildea (centre), during the Siege of Pretoria, which took place during the Anglo-Transvaal War (1880-1881) (Allen, 2007:100). Gildea was in command of the British forces during the Battle at Rooihuiskraal.

1881	S.J. Minnaar discovered gold on the farm Kromdraai in this year. Minnaar's discovery brought the attention back to Krugersdorp after it had shifted south to the Heidelberg area (Bergh, 1999). The farm Kromdraai is located roughly 16 km southwest of the study area.
1882	Gold was discovered on the farm Tweefontein. By June 1885 a stamp battery was working on the farm (Bergh, 1999). The farm Tweefontein is located roughly 14 km west of the study area.
January 1884	Fred Struben discovers gold on the farm Sterkfontein (Bergh, 1999). The farm Sterkfonteis located roughly 19 km southwest of the study area.

DATE	DESCRIPTION
April 1884	Fred Struben discovers banket for the first time on the farm Paardeplaats / Groot Paardekraal (Bergh, 1999).
March 1885	Fred Struben discovers gold bearing conglomerate on the farm Honingklip (Bergh, 1999). This farm is located roughly 20.8 km southwest of the study area.
8 December 1885	The farm Kromdraai was proclaimed a public diggings, thereby becoming the first farm in the Witwatersrand to be officially declared a gold field (Bergh, 1999).
1887	The discovery of gold along the Witwatersrand and the proclamation of public diggings on various farms in the area such as Paardekraal, Vogelstruisfontein, Luipaardsvlei, Klipplaat, Heuningklip and Wilgespruit led to the establishment of a stands township on the farm Paardekraal in 1887. On the request of Paardekraal's owner, the town was named after President Paul Kruger. The district town of Krugersdorp was proclaimed in November 1894 (Du Plooy, 2004).
1899 – 1902	<p>No evidence for battles or skirmishes in the direct vicinity of the study area during the South African War (1899-1902) could be found. However, two of the closest skirmishes and battles which could be identified during the desktop study will be discussed below.</p> <p>The first of these is the Battle of Kalkheuvel Pass on 3 June 1900. The battle can be described as forming part of the bigger onslaught on Pretoria. The pass is located on the farm Kalkheuvel 493 JR, roughly 15 km northwest of the study area. Arriving at Diepsloot, a British force under the command of General Ian Hamilton and General French established that the only suitable place to cross over the Jukskei River was at a place called Roodewal further to the west. French's force now consisted of the 1st and 4th Cavalry Brigades with General Hutton's Mounted Infantry Brigade following in support. French's force was subsequently attacked as they attempted to force their way through Kalkheuvel Pass. However, as darkness fell the Boer force withdrew and the battle ended, leaving a number of dead and wounded on both sides (Copley, 1993).</p> <p>The second skirmish occurred during December 1900 on the farm Tweefontein 523 IQ. This farm is located approximately 17 km west of the study area. A brief background to this skirmish will be given. After the occupation of Pretoria by Lord Roberts on 5 June 1900 and the subsequent occupation of Krugersdorp on the 18th of June 1900 by British troops under Major-General Archibald Hunter (Du Plooy, 2004), the guerrilla phase of the war was about to begin in the study area and wider surroundings. During this time field cornet Sarel Oosthuizen, the commander of the Krugersdorp commando, started dividing it into a number of smaller more mobile commandoes which were associated with various regions of the Krugersdorp district. The most significant of these for the present study was the Zwartkop commando, named after the hill of that name. This hill is located just over 19 km southwest of the present study area. The</p>

DATE	DESCRIPTION
	<p>commando fell under the command of field cornet Frans van Zyl, whose farm Tweefontein was also used as their base. While the Zwartkop commando based themselves at Tweefontein, they also made use of the strategic Zwartkop Hill, as it provided them with a very good all-round view of the entire area. During the latter part of 1900, a number of raids were undertaken by the commando on British outposts at Kromdraai, Sterkfontein and other farms in the area to the west of the study area. A response to these attacks came in December 1900, when General R.A.P. Clements led a farm-burning column into the areas to the west of the study area. While camped on the farm Sterkfontein, Clements' column spent two days destroying a number of farms in Kromdraai and the Crocodile River valley. On the third day, the slopes of Zwartkop were shelled from gun emplacements on the Krugersdorp ridge, thereby scattering the members of the commando who were based there. With a classic pincer movement the British attempted to capture field cornet Van Zyl and the Zwartkop commando on the farm Tweefontein. However, the commando managed to escape to the south and ended up at Roodepoort. Two days later, General Clements moved on to Hekpoort, and the members of the Zwartkop commando returned to their positions at Zwartkop and Tweefontein (Carruthers, 2007).</p>



Figure 12: Historic photograph depicting General French's Cavalry approaching Pretoria. Note the remains of a Late Iron Age stonewalled settlement visible in the background (Goldmann, 1902).

<p>1972</p>	<p>Lanseria Airport</p> <p>In 1972, two Pretoria pilots, Fanie Haacke and Abe Sher, identified the ideal site for an airport in this area. Issues such as the proposed airport's location</p>
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DATE	DESCRIPTION
	<p>in relation to residential areas, land suited to long runways with good approaches, identification of smog and fog-free zones and a site in open surrounds in case of forced landings, were instrumental in ensuring Lanseria's enduring success.</p> <p>The Krugersdorp and Roodepoort Municipalities as well as the Transvaal Peri-Urban Board purchased the land and contracted it to the newly formed Lanseria Management Company on a 99-year lease. Lanseria International Airport was opened to air traffic by, the then minister of transport, Hannes Rall, on 16 August 1974. On that day, a Learjet ZS-MTD became the first jet to land at Lanseria International Airport.</p> <p>When former President, Nelson Mandela, was released from prison in May 1990, he was flown to Johannesburg and the first time he set foot on Gauteng soil after such a long time, was when he stepped off his aircraft onto the tarmac at Lanseria. (http://www.lanseria.co.za/history)</p>
1995	<p>The Diepsloot Township is located roughly 10 km from the study area and was established in 1995 as a transit camp for families from informal settlements in Alexandra (www.joburg.org.za).</p>

4.2 Palaeontology

All of the proposed development sites and alternative routes are completely underlain by the Halfway House Granite Dome. The Halfway House Granite is a coarse-grained plutonic igneous rock type which was formed by crystallisation directly from a liquid magma deep within the Earth's crust. The potential for any fossil materials occurring within this rock unit is thus zero.

The proposed development is thus unlikely to pose a substantial threat to local fossil heritage. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development. Any of the five proposed routes are accepted as suitable options from a palaeontological perspective.

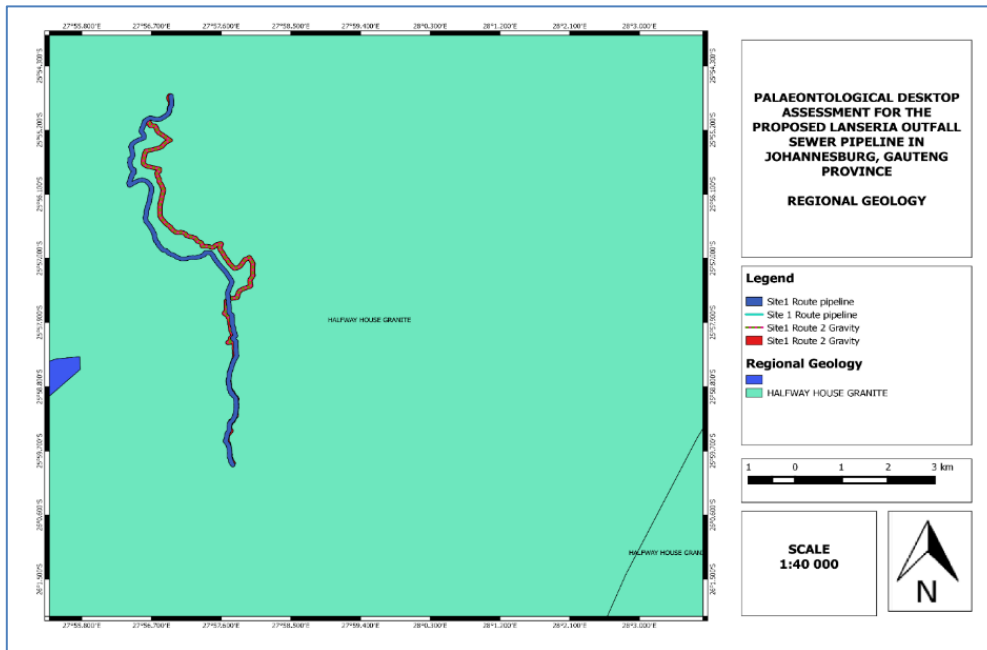


Figure 13: The surface geology of routes to Site 1 of the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. The site is completely underlain by the Halfway House Granite Dome (Banzai Environmental 2017)

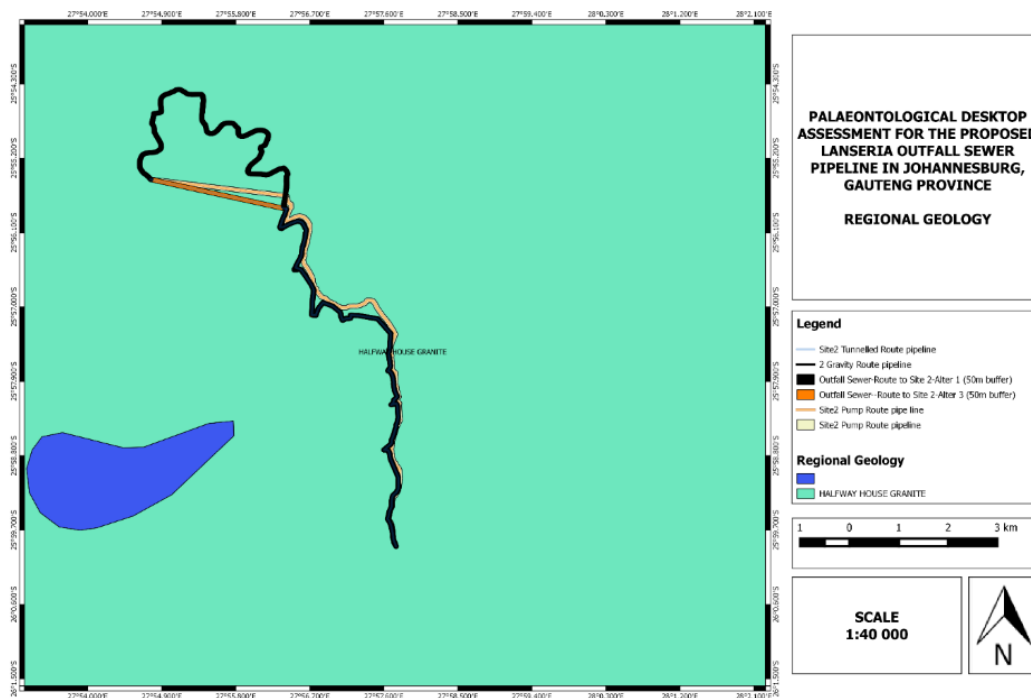


Figure 14: The surface geology of routes to Site 2 of the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. The site is completely underlain by the Halfway House Granite Dome (Banzai Environmental 2017)

5 FIELD WORK FINDINGS

Due to the nature of cultural remains, with the majority of artefacts occurring below the surface, a controlled-exclusive surface survey was conducted over a period of three days, on foot and by vehicle, by three archaeologists from PGS. The fieldwork was conducted on the 6th, 20th and 21st of April 2017.

The track logs (in blue) for the survey are indicated on the map below. The various alternative routes for the two sites have been combined in *Figure 15*.

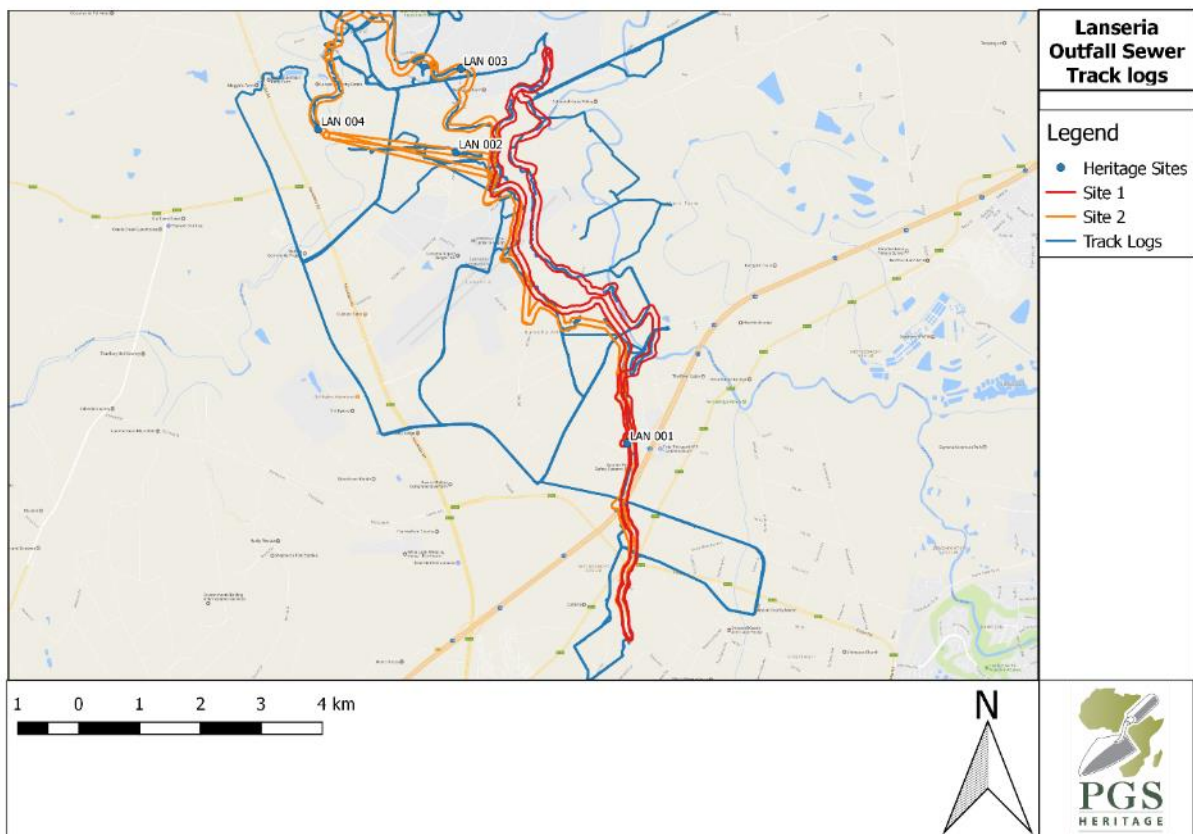


Figure 15: Map indicating track logs of the HIA conducted.

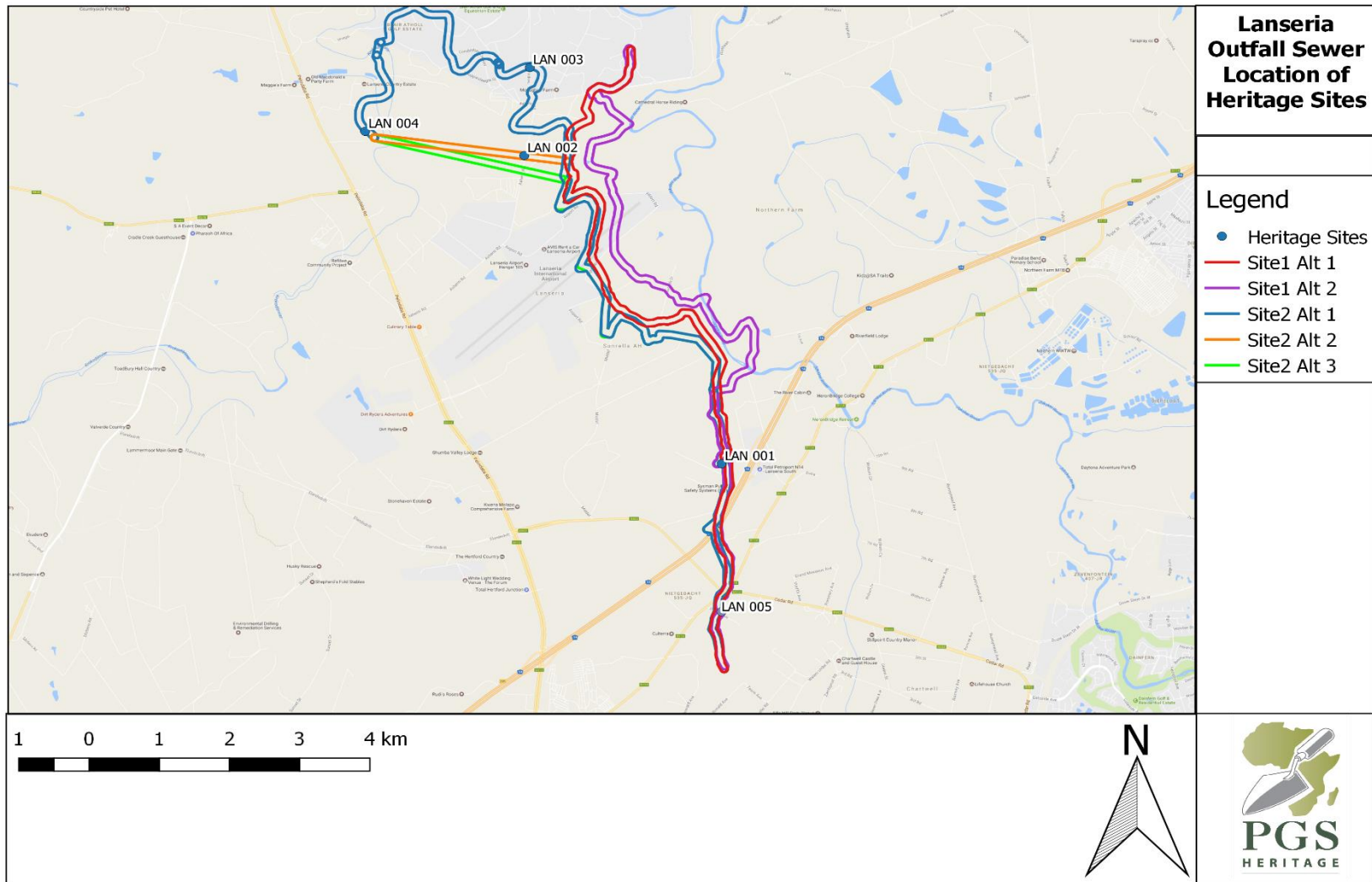


Figure 16: Map indicating the location of Heritage sites

5.1 Heritage Findings

A total of five heritage sites were identified within the proposed development area.

5.2 Fieldwork Findings

5.2.1 LAN 001

GPS Coordinates: -25.969691°, 27.962125°

Route alternatives affected:

- Site 1 Alternative 2;
- Site 2 Alternative 1; and
- Site 2 Alternative 2.

Site Description:

A small informal burial ground is located here. It consists of three large graves next to each other and one smaller grave below the three large graves. The graves are stone backed and oriented east to west.



Figure 17: View of the informal burial ground

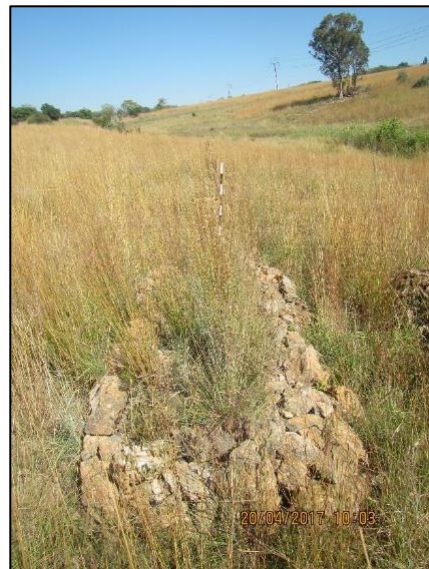


Figure 18: Close up view of one of the graves at LAN 001.

Site Significance:

The identified site **LAN 001** is deemed to be of **High heritage significance** and is rated as **Generally Protected A (GP.A)**. Mitigation measures and permits are therefore required before the site may be affected, moved or destroyed.

Please refer **Section 8** for the required mitigation measures.

5.2.2 *LAN 002:*

GPS Coordinates: -25.926764°, 27.934044°\

Route alternatives affected:

- Site 2 Alternative 2.

Site Description:

Remains of a small dwelling occur at this location. Only the foundation and a few bricks remain. The structure occurs between a small clump of trees and is about 5x5m.



Figure 19: Remains of a structure at LAN 002

Site Significance:

The identified site LAN 002 is deemed to be of **Low heritage significance** and no further mitigation measures will be necessary.

5.2.3 LAN 003:

GPS Coordinates: -25.914496°, 27.934840°

Route alternatives affected:

- Site 2 Alternative 1.

Site Description:

A possible grave occurs at this location. A rock packed feature occurs with an east to west orientation which is typical of graves. The feature occurs under a small clump of trees.



Figure 20: Possible Grave at LAN 003



Figure 21: Grave at LAN 003.

Site Significance:

The identified site LAN 003 is deemed to be of **High heritage Significance** and is rated as **Generally Protected A (GP.A)**. Mitigation measures and permits are therefore required for the site before it is affected, moved or destroyed.

Please refer **Section 8** for the required mitigation measures.

5.2.4 LAN 004:

GPS Coordinates: -25.914496°, 27.934840°

Route alternatives affected:

- Site 2 Alternative 1

Site Description:

The remains of a small stone walled structure occurs at this location. The structure is rectangular in shape and consists of stone packed walls which have collapsed. There are two small rooms, one of about 5x5 m and a second room attached which measures about 2x1 m



Figure 22: View of the identified structure at LAN

004



Figure 23: View of the stone walling at LAN 004.

Site Significance:

The identified site LAN 004 is deemed to be of **Low heritage significance** and no further mitigation measures will be necessary.

5.2.5 LAN 005

GPS Coordinates: -25.990286°, 27.962121°

Route alternatives affected:

- Site 1 Alternative 1;
- Site 1 Alternative 2;
- Site 2 Alternative 1; and
- Site 2 Alternative 2.
- Site 2 Alternative 3;

Site Description:

A small informal burial ground is located here. It consists of approximately 15 graves. The area where the graves are located is heavily overgrown with thick vegetation and it is difficult to determine exactly how many graves are present. The graves are stone packed and oriented east to west.



Figure 24: View of the informal burial ground completely overgrown



Figure 25: Close up view of one of the graves at LAN 005.

6 OVERALL IMPACT EVALUATION

The study has identified that the proposed project activities will have an impact on the identified heritage resources in the project area, however all the envisaged impacts on heritage resources, can be mitigated. The study has identified that the proposed project activities will have a High to Medium impact on heritage resources.

6.1 Status Quo and “No Go” Areas

6.1.1 *Status Quo*

A total of five heritage sites were identified within the proposed development area.

The proposed development present possible impacts on some of the heritage resources identified (**LAN 001**, **LAN 003**, and **LAN 005**). The identified heritage sites are rated as having a High heritage Significance, as well as being Generally Protected A (GP.A).

6.1.2 *“No go” Areas*

The sites rated as having **High heritage Significance** as well as being **Generally Protected A (GP.A)** are deemed as no-go areas without the implementation of mitigation. Mitigation measures and permits are required before they may be affected or moved/destroyed, thus the sites identified are considered “no go” areas until further mitigation is implemented.

6.2 Project Impact (Unmitigated)

During the construction, impacts may occur to Heritage resources as identified for the project. These impacts will occur as a result of construction activities such as topsoil stripping, excavations and vegetation clearing.

The combined weighted project impact to the Heritage resources (prior to mitigation) will possibly be of a moderate to high negative significance. The impact will be permanent and is in all likelihood going to happen. The impact risk class is thus **moderate to high**.

However, the implementation of the recommended mitigation measures will minimise the impacts and reduce the overall impacts to **low**.

The combined weighted project impact to the Palaeontological resources (prior to mitigation) will be of a low negative significance. The impact will be insignificant.

6.3 Cumulative Impact

The baseline impacts are considered to be moderate for Heritage resources, and additional project impacts (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts, where the cumulative unmitigated impact will probably be of a moderate to high significance. The impact is going to happen and will be of short term in nature, therefore the impact risk class will be Moderate to High. However, with the implementation of the recommended management and mitigation measures this risk class can be minimized to a Low rating.

7 SUMMARY IMPACT ASSESSMENT TABLE

POTENTIAL IMPACTS (in order of impact as described in Impact Matrix)	ASPECT (refer to Impact Matrix)	Nature	Type	Extent	Duration	Severity	Reversibility	Irreplaceable Loss	Probability	MITIGATION POTENTIAL	IMPACT SIGNIFICANCE		MITIGATION MEASURES
											Without Mitigation	With Mitigation	
CONSTRUCTION PHASE													
Impacts on palaeontological resources	Heritage Resources	Negative	Direct	Site	Permanent	Low	Irreversible	Resource cannot be replaced	unlikely	High	Low	Low	Refer to Section 8 and 9
Impact on burial grounds	Heritage Resource	Negative	Direct	Local	Permanent	High negative	Irreversible	Resource cannot be replaced	Probable	Moderate or Partially Mitigatable	High	Low	Refer to Section 8 and 9

8 HERITAGE MANAGEMENT GUIDELINES

8.1 General Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
 - (a) the construction of a road, wall, transmission 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 5 000 m² 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 10 000 m² 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.

In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the SAHRA needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).

This survey and evaluation must include:

- (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 of the National Heritage Resources Act;
- (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.

3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
 - a. Heritage;
 - b. Graves;
 - c. Archaeological finds; and
 - d. Historical Structures.

This module must be tailor made to include all possible finds that could be expected in that area of construction.

Possible finds include:

 - a. Open air Stone Age scatters, disturbed during vegetation clearing. This will include stone tools.
 - b. Palaeontological deposits such as bone, and teeth in fluvial riverbank deposits.
4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
7. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
8. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
9. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

Table 4: Roles and responsibilities of archaeological and heritage management when heritage resources are discovered during construction

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should attend all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology support team

Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites, when discovered.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into the employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites (when discovered). The client with the specialist needs to agree on the scope and activities to be performed	The client	Environmental Consultancy and the Archaeologist
When a specialist/archaeologist has been appointed for mitigation work on discovered heritage resources, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

8.2 All phases of the project

8.2.1 Archaeology

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area.

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches 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 is often changed or

added to during the subsequent history of the project. 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 recognise any significant material being unearthed, and to make the correct judgment on which actions should be taken. In the event that possible heritage resources are identified a qualified archaeologist/palaeontologist must be contacted to evaluate the finds and make recommendations on the mitigation required.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological/palaeontological site or cultural material be discovered during construction (or operation), such as graves or burial grounds, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist/palaeontologist available to do such work. This provision can be made in an archaeological monitoring programme.

In the case where archaeological material is identified during construction the following measures must be taken:

- Upon the accidental discovery of archaeological material, a buffer of at least 20 meters should be implemented.
- If archaeological material is accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the material permit must be applied for from SAHRA under Section 35 of the NHRA.

8.2.2 *Graves*

In the case where a grave is identified during construction the following measures must be taken:

- Upon the accidental discovery of graves, a buffer of at least 50 meters should be implemented.
- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a permit must be applied for from SAHRA (Section 36 of the NHRA) and other relevant authorities

(National Health Act and its regulations). The local South African Police Services must immediately be notified of the find.

- Where it is recommended that the graves be relocated, a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

- i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
 - ii. Site notices indicating the intent of the relocation;
 - iii. Newspaper notices indicating the intent of the relocation;
 - iv. A permit from the local authority;
 - v. A permit from the Provincial Department of Health;
 - vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
 - vii. An exhumation process that keeps the dignity of the remains intact;
 - viii. The whole process must be done by a reputable company that is well versed in relocations;
- The exhumation process must be conducted in such a manner as

9 CONCLUSIONS AND RECOMMENDATIONS

PGS Heritage (Pty) Ltd (PGS) was appointed by Nemai Consulting to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Report (EIA), for the proposed development of the Lanseria Outfall Sewer, Johannesburg, Gauteng.

A total of five heritage sites were identified within the proposed development area. These include the remains of stone walled structures (**LAN 002** and **LAN 004** both of Low heritage significance), most likely old farm buildings. Three burial grounds, **LAN 001** consists of four graves, **LAN 003** is a possible single grave and **LAN 005** consists of approximately 15 graves (these three sites are of High heritage significance).

All of the proposed development routes present possible impacts on the heritage resources identified. The identified burial grounds and graves are rated as a having High/Medium Heritage Significance as well as being Generally Protected A (GP.A). Mitigation measures and permits are therefore required

before they may be affected or moved/destroyed, thus the sites identified are considered as “no go” areas until further mitigation is implemented. (Refer to Section 8 for guidelines).

As the informal burial grounds (LAN 001 and LAN 005) occur where Layout options overlap, from a heritage perspective, all of the five layout options will be impacted equally. However, if mitigation measures are followed, either route will have a LOW impact on heritage resources and development can proceed.

Extent of mitigation

Mitigation will only be required for LAN 001, LAN 003 and LAN 005 (burial grounds):

- Demarcate the site as a no go area, with a 20 m buffer and a fence.
- It is also recommended that the ECO monitor construction at these locations.
- If the graves will be disturbed in any way during construction or operation, and a buffer is not possible, a grave relocation process will need to take place

10 PALAEOLOGY

A paleontological Impact Assessment was conducted by Banzai Environmental (Pty) Ltd.

All of the five proposed development sites are completely underlain by the Halfway House Granite Dome. The Halfway House Granite is a coarse-grained plutonic igneous rock type which was formed by crystallisation directly from a liquid magma deep within the Earth’s crust. The potential for any fossil materials occurring within this rock unit is thus zero.

The proposed development is thus unlikely to pose a substantial threat to local fossil heritage. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development. Any of the five proposed routes are accepted as suitable options from a paleontological perspective.

11 PREPARERS

Jessica Angel – Heritage Specialist

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LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA**1 General principles**

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and paleontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the NHRA, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources is integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a formal burial ground (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have an interest in the graves - they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that -

An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and paleontological 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; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and pre-historic cultural remains, including graves and human remains.

2 Graves and burial grounds

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal burial ground administered by a local authority.

Graves in the category located inside a formal burial ground administered by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal burial ground but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the burial ground authority must be adhered to.

CURRICULUM VITAE OF TEAM**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

MPhil – Conservation of the Built Environment - Current

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 – PGS Heritage (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 and the Democratic Republic of the Congo

JESSICA ANGEL
Professional Archaeologist

Personal Details

- **Name:** Jessica
- **Surname:** Angel
- **Identity Number:** 8312250052082
- **Date of Birth:** 25-12-1983
- **Citizenship:** South African
- **Gender:** Female
- **Marital Status:** Single
- **Languages Spoken:** English and Afrikaans

Education History

- **2002:** Matriculated from Northcliff High School with the following subjects: English, Afrikaans, Mathematics, Science, Biology and Art.
- **2005:** Completed BA at University of the Witwatersrand with Geography and Archaeology Majors.
- **2006:** Completed BSc Hons (Geography) at the University of the Witwatersrand with the following subjects: Environmental Management, Advanced Geographic Information Systems (GIS), Paleogeomorphology and Globalisation and Agro Food Restructuring.
- **2009 – 2013:** M.Sc Archaeology and Geography, with thesis title: *Mpumalanga Late Iron Age: Incorporating Geographic Information Systems (GIS) and Archaeological Data to Better Understand Spatial and Temporal Distribution of Past Societies.* (Graduated March 2014).

Employment History

Part time employment as a student:

- **2011:** Research Assistant: GIS work for Prof Karim Sadr. Duties include: Google Earth survey work and digitising.
- **2012-2013:** Basic internship at PGS. Duties include gaining familiarity with gathering relevant background data, field surveys, exhumations and report writing.
- **2013:** Heritage work at NGT. Background research, report writing and ground surveys.
- **2015 - Present–** Archaeologist – PGS Heritage

Experience in the field of archaeology:

September 2012: First Phase Heritage Assessment. Belfast. Marko Hutten and Jennifer Kitto
August 2012: First Phase Heritage Assessment. Delareyville. Wouter Fourie. Stone Age survey
August 2012: Heritage Assessment. MP. Chris van Vuuren and Jennifer Kitto. Ndebele initiation site.
February 2013: Map survey. PTA East. Polka Birkholtz. Mapping Iron Age site.
February 2013: Grave Exhumation. Chlorkop. Marko Hutten
March 2013: First Phase Heritage Assessment. MP. Jennifer Kitto.
July 2013: Grave Exhumation. Mafikeng. Prof Maryna Steyn and Coen Nienaber.
November 2013: First Phase Heritage Assessment. Port Nolloth. Luke Verbant, Ursula Verbant.
January 2015 – June 2015: 10 Heritage Impact assessments and background research for PGS Heritage.