



PGS
HERITAGE

**PALAEONTOLOGICAL EXEMPTION LETTER OF THE PROPOSED 2.5ML PROCESS
WATER RESERVOIR AT GLORIA MINE, BLACK ROCK, HOTAZEL, NORTHERN CAPE**

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PGS Project No: 394PIA



+27 (0) 12 332 5305



+27 (0) 86 675 8077



contact@pgsheritage.co.za



PO Box 32542, Totiusdal, 0134

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological specialist 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 palaeontological 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 a palaeontological specialist 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;

PALAEONTOLOGICAL CONSULTANT:

Banzai Environmental (Pty) Ltd

CONTACT PERSON:

Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

SIGNATURE:



ACKNOWLEDGEMENT OF RECEIPT

Report Title	Palaeontological Exemption Letter of the proposed 2.5ml process water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape		
Control	Name	Signature	Designation
Author	Elize Butler		Palaeontologist
Reviewed			Principal Heritage Specialist
Client			

CLIENT:

EScience Associates (Pty) Ltd.

CONTACT PERSON:

Abdul Ebrahim,

E-mail: abdu@escience.co.za,

Tel: +27 (0)11 718 6380

SIGNATURE:



EXECUTIVE SUMMARY

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Assessment for the proposed 2.5ml process water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape.

This is a recommended exemption from further Palaeontological studies as the proposed development is smaller than 600 m².

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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;
- 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 2 500 000 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.

Abbreviations	Description
AIA	Archaeological Impact Assessment

ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late 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
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

1 INTRODUCTION

1.1. Scope of the Proposed Activities

The planned process water storage capacity extension at Gloria Mine requires the construction of an extra 2.5ML process water reservoir (Figure 1-3). Process water from the underground abstraction, tailings management, and other process water sources is assembled in present process water reservoirs and will be increased by the installation of a new 2.5ML reservoir to escalate storage and buffer capacity.

The planned upgrade will be inaugurated within the present disturbed footprint of the Gloria mine operations at Black Rock. The final location will be confirmed by detailed final design considerations but will be within the current disturbed footprint and will be in the vicinity to the locations showed in **Error! Reference source not found..**

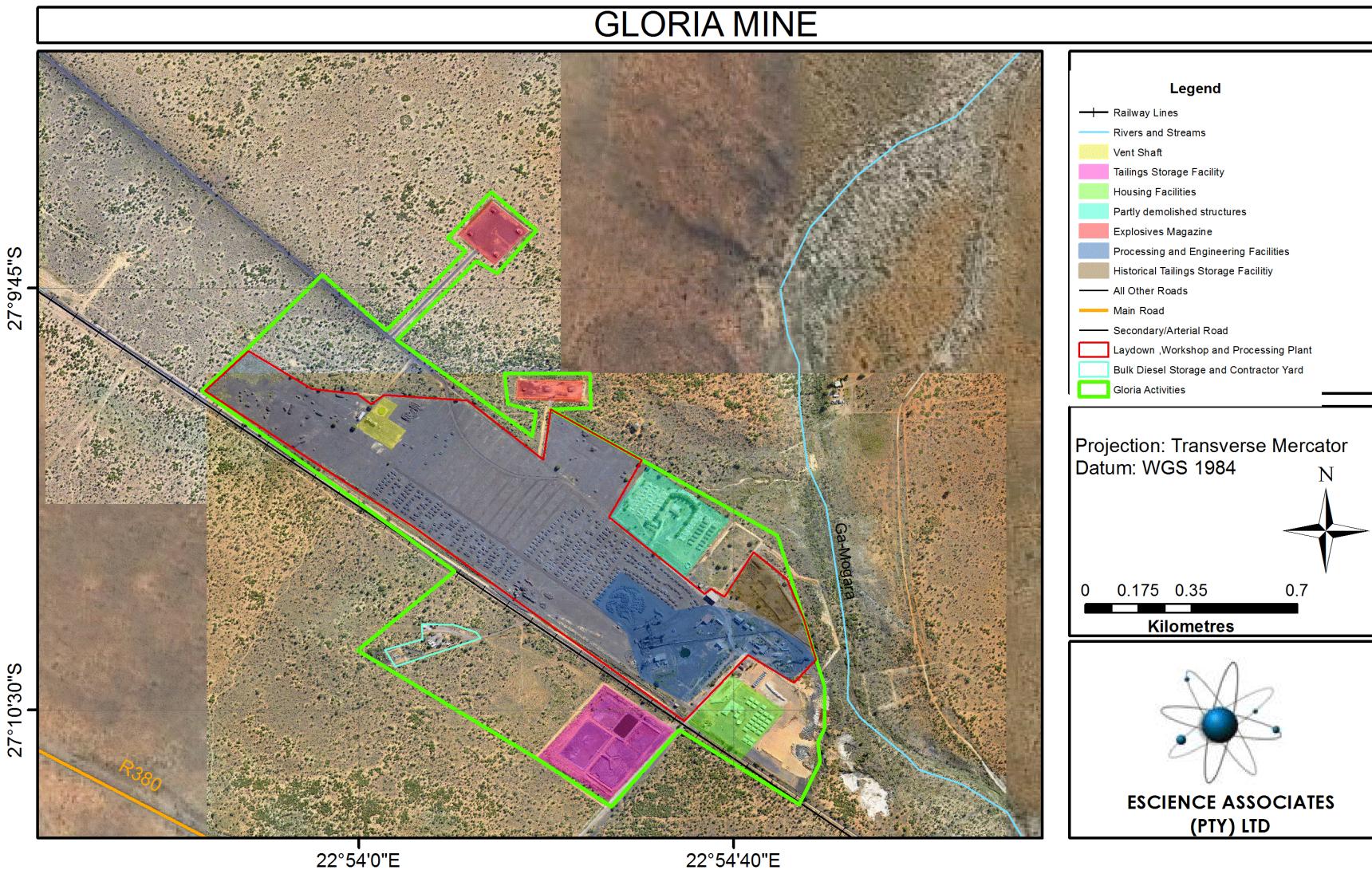


Figure 1: Current operations at Gloria mine

LOCATION AND LAYOUT ALTERNATIVES

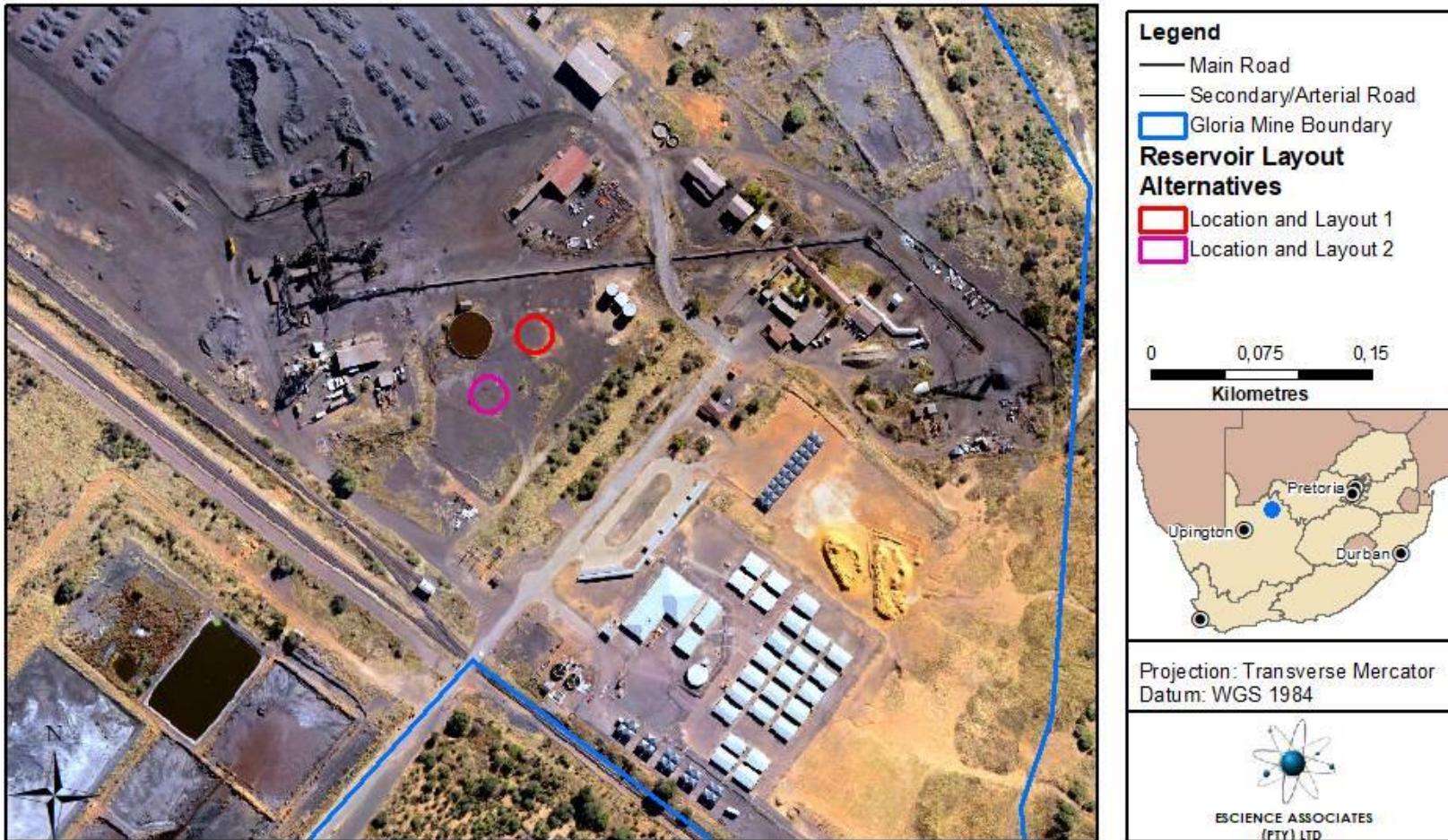


Figure 2: Proposed Activities

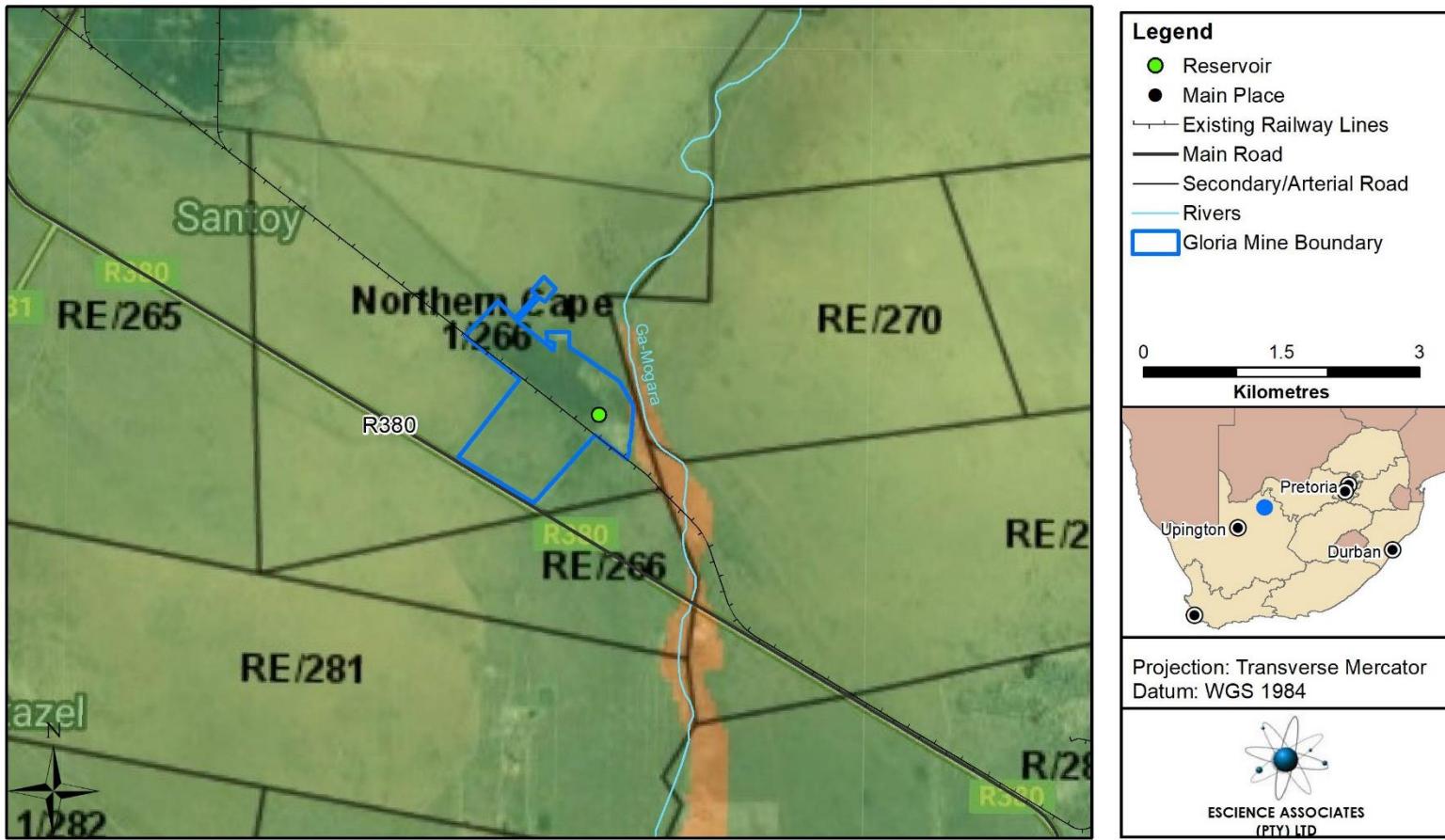


Figure 3: Locality map of the Gloria mine reservoir. Map modified from map provided by EScience Associates (Pty) Ltd.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 12 years. She has been conducting PIAs since 2014.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Desktop Assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- **any development or other activity which will change the character of a site—(exceeding 5 000 m² in extent; or**
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Kalahari Group is low and the Griqualand West rocks of the Transvaal Supergroup is moderate.

The Cenozoic Kalahari Group is the most widespread body of terrestrial sediments in southern Africa. The Cenozoic sands and calcretes of the Kalahari Group range in thickness from a few metres to more than 180m (Partridge et al., 2006). The youngest formation of the Kalahari group is the Gordonia Formation which is generally termed Kalahari sand and comprises of red aeolian sands that covers most of the Kalahari Group sediments. The pan sediments of the area originated from the Gordonia Formation and contains white to brown fine grained silts, sands and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters. Quaternary alluvium, aeolian sands, surface limestone, silcrete, and terrace gravels are also included in the Kalahari Group (Kent 1980).

Partridge et al., (2006) describes numerous types of superficial deposits of Late Caenozoic (Miocene to Pliocene to Recent) age throughout the Karoo Basin. Sands and gravel in the development footprint has a possible fluvial origin.

The fossil assemblages of the Kalahari are generally very low in diversity, and occur over a wide range and thus the palaeontological diversity of this Group is low (SAHRIS website). These fossils represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits have been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn cores as well as mammalian teeth. Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's burrows and mammalian trackways. Amphibian and crocodile remains have been uncovered where the depositional settings in the past were wetter.

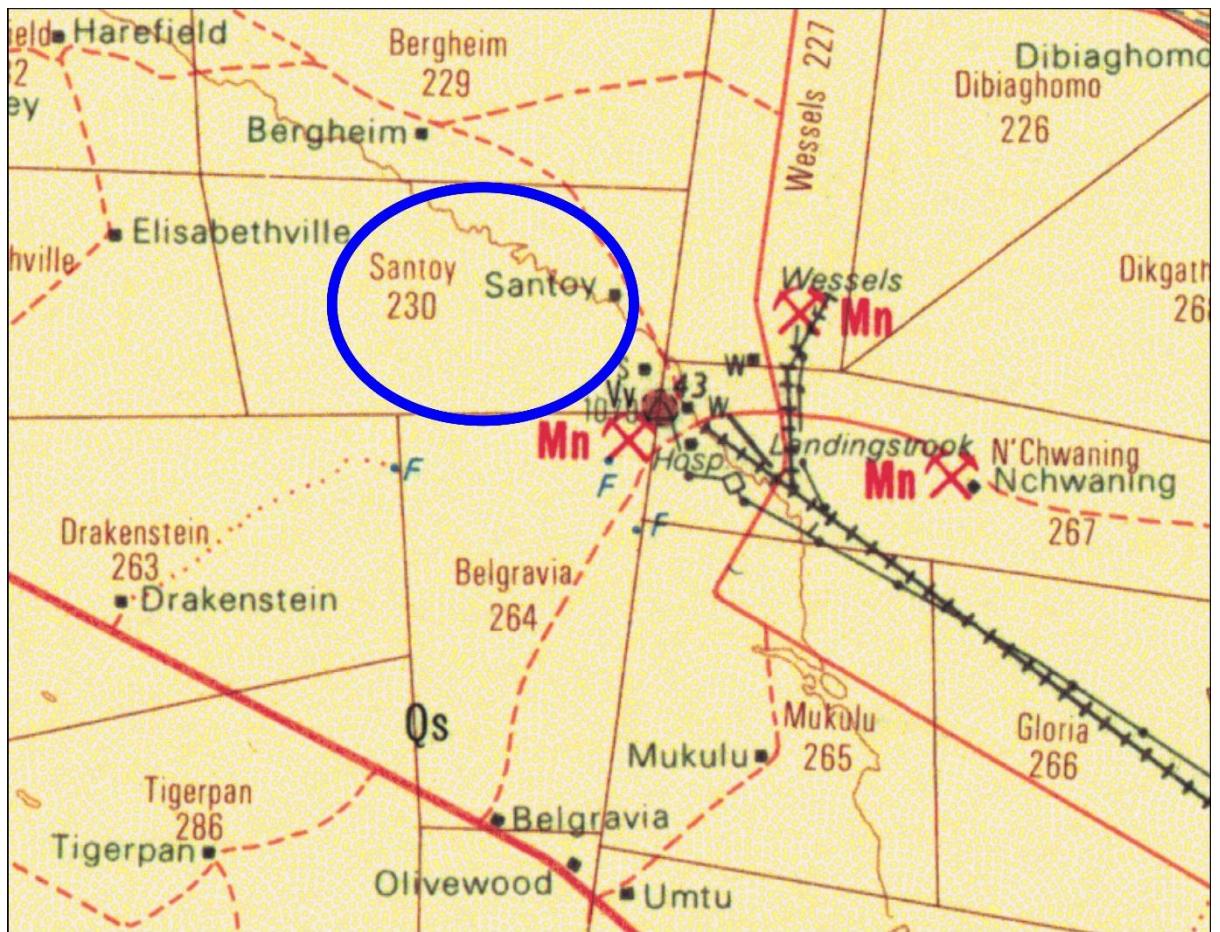


Figure 4: Extract of the 1:250 000 Kuruman geological map 2722 (Council for Geoscience, Pretoria) indicating the approximate position of the proposed Gloria reservoir (indicated in blue), in the John Taolo Gaetsewe District Municipality, Hotazel, Northern Cape.

Legend to Map and short explanation.

Qs – Red to flesh-coloured wind-blown sand (beige). Kalahari Group. Quaternary.

Hotazel is located in the **Griqualand West Basin**, Northern Cape Province which consists of clastic sediments as well as volcanic rocks, diamictites and banded iron formations (Table 1). Manganese deposits is present in the Hotazel Formation, upper Postmasburg Group (approximately 2222 Ma). The Vryburg Formation is the basal unit and overlies unconformably the granite and rocks of the Ventersdorp Supergroup. The Campbell Group overlies the Vryburg Formation and consists of the Schmidtsdrif Formation and the upper Ghaap Plateau Formation. The Griquatown Group is divided into two formations namely the Asbestos Hills and Koegas Formations. The Gamagara Formation follows and is positioned on the Maremane Anticline, and is overlain by the Makganyene Formation. The Cox Group comprises of the lower Ongeluk Formation and the upper Voëlwater Formation. The Ongeluk Formation was deposited under water and reaches a thickness of between 400 and 900 m. This Formation is basal and is mainly volcanic (Visser 1989). Manganese is present in the

upper Voëlwater Formation (Snyman 1996). According to Kent (1980) and Snyman (1996) Griqualand West Basin attains a maximum thickness of 4500 m.

Algal growth structures, also known as Stromatolites, are fossil structures described from the dolomites of the Transvaal Supergroup (Figure 3). Stromatolites are layered mounds, columns and sheet-like sedimentary rocks. These structures were originally formed by the growth of layer upon layer of cyanobacteria, a single-celled photosynthesizing microbe. Cyanobacteria are prokaryotic cells (simplest form of modern carbon-bases life). Stromatolites are first found in Precambrian rocks and are known as the earliest known fossils. The oxygen atmosphere that we depend on was generated by numerous cyanobacteria photosynthesizing during the Archaean and Proterozoic Era.



Figure 5: Example of a well preserved stromatolite from the Archaean Era.

Almond & Pether 2008, allocated a low significance to the Kalahari Group because fossil assemblages are generally rare and low in diversity and occur over a wide-ranging geographic area. In the past palaeontologists did not focus on Cenozoic superficial deposits although they sometimes comprise of significant fossil biotas. However, Groenewald and Groenewald (2014) allocated a high palaeontological sensitivity to the Cenozoic aged terrestrial organisms which are important indicators of palaeoenvironmental conditions.

Table 1: Generalised Stratigraphic Column and Associated Geology

Stratigraphy			Lithology	
Kalahari Formation (Qs and Q)			Clay, limestone and sand	
Transvaal Supergroup	Postmansburg Group	Voëlwater Subgroup	Hotazel Formation	Iron Formation
				Upper Mn ore body
				Middle Mn ore body
				Iron Formation
				Lower Mn ore body
				Mn-rich iron formation
				Iron Formation
Ongeluk Formation			Basaltic lava	

Table 2: Table modified from Palaeotechnical Report (Almond and Pether 2009).

Subgroup/sequence	Group	Formation	Fossil Heritage	Comment
Tertiary-Quaternary	Kalahari		Terrestrial organisms	Trace fossils, ostracods, bivalves, gastropod shells, diatoms, bones horn corns, mammalian teeth, Tortoise shells
Griqualand West Super Group	Campbell	Ghaapplato (Vgh)	Stromatolites	Cyanobacterial microfossils are present
	Griquastad	Asbestos Hills	Stromatolites	Cyanobacterial microfossils are present

5 GEOGRAPHICAL LOCATION OF THE SITE

The proposed development is about 12 kilometres north-west of Hotazel and approximately 80 km from Kuruman in the Northern Cape Province.

6 FINDINGS AND RECOMMENDATIONS

The proposed water reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape is completely underlain by the Cenozoic Kalahari Group as well underlying Griqualand West Basin rocks, Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources

Information System, the Palaeontological Sensitivity of the Kalahari Group is low and the Griqualand West rocks of the Transvaal Supergroup are moderate.

This development is recommended for exemption from further Palaeontological studies as the proposed development is smaller than 600 m².

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