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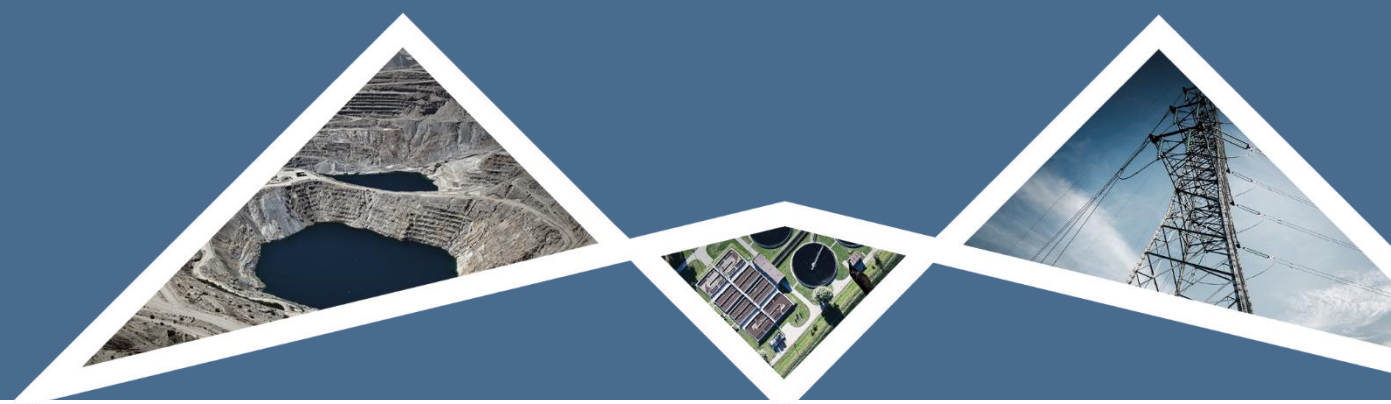
SCOPING REPORT

HARMONY GOLD:
THE Brand A Tailings Storage Facility Project

MARCH 2024



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ACRONYMS AND ABBREVIATIONS

Air:	Pollution Prevention Act (APPA)
AQSR:	Air Quality Sensitive Receptors
ASTM:	American Standard Testing Methodology
CA:	Competent Authority
CARA:	Conservation of Agricultural Resources Act, 1983
CMA:	Catchment Management Agency
DESTEA:	Department of Economic, Small Business Development, Tourism & Environment
DFFE:	Department of Forestry, Fisheries and the Environment
DMRE:	Department of Mineral Resources and Energy
DWS:	Department of Water and Sanitation
EA:	Environmental Authorisation
EC:	Electrical Conductivity
ECA:	Environmental Conservation Act
EAP:	Environmental Assessment Practitioner
EIA:	Environmental Impact Assessment
EIMS:	Environmental Impact Management Services (Pty) Ltd
ELWU:	Existing Lawful Water Use
EN:	Endangered
EMPr:	Environmental Management Programme
FSN:	Free State North
GA:	General Authorisation
GN:	Government Notice
GQM:	Groundwater Quality Management
HIA:	Heritage Impact Assessment
I&AP:	Interested and Affected Party
IDP:	Integrated Development Plan
IEM:	Integrated Environmental Management
IWML:	Integrated Waste Management Licence
LC:	Leachable Concentration
LED:	Local Economic Development
LOM:	Life of Mine
MAE:	Mean Annual Evaporation
MAP:	Mean Annual Precipitation
MAR:	Mean Annual Runoff
MPRDA:	Minerals and Petroleum Resources Development Act, 2002

MR:	Mining Right
NAAQS:	National Ambient Air Quality Standards
NAEIS:	National Atmospheric Emissions Inventory System
NDP:	National Development Plan
NEMA:	National Environmental Management Act, 1998
NEM:AQA:	National Environmental Management: Air Quality Act, 2004
NEM:WA:	National Environmental Management: Waste Amendment Act, 2008
NEMBA:	National Environmental Management: Biodiversity Act, 2004
NGDB:	National Groundwater Database
NGO:	Non-Governmental Organization
NHRA:	National Heritage Resources Act, 1999
NT:	Near Threatened
NWA:	National Water Act, 1998
ONAs:	Other Natural Areas
PHRA:	Provincial Heritage Resources Authority
PSDF:	Provincial Spatial Development Framework
PIA:	Palaeontological Impact Assessment
POI:	Point of Interest
PPP:	Public Participation Process
Re:	Remaining Extent
RWD:	Return Water Dam
SAHRA:	South African Heritage Resources Agency
SANS:	South African National Standards
SCC:	Species of Conservation Concern
SDF:	Spatial Development Framework
SLP:	Social & Labour Plan
SPLUMA:	Spatial Planning and Land Use Management Act
SWMP:	Stormwater Management Plan
TC:	Total concentration
TDS:	Total Dissolved Solids
TSF:	Tailings Storage Facility
WMA:	Water Management Area
WML:	Waste Management License
WULA:	Water Use License Application
WUL:	Water Use Licence

GLOSSARY OF TERMS

This section provides a catalogue of terms and definitions, which may be used in this report and, or other documents drafted for the project.

Table 1: Glossary of terms

Term	Definition
Alien Invasive Species	Species of plants, animals or other organisms that are not indigenous to a region and which easily spread and destroy the indigenous plant species, taking over an area and causing biological and socio-economic harm.
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted
Basic Assessment Process	An environmental assessment process that is undertaken in line with Listing Notices 1 and 3 in terms of the NEMA EIA Regulations with the aim of obtaining Environmental Authorisation.
Clearing/Clearance	Clearing/Clearance refers to the removal of vegetation through permanent eradication and in turn no likelihood of regrowth. 'Burning of vegetation (e.g. fire-breaks), mowing grass or pruning does not constitute vegetation clearance, unless such burning, mowing or pruning would result in the vegetation being permanently eliminated, removed or eradicated'.
Competent Authority	An organ of state charged by the National Environmental Management Act (NEMA) with evaluating the environmental impact of an activity and, where appropriate, with granting or refusing an environmental authorisation in respect of that activity.
Conservation Plan Areas (C-Plan Areas)-	A tool developed by the Environmental Provincial Department to identify sensitive areas. The main purposes of this tool is to: • serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process. • inform protected area expansion and biodiversity stewardship programmes in the province; and serve as a basis for development of Bioregional Plans in municipalities within the province. Some of the aspects that inform the identification of C-Plan Areas include Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESA's), Watercourses, Ridges, Protected Areas, etc
Critical Biodiversity Area	Areas that are deemed important to conserve ecosystems and species. For this reason, these areas require protection.
Cultural significance	Means aesthetic, architectural, historical, scientific, social, spiritual, linguistic, or technological value or significance.
Development	Means the building, erection, construction or establishment of a facility, structure, or infrastructure, including associated earthworks or Quarries, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or quarries, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.
Duty of Care	Every person who causes, has caused or may cause significant pollution or degradation of the environment to take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environmental is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution and degradation of the environment."

Term	Definition
Decommissioning	Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily recommissioned.
Environment	the surroundings within which humans exist and that are made up of— (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.
Ecological Support Area	Areas that support the ecological functioning of protected areas or CBAs or provide important ecological infrastructure.
Environmental Assessment Practitioner	Individual responsible for the planning, management, coordination or review of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instruments introduced through regulations.
Environmental Authorisation	This is a decision by a Competent Authority to authorise a listed activity in terms of the National Environmental Management Act (NEMA). The authorisation means that a project, either in totality or partially, can commence subject to certain conditions. The Competent Authority has a right to refuse to grant authorisation for a project in totality or partially.
Environmental Impact Assessment Process:	An environmental assessment process that is undertaken in line with Listing Notice 2 the NEMA EIA Regulations with the aim of obtaining Environmental Authorisation.
Environmental Management Programme:	A programme with set objectives and timeframes that seek to achieve a required end state and describes how activities that have or could have an adverse impact on the environment will be mitigated, controlled, and monitored.
Flora	Plant life that occurs in a specific geographical region and/habitat.
Fauna	Animal life that occurs in a specific geographical region and/habitat.
Heritage Resource	Means any place or object of cultural significance.
Indigenous Vegetation	Plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Interested and Affected Party	In relation to an application for Environmental Authorisation, this refers to an interested and affected party whose name is recorded in the register opened for that application in terms of regulation 42 of the NEMA EIA Regulations. This party will ideally be interested in the development but also affected by the proposed application and have a certain interest in the application.
Public Participation Process	In relation to the assessment of the environmental impact of any application for an environmental authorisation, means a process by which potential Interested and Affected Parties are given opportunity to comment on, or raise issues relevant to, the application.
Regulated area of a watercourse:	• The outer edge of the 1:100-year flood line and /or delineated riparian habitat whichever is the greatest measured from the middle of a river, spring, natural channel, lake or dam. • In the absence of a determined 1:100-year flood line or riparian area, the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act). • 500m radius from the delineated boundary of any wetland or pan.

Term	Definition
Riparian Area	A Habitat that includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
Species of Conservation Concern	IUCN Red List definition: Threatened species, and other species of significant conservation importance: Extinct, Extinct in the Wild, Near Threatened, Data Deficient. In South Africa, the following additional categories are added: Rare, Critically Rare.
Threatened or Protected Species	These refers to either plants or animals that are at a threat of Extinction or are protected due to their high conservation value or national importance.
Urban Edge	A demarcated edge of an area that is used as land use management tool to manage, direct and control the outer limits of development growth around an urban area. The aim is to control urban sprawl due to its associated adverse impacts.
Watercourse	(a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, lake or dam into which, or from which, water flows; and (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

EXECUTIVE SUMMARY

Harmony Gold Mining Company Limited (hereafter referred to as Harmony / "the applicant") has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the independent Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisation and associated consultation processes for a proposed Brand A Tailings Storage Facility (TSF) and associated infrastructure near Welkom in the Matjhabeng Local Municipality in the Free State province. Brand A TSF is an existing TSF that has been reclaimed and slurry deposition is now proposed on the Brand A TSF footprint.

The applicant owns and operates a number of Gold Mines and plants in the Welkom region in the Free State and currently deposits tailings onto the Free State South 2 Tailings Storage Facility (TSF), St. Helena 4 TSF, St. Helena 123 TSF, Dam 23 TSF, Brand D TSF and Target 1&2 TSF. The current planned Life of Mine (LOM) of the Free State operations exceed the available deposition capacity of these TSFs. As such, Harmony is undertaking a feasibility assessment to redeposit slurry on the footprint of Brand A TSF which has largely been reclaimed to date. The study area falls within the Matjhabeng Local Municipality Wards 8, 11 and 24 (Lejweleputswa District Municipality) administrative area. The project area is situated within 22 farm properties distributed between Farm Harmony 222, Farm Klippan 14, Farm La Riviera 289, Farm Rustgevonden 564, Farm Saaiplaas 690, Farm Saaiplaas 771, and Farm Vaalkranz 220.

The existing, reclaimed Brand A TSF site is approximately 165ha. Slurry deposition is proposed on the Brand A TSF footprint and the existing Return Water Dam (RWD) will be used for the containment of affected water from the penstock, underdrainage and runoff. In order to allow for slurry deposition on Brand A from either of the operational plants (Central Plant, Saaiplaas Plant and Harmony One Plant), a number of new residue deposition pipelines will be required. The residue deposition pipelines will have a NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. The pipelines will be flanged steel pipelines and installed above-ground on pre-cast concrete plinths. A 3.5m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections.

EIMS will compile and submit the required documentation in support of applications for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998)- Listed activity: **Listing Notice 1**, *Activities 10, 19, 21D;* **Listing Notice 2**, *Activity 6*; and **Listing Notice 3**, *Activities 12 and 14* as well as the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008) – *Activities B7, B10 and B11*; and

- Water Use Licence (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses: Section 21 (c), Section 21 (i) and Section 21 (g). A separate application for a Water Use Licence (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.

PURPOSE OF THE SCOPING REPORT

The purpose of the scoping process is to:

- Identify the policies and legislation that are relevant to the activity;

- To motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

- To identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking;

- Where appropriate, to identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process including cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;

- To identify the key issues to be addressed in the assessment phase;

- To agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required, as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
- To identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

PUBLIC PARTICIPATION PROCESS

According to Section (2)(4)(f) of NEMA, the participation of all Interested and Affected Parties (I&APs) must be promoted and all potential I&APs must be informed early and in an informative and proactive way regarding applications that may affect their lives or livelihood. To give effect to the above sections, it is essential to ensure that there is an adequate and appropriate opportunity for Public Participation (PP) in decisions that may affect the environment. The Public Participation Process (PPP) for the proposed project has been undertaken in accordance with the requirements of NEMA in line with the principles of Integrated Environmental Management (IEM). The PPP commenced on the 9th of November 2023 with an initial notification and call to register as interested and affected parties (I&APs). The comments received from I&APs during the initial call to register and commenting period so far have been captured in Public Participation Report in **Appendix C**.

Comments received during this Scoping Report review period will also be collated and added to the Public Participation Report which will be submitted to the Competent Authority (CA). Should the CA accept the Scoping Report, an Environmental Impact Assessment (EIA) Report including an Environmental Management Programme (EMPr), will also be compiled and presented for public comment as part of this EIA process during which time further stakeholder engagement will take place.

This Scoping Report will be available for public review and comment for a period of 30 days from 3 April 2024 to 2 May 2024 Contact details are provided below:

- Environmental Impact Management Services (Pty) Ltd (EIMS)
- P.O. Box 2083 Pinegowrie 2123
- Phone: 011 789 7170 / Fax: 011 787 3059
- Contact: Jolene Webber
- EIMS Reference No: 1599
- Email: brandatsf@eims.co.za

PROJECT ALTERNATIVES AND ENVIRONMENTAL IMPACT ASSESSMENT

In terms of the EIA Regulations published in Government Notice (GN) R982 of 2014, as amended, feasible and reasonable alternatives must be identified and considered within the EIA process. According to the above-mentioned, an alternative is defined as *"…in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:*

(a) property on which or location where it is proposed to undertake the activity;

(b) type of activity to be undertaken;

(c) design or layout of the activity;

(d) technology to be used in the activity;

(e) operational aspects of the activity; and

(f) includes the option of not implementing the activity."

The alternatives discussed in this report are the No-Go Option; Layout or Design Alternatives, Activity Alternatives and Process Alternatives. The preferred option under each category of alternatives is discussed in detail in **Section 4** of this report.

Each of the identified risks and impacts at the various project phases were assessed. The assessment criteria include the nature, extent, duration, magnitude / intensity, reversibility, probability, public response, cumulative impact, and irreplaceable loss of resources.

The most significant risks and impacts identified were those that remain high in terms of significance even post mitigation measures being considered. The following preliminary identified impacts were determined to have a potentially moderate final significance at this stage:

- Negative impact on groundwater quality during operation and closure phases;
- Negative impact on identified wetlands and aquatic species;
- Negative visual impact during operation;
- Mortality / disturbance of terrestrial species;
- Reduction in air quality during operation; and
- Positive socio-economic impact through employment opportunities.

The negative impacts, in particular, will be further interrogated and assessed during the EIA phase of the project. Potential preliminary mitigation measures have been identified and will be refined based on input from the Environmental Assessment Practitioner (EAP), public consultation, and specialist assessments during the EIA phase of the project. The associated EMPr will identify appropriate mitigation mechanisms for avoidance, minimisation and / or management of the negative impacts and enhancement of the positive aspects.

The following EIA-phase specialist studies are to be conducted:

- Soils and Agricultural Impact Assessment;
- Visual Impact Assessment;
- Air Quality Assessment;
- Groundwater Assessment;
- Terrestrial Biodiversity Assessment;
- Health Risk and Radiological Impact Assessment;
- Aquatics and Wetland Assessment;
- Socio-economic Impact Assessment;
- Climate Change Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment; and
- Closure and Rehabilitation Plan.

1 INTRODUCTION

Harmony Gold Mining Company Limited (hereafter referred to as Harmony / "the applicant") has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisation and associated consultation processes for the Brand A Tailings Storage Facility (TSF) project and associated infrastructure near Welkom in the Matjhabeng Local Municipality in the Free State province. Brand A TSF is an existing TSF that has been reclaimed and slurry deposition is now proposed on the Brand A TSF footprint.

The applicant owns and operates a number of Gold Mines and plants in the Welkom region in the Free State and currently deposits tailings onto the Free State South 2 Tailings Storage Facility (TSF), St. Helena 4 TSF, St. Helena 123 TSF, Dam 23 TSF, Brand D TSF and Target 1&2 TSF. The current planned Life of Mine (LOM) of the Free State operations exceed the available deposition capacity of these TSFs. As such, Harmony is undertaking a feasibility assessment to redeposit slurry on the footprint of Brand A TSF which has largely been reclaimed to date. The study area falls within the Matjhabeng Local Municipality Wards 8, 11 and 24 (Lejweleputswa District Municipality) administrative area. The project area is situated within 22 farm properties distributed between Farm Harmony 222, Farm Klippan 14, Farm La Riviera 289, Farm Rustgevonden 564, Farm Saaiplaas 690, Farm Saaiplaas 771, and Farm Vaalkranz 220.

Slurry deposition is proposed on the reclaimed Brand A TSF footprint and the existing Return Water Dam (RWD) will be used for the containment of affected water from the penstock, underdrainage and runoff. In order to allow for slurry deposition on Brand A from either of the operational plants (Central Plant, Saaiplaas Plant and Harmony One Plant), a number of new residue deposition pipelines will be required. The precise dimensions and details of the proposed new TSF are not known at this stage as the engineering designs are still being completed however it should be emphasised that the new TSF will be constructed on the existing reclaimed footprint of the old Brand A TSF. These details will be presented in the EIA phase report once this information becomes available. The following details are relevant to the current application:

- Infrastructure will include the TSF and and associated water management infrastructure including pipelines
- The TSF will cover a total area of up approximately 165 hectares.
- Tailing deposition method to be used: cyclone deposition.
- The height of the TSF is still being determined through the engineering designs but is expected to be approximately 40m.
- The TSF barrier system will be determined in consultation with the authorities and will be in compliance with relevant norms and standards for determination of liner requirements.
- The residue deposition pipelines will have a NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s.
- The pipelines will be flanged steel pipelines and installed above-ground on pre-cast concrete plinths.
- 3.5m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections.

EIMS will compile and submit the required documentation in support of applications for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998)- Listed activity: Listing Notice 1, Activities 10, 19, 21D; Listing Notice 2, Activity 6; and Listing Notice 3, Activities 12 and 14 as well as the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008) – Activities B7, B10 and B11; and

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1.1 REPORT STRUCTURE

This report has been compiled in accordance with the 2014 NEMA EIA Regulations, as amended. A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in **Table 2** below.

Table 2: Report structure

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 2(2)(a):	Details of – i. The Environmental Assessment Practitioner (EAP) who prepared the report; and ii. The expertise of the EAP, including a curriculum vitae;	**Section 1.2** **Appendix B**
Appendix 2(2)(b):	The location of the activity. Including – i. The 21-digit Surveyor General code of each cadastral land parcel; ii. Where available, the physical address and farm name; iii. Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**Section 1.9**
Appendix 2(2)(c):	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – i. A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or ii. On a land where the property has not been defined, the coordinates within which the activity is to be undertaken;	**Section 1.9** **Section 2.2** **Section 2.3**
Appendix 2(2)(d):	A description of the scope of the proposed activity, including – i. All listed and specified activities triggered; ii. A description of the activities to be undertaken, including associated structures and infrastructure;	**Section 2.2** **Section 2.3**
Appendix 2(2)(e):	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	2.4

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 2(2)(f):	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	3.2
Appendix 2(2)(h):	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including – i. Details of all alternatives considered; ii. Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; iii. A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; iv. The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; v. The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts – a. Can be reversed; b. May cause irreplaceable loss or resources; and c. Can be avoided, managed or mitigated; vi. The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; vii. Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; viii. The possible mitigation measures that could be applied and level of residual risk; ix. The outcome of the site selection matrix; x. If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and xi. A concluding statement indicating the preferred alternatives, including preferred location of the activity;	4, 5, 6 and 7
Appendix 2(2)(i):	A plan of study for undertaking the environmental impact assessment process to be undertaken, including – i. A description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; ii. A description of the aspects to be assessed as part of the environmental impact assessment process; iii. Aspects to be assessed by specialists;	8

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	iv. A description of the proposed method of assessing the environmental aspects, including a description of the proposed method assessing the environmental aspects to be assessed by specialists; v. A description of the proposed method of assessing duration and significance; vi. An indication of the stages at which the competent authority will be consulted; vii. Particulars of the public participation process that will be conducted during the environmental impact assessment process; and viii. A description of the tasks that will be undertaken as part of the environmental impact assessment process; ix. Identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored;	
Appendix 2(2)(j)	An undertaking under oath or affirmation by the EAP in relation to – i. The correctness of the information provided in the report; ii. The inclusion of comments and inputs from stakeholders and interested and affected parties; and iii. Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	**Section 10** **Section 11**
Appendix 2(2)(k):	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;	11
Appendix 2(2)(l):	Where applicable, any specific information required by the competent authority; and	None
Appendix 2(2)(m):	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	None

1.2 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations relating to this scoping phase assessment should be noted:

- The application is limited to the proposed Brand A TSF and associated infrastructure near Welkom in the Matjhabeng Local Municipality in the Free State province;
- The information provided by the applicant is considered accurate, adequate, unbiased, and no information that could change the outcome of the scoping process has been withheld;
- The preliminary site sensitivity verification and desktop assessments are sufficient for the scoping phase and the information that will be obtained from the specialist studies for this project during the EIA Phase will be accurate, objective and sufficient for the level of assessment required;
- Detailed assessment of the positive and negative environmental impacts of the proposed project will be undertaken during the Environmental Impact Assessment phase;

In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report are correctly and effectively implemented and managed throughout the life of the project;

This study is not based on any engineering designs as these designs are still being completed. The designs will be made available to all stakeholders and I&APs during the EIA phase of the project;

- In accordance with the Protection of Personal Information Act (Act 4 of 2013), personal information (emails, contact numbers, address) are blanked out and/or excluded during the Public Participation and only provided to the competent authority officials;

Personal information of I&APs made available to the competent authority will only be used by the authorities to confirm or obtain information regarding this specific project; and

The information presented in this report was the most accurate and relevant at the time of compilation of the report.

1.3 PURPOSE OF THE REPORT

The purpose of the scoping phase is to gather information on the proposed site and establish an understanding of the study area and the receiving environment. This phase will also determine how the proposed activities will potentially impact on the environment. The Assessment of alternatives e.g., activity, location, design, etc. will be considered in this report. The report will further identify any Interested and Affected Parties in the study area, engage with such parties and relevant authorities and identify environmental issues and potential impacts. This Scoping report is intended to guide the EIA process and the required specialist studies by:

- Providing an overview of the legal requirements with regards to the proposed Brand A TSF project;
- Provide a project description of the proposed Brand A TSF project as well as the anticipated environmental and social impacts that will be further investigated in the EIA phase;
- Setting the scope for the EIA process as well as the Terms of Reference (ToR) for the proposed specialist studies; and
- Outlining the approach and methodologies to be used in the Scoping and EIA phase including the impact assessment methodology.

1.4 THE SCOPING AND EIA REQUIREMENTS

The list of activities applied for in terms of the NEMA EIA Regulations 2014 as amended are discussed in **Section 2.3**. These listed activities triggered by the proposed development of Brand A TSF facility must follow the required Environmental Impact Assessment process as required by the NEMA EIA Regulations 2014, as amended, as set out in Government Notice Regulations 982 in Government Gazette No. 40772 of 7 April 2017. Based on these Regulations, a Scoping and EIA process must be followed. The Application Form will be submitted

to the competent authority, the Department of Mineral Resources and Energy (DMRE) Free State Region. The DMRE is the relevant Competent Authority stipulated in the 2014 NEMA EIA Regulations application procedures as the applicant is a private company and the proposed redeposition onto Brand A TSF is a mining application within the Free State Province, thus, is in line with the identified activities which the Member of the Executive Council of the National Department of Forestry, Fisheries and the Environment (DFFE) has delegated to the DMRE provincial departments.

1.5 THE SCOPING PHASE

The Scoping and EIA process must be undertaken in accordance with the 2014 EIA Regulations No. 982, as amended. The main objectives of the current Scoping Phase, in terms of the regulatory requirements stipulated in *Appendix 2* of the 2014 EIA Regulations, are to:

a) identify the relevant policies and legislation relevant to the activity;

b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;

d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;

e) identify the key issues to be addressed in the assessment phase;

f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and

g) identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Once the Draft scoping process is complete, a Final Scoping Report must be prepared detailing the scope of the EIA required for the proposed activities. This Scoping Report has been compiled in accordance with the requirements set out in Appendix 2 of the 2014 EIA Regulations, as amended, which outlines the contents of a Scoping Report and provides the requirements necessary for undertaking the Public Participation Process. A final Scoping Report will be prepared and submitted to the competent authority (DMRE) for review and decision making. The competent authority will communicate the decision within 45-days of submission of the Final Scoping Report. The decision can either be an acceptance or rejection of the Scoping Report. The process can only proceed into the EIA Phase upon the receipt of approval of the Scoping Report. It must be noted that the approval may be issued with recommendations and/or requirements for the EIA Phase.

1.6 DETAILS OF THE EAP

EIMS is appointed by Harmony as the independent EAP and to assist in preparing and submitting the EA and WUL applications, Scoping and EIA Reports, and undertaking a Public Participation Process (PPP) in support of the proposed redeposition on the Brand A tailings storage facility footprint. The contact details of the EIMS consultant and EAP who compiled this Report are indicated in **Table 3**.

Table 3: Details of the Environmental Assessment Practitioner

EAP:	Mr. Vukosi Mabunda
Tel No:	+27 11 789 7170
Fax No:	+27 86 571 9047
E-mail:	vukosi@eims.co.za
Professional Registrations:	• Registered Environmental Assessment Practitioner with Environmental Assessment Practitioner Association of South Africa – EAPASA (Reg. No: 2019/867) • Professional Natural Scientist with the South African Council for Natural Scientific Professions – SACNASP (Reg. No: 134178).

1.7 EXPERTISE OF THE EAP

EIMS is a private and independent environmental management-consulting firm that was founded in 1993. EIMS is an independent specialised environmental consulting firm offering the full spectrum of environmental management services across all sectors within the African continent. EIMS has successfully completed many hundreds of assignments over the years with an excess of 28 years' experience in conducting EIA's for both the government and private sector. Please refer to the EIMS website (www.eims.co.za) for examples of EIA documentation currently available.

In terms of Regulation 13 of the EIA Regulations (GN R. 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. EIMS is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, inter alia, the requirement that EIMS is:

- Objective and independent;
- Has expertise in conducting EIA's;
- Comply with the NEMA, the environmental regulations and all other applicable legislation;
- Considers all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

This Scoping Report was prepared by Vukosi Mabunda, a Registered EAP employed by EIMS. His CV is included in **Appendix B** of this report. Mr Vukosi Mabunda is currently an Environmental Assessment Practitioner and a Geographic Information Systems (GIS) Specialist with 6 years' working experience. Vukosi is a Registered Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA). He is one of the few dual registered professionals with SACNASP as a Professional Geospatial Scientist and Professional Environmental Scientist. Vukosi has dual professional background in Geographic and Environmental Sciences with a Master of Science Degree in Geography obtained in 2021 from the University of Johannesburg. Vukosi has experience in Project Management, small to large scale Environmental Impact Assessments, Environmental Auditing, Water Use Licensing, and Public Participation.

1.8 SPECIALIST CONSULTANTS

One of the objectives of a Scoping Report is to identify the required specialist assessment to be undertaken during the EIA Phase. Based on a review of the National Web-Based Environmental Screening Tool Report, EAPs Site Sensitivity Verification and review of available information, the following specialist assessments have been pre-identified as necessary assessments required during the EIA phase:

- Visual Impact Assessment;
- Air Quality Assessment;

- Groundwater Assessment;
- Terrestrial Biodiversity Assessment;
- Health Risk and Radiological Impact Assessment;
- Aquatics and Wetland Assessment;
- Socio-economic Impact Assessment;
- Climate Change Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment; and
- Closure and Rehabilitation Plan.

Engineering inputs will also be obtained to inform the design of the TSF. The specialist studies listed above will involve the gathering of data relevant to identifying and assessing preliminary environmental impacts that may occur as a result of the proposed project. These preliminary impacts were assessed according to pre-defined impact rating methodology (Section 7.1). Preliminary mitigation / management measures to minimise potential negative impacts or enhance potential benefits are put forward in this Scoping Report and will be adjusted where relevant during the EIA phase once detailed assessments are concluded and input from the public has been considered.

1.9 DESCRIPTION OF THE PROPERTY

Table 4 provides a description of the property details of the proposed Brand A TSF site as well as the distance to the nearest towns. The proposed project will be located within the FS 30/5/1/2/2/82 MR (Freegold) mining right. It must be noted that a Section 102 amendment to amend the MR to included Portions 1 and 5 of Farm Saaiplaaas 690 to cover the RWD and pipelines may be required and if so, will be undertaken parallel to this environmental authorisation. See **Figure 1** and **Figure 2** for the locality of the redeposition proposed for the Brand A TSF as well as the associated pipeline routes.

Table 4: Locality details

Property	The proposed project area is situated within 22 farm properties distributed between Farm Harmony 222, Farm Klippan 14, Farm La Riviera 289, Farm Rustgevonden 564, Farm Saaiplaas 690, Farm Saaiplaas 771, and Farm Vaalkranz 220.			
Property Name, 21-digit Surveyor General Code and Ownership	**Farm Name**	**Portion**	**LPI Code**	**Ownership Type**
	Farm Harmony 222	72	F03500000000022200072	Private (Individual)
	Farm Klippan 14	1	F03900000000001400001	Applicant
	Farm Klippan 14	2	F03900000000001400002	Applicant
	Farm Klippan 14	15	F03900000000001400015	TBC
	Farm La Riviera 289	2	F03500000000028900002	Private (Trust)
	Farm La Riviera 289	3	F03500000000028900003	Applicant
	Farm La Riviera 289	Re/4	F03500000000028900004	Private (Trust)
	Farm Rustgevonden 564	1	F03500000000056400001	Applicant
	Farm Saaiplaaas 690	Re/0	F03500000000069000000	State (Municipality)
	Farm Saaiplaaas 690	1	F03500000000069000001	Applicant
	Farm Saaiplaaas 690	5	F03500000000069000005	State (Municipality)
	Farm Saaiplaaas 690	7	F03500000000069000007	TBC
	Farm Saaiplaaas 690	9	F03500000000069000009	TBC
	Farm Saaiplaaas 690	10	F03500000000069000010	Private (Company)
	Farm Saaiplaaas 690	11	F03500000000069000011	TBC
	Farm Saaiplaaas 690	15	F03500000000069000015	Applicant

	Farm Saaiplaaas 771	Re/0	F03500000000077100000	Applicant
	Farm Saaiplaaas 771	2	F03500000000077100002	State (Municipality)
	Farm Saaiplaaas 771	6	F03500000000077100006	TBC
	Farm Saaiplaaas 771	12	F03500000000077100012	Private (Company)
	Farm Saaiplaaas 771	15	F03500000000077100015	Applicant
	Farm Vaalkranz 220	14	F03500000000022000014	Applicant
Application Area (Ha)	The approximate sizes of the infrastructure is as follows: • Existing Brand A TSF footprint is approximately 165ha; • Proposed Harmony One Plant to Brand A TSF pipeline is approximately 4km long; • Proposed Saaiplaas Plant to Brand A TSF pipelines either ~4.4km or ~4.6km long; • Proposed Central Plant to Brand A TSF pipelines approximately 9.2km long; and • Proposed 3,5m wide access road along the pipelines (approximately 20km long).			
Magisterial District	Development area falls within the Matjhabeng Local Municipality Wards 8, 11 and 24 (Lejweleputswa District Municipality) administrative area.			
Distance and direction from nearest towns	Brand A TSF is located at 28° 0'53.81"S; 26°50'18.34"E between Bronville and Saaiplaas in Welkom (refer to **Figure 1**). The proposed development site is approximately 10.5km southeast of Welkom central business district area.			
Surrounding land uses	The site is mostly grassland with scattered areas that are disturbed and degraded due to anthropogenic activities, such as clearing of vegetation, presence of alien and invasive plant species, and fragmentation due to the presence of the mining infrastructure such as existing TSFs and access roads. Existing TSFs located to the north, east and south of the site. There are agricultural activities within the vicinity of the proposed development area.			

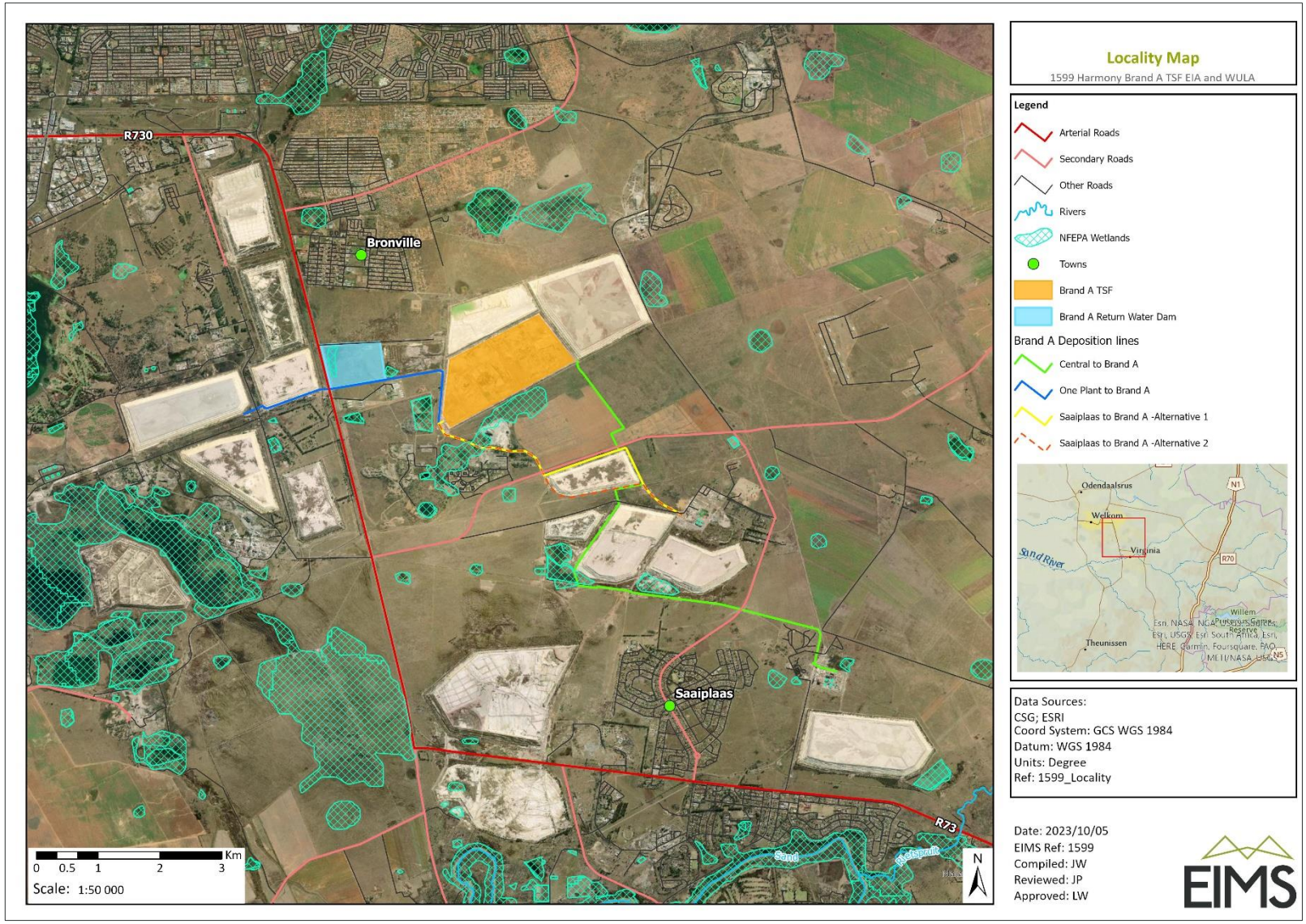

Figure 1: Aerial imagery locality map indicating the location of the proposed new tailings storage facility

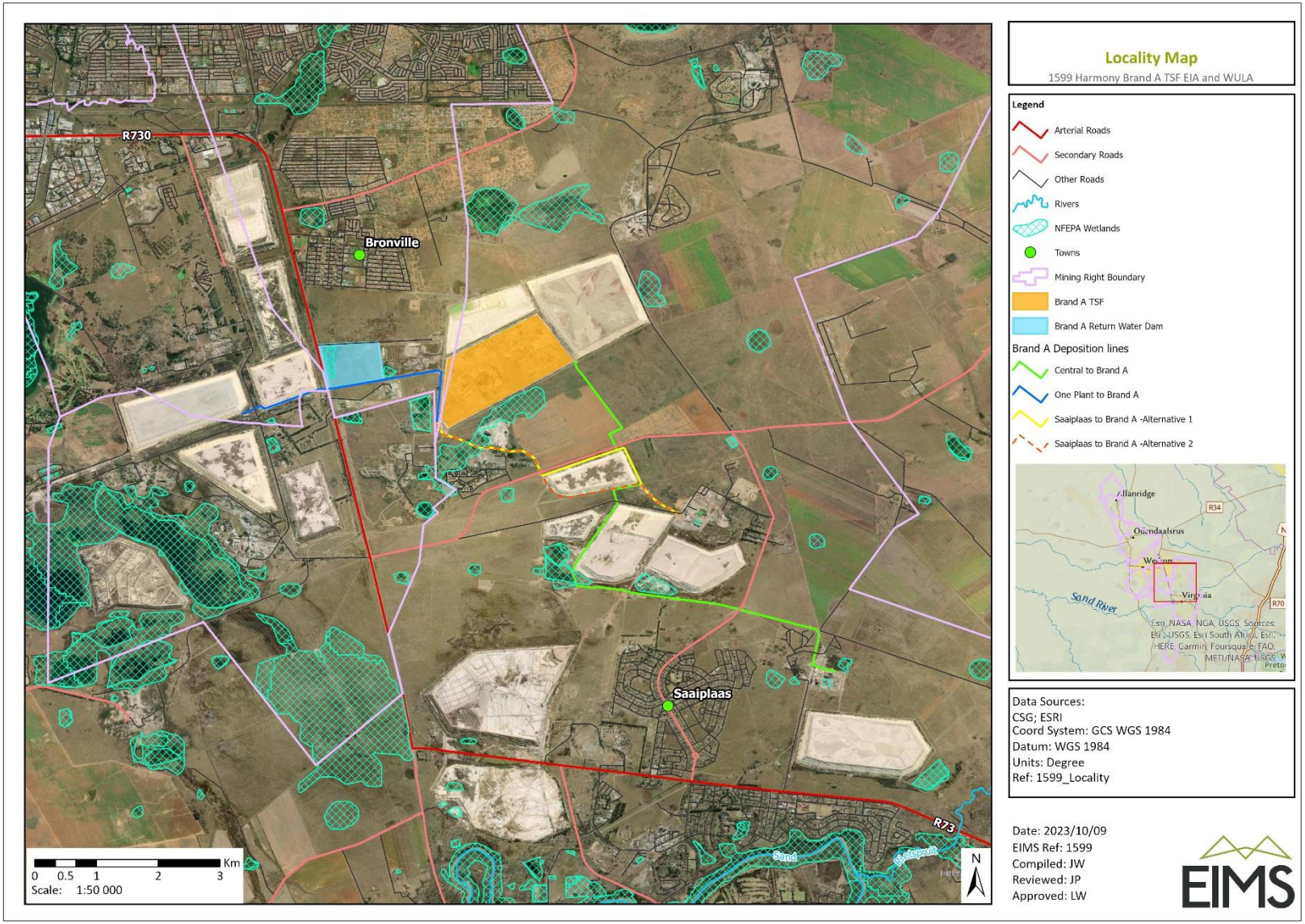

Figure 2: Locality map indicating the location of the proposed new tailings storage facility in relation to Harmony's mining right areas

2 DESCRIPTION AND SCOPE OF THE PROPOSED PROJECT

This section provides a detailed description for the proposed project. Most of the key information presented in this chapter was obtained from the applicant. The aim of the project description is to describe the proposed activities planned to take place at the Brand A TSF project area. Furthermore, the project description is designed to facilitate the understanding of the proposed project related activities which are anticipated to lead to the preliminary impacts identified and assessed in this Scoping Report, and for which management measures have been, or will be designed.

2.1 PROJECT DESCRIPTION

Harmony (the applicant) holds an approved Mining Right (MR) and Environmental Management Programme (EMPr), in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002, as amended) (MPRDA), for the mining of gold at various operations in the Welkom area. The applicant owns and operates a number of Gold Mines and plants in the Welkom region in the Free State and currently deposits tailings onto the Free State South 2 Tailings Storage Facility (TSF), St. Helena 4 TSF, St. Helena 123 TSF, Dam 23 TSF, Brand D TSF and Target 1&2 TSF. The current planned Life of Mine (LOM) of the Free State operations exceed the available deposition capacity of these TSFs. As such, Harmony is undertaking a feasibility assessment to redeposit slurry on the footprint of Brand A TSF which has largely been reclaimed to date. The study area falls within the Matjhabeng Local Municipality Wards 8, 11 and 24 (Lejweleputswa District Municipality) administrative area. The project area is situated within 22 farm properties distributed between Farm Harmony 222, Farm Klippan 14, Farm La Riviera 289, Farm Rustgevonden 564, Farm Saaiplaas 690, Farm Saaiplaas 771, and Farm Vaalkranz 220.

EIMS will compile and submit the required documentation in support of applications for of applications for:

- Environmental Authorisation (EA) and Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998) - Listed activity: Listing Notice 1, Activities 10, 19, 21D; Listing Notice 2, Activity 6; and Listing Notice 3, Activities 12 and 14 as well as the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008) – Activities B7, B10 and B11; and
- Water Use Licence (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses: Section 21 (c), Section 21 (i) and Section 21 (g). A separate application for a Water Use Licence (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.

2.2 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

Tailings are the mineral waste remaining after ore processing to extract mineral concentrates and are typically stored within an engineered containment structure known as a tailing storage facility or TSF. Tailings is a common by-product of the metals and minerals recovery process. It usually takes the form of a liquid slurry made of fine metal or mineral particles and water – created when mined ore is crushed and finely ground in a milling process (refer to **Figure 3**).

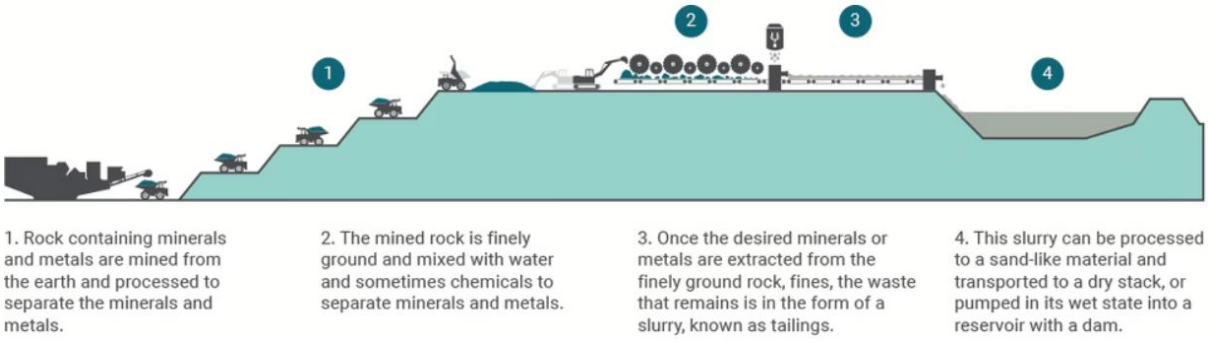

Figure 3: Tailings Storage Facility Process (International Council on Mining and Metals, 2023)

From the mill, the tailings is typically pumped to storage facilities which are commonly constructed using earth dams. As the sandy residue of tailings gradually drains and becomes compact and dry, grass and other vegetation can be planted to stabilise the environment through a reclamation process. Before the water in the tailings can be used again, or discharged into the local drainage system, it must be treated to remove harmful substances that would pollute the environment or risk the health and safety of local communities near the facility.

If not managed properly, tailings can have chronic adverse impacts on the environment and human health and safety, with pollution from effluent and dust emissions being potentially toxic to humans, animals or plants. Acute and potentially very damaging impacts can occur should a tailings storage facility physically fail. In such instances, flowable tailings materials can inundate and greatly impact the surrounding environment and even lead to loss of human life.

Tailings differ from overburden: the waste rock or material that overlies an ore or mineral body and is displaced unprocessed and stockpiled separately (or co-disposed with tailings) during mining. Tailings can be in the form of liquid, solid, or a slurry of fine particles. The proposed Brand A TSF is a slurry TSF (refer to **Figure 4**). To allow for slurry deposition on Brand A from either of the operational plants (Central Plant, Saaiplaas Plant and Harmony One Plant), a number of new residue deposition pipelines (refer to **Figure 5**) will be required as described below:

- Harmony One Plant to Brand A TSF:
    - This pipe extends from the existing pipe from Harmony One Plant depositing onto FSS2 to Brand A TSF and follows the route that already has other slurry pipelines.
    - The pipeline is approximately 4km long and extends from One Plant at coordinates 28° 1'17.78"S; 26°48'8.15"E to Brand A at 28° 1'21.78"S; 26°49'52.22"E.
- Saaiplaas Plant to Brand A TSF:
    - There are existing pipes running between Saaiplaas Plant and Brand A TSF, which include the residue pipeline from Saaiplaas Plant to the St. Helena 123 TSF and the reclamation pipeline from Brand A TSF to Saaiplaas Plant.
    - There are two optional routes around the Saaiplaas 6 TSF (alternative 1 which is approximately 4.6km long and alternative 2, approximately 4.4km long). The alternatives both start (28° 2'10.69"S; 26°51'57.44"E) and end at the same point (28° 1'21.81"S; 26°49'52.31"E) with the deviation of approximately 1.km. The alternatives only deviate around 27 SP 6 (28° 1'54.16"S; 26°51'36.50"E) before aligning on the same route again (28° 1'49.95"S; 26°50'45.46"E). The residue line from Saaiplaas Plant to Brand A TSF could follow either of these routes.
    - The pipe is approximately 4km long and extends from 28° 1'17.78"S; 26°48'8.15"E at Harmony One Plant to 28° 1'21.78"S; 26°49'52.22"E at Brand A TSF.
- Central Plant to Brand A TSF:
    - There is an existing pipeline from Central Plant to Brand D TSF.
    - Deposition from Harmony One plant to Brand A TSF would follow the existing pipe route and could potentially use the same pipeline.
    - The pipeline is approximately 9.2km long and extends from Central Plant at coordinates 28° 3'32.84"S; 26°53'18.22"E to Brand A TSF at 28° 0'50.15"S; 26°51'2.48"E.

Figure 4: Aerial view of Tailings Storage Facility at the Harmony Free State Operations

Figure 5: View of a return water dam (left) and residue deposition pipelines (right)

The proposed Brand A TSF site covers an area of approximately 165ha. Slurry deposition is proposed on the Brand A TSF footprint and the existing Return Water Dam (RWD) will be used for the containment of affected water from the penstock, underdrainage and runoff (**Figure 5**). In order to allow for slurry deposition on Brand A TSF from either of the operational plants, a number of new residue deposition pipelines will be required (**Figure 5**). The residue deposition pipelines will have a NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. The pipelines will be flanged steel pipelines and installed above-ground on pre-cast concrete plinths. A 3.5m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections. The precise dimensions and details of the proposed new TSF will be provided in the EIA Report once the engineering designs have been completed.

2.3 LISTED AND SPECIFIED ACTIVITIES TRIGGERED

In terms of Section 24(2) of NEMA, the Minister and/or any MEC in concurrence with the Minister may identify activities which require authorisation as these activities may negatively affect the environment. Environmental Impact Assessment (EIA) Regulations were promulgated in 2014 and amended in 2021 in terms of Section 24(5) and Section 44 of the National Environmental Management Act (NEMA), Act 107 of 1998 and consist of the following:

- *Regulation 982* provide details on the processes and procedures to be followed when undertaking an Environmental Authorisation process (also referred to as the EIA Regulations);
- *Listing Notice 1* (Regulation 983, as amended) defines activities which will trigger the need for a Basic Assessment process;

- *Listing Notice 2* (Regulation 984, as amended) defines activities which trigger an Environmental Impact Assessment (EIA) process. If activities from both R 983 and R 984 are triggered, then an EIA process will be required; and
- *Listing Notice 3* (Regulations 985, as amended) defines certain additional listed activities for which a Basic Assessment process would be required within identified geographical areas.

The above regulations were assessed to determine whether the proposed project will trigger any of the above listed activities, and if so, which Environmental Authorisation Process would be required. The triggered listed activities presented in **Table 5** and the applicant will require an Environmental Authorisation (EA) and Waste Management License (WML) in terms of GNR 984 Listing Notice 2 of the NEMA EIA Regulations 2014 as amended. A Scoping and EIA process is required in line with all the requirements of the NEMA EIA Regulations, 2014, as amended.

Table 5: Relevant NEMA listed activities relevant to the proposed development

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
GN983, Activity 10	The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more.	In order to allow for slurry deposition on Brand A from either of the operational plants (Central Plant, Saaiplaas Plant and One Plant), a number of new residue deposition pipelines will be required. The residue deposition pipelines will have a NB diameter of more than 0.36m with a peak throughput of more than 120 ℓ/s
GN983, Activity 19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	The proposed pipelines and maintenance road will likely intersect wetlands and may require infilling of more than 10m3 to ensure structural integrity.
GN983, Activity 21D	Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.	The project will require an amendment to that mining right through a MPRDA Section 102 application.
GN984, Activity 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.	Proposed Brand TSF A will involve the discharging of effluent, thus, requiring a Water Use Licence in terms of Section 21g.
GN985 Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. **b. Free State** *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as*	Clearance of vegetation in the preparation of the construction footprint will result in a potential impact on listed endangered ecosystem and critical biodiversity areas.

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
	critically endangered in the National Spatial Biodiversity Assessment 2004; *ii. Within critical biodiversity areas identified in bioregional plans;* *iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*	
GN985 Activity 14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. **b. Free State** *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	The proposed footprint for the TSF, pipelines and access roads is located within 32m of wetlands and will exceed 10 square metres.

The listed activities that are triggered by the project in terms of GN921 (as amended) promulgated under the National Environmental Management Waste Act (Act 59 of 2008 - NEMWA) are specified in **Table 6** below:

Table 6: Applicable NEMWA Activities relevant to the proposed development

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
Category B, Activity B7	The disposal of any quantity of hazardous waste to land.	TSF operations
Category B, Activity B10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	TSF construction
Category B, Activity B11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	TSF construction / operation

The Department of Mineral Resources and Energy (DMRE) has been identified as the CA for both the NEMA and NEM:WA listed activities triggered by the project. A separate application for a Water Use Licence (WUL) has also been lodged with the Department of, Water and Sanitation (DWS) for the water use triggers.

2.4 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g., on livelihoods, loss of heritage site, opportunity costs, etc.). This section of the report provides the need and desirability for the proposed Brand A TSF.

The applicant owns and operates a number of Gold Mines and plants in the Welkom region in the Free State and currently deposits tailings onto the Free State South 2 Tailings Storage Facility (TSF), St. Helena 4 TSF, St. Helena 123 TSF, Dam 23 TSF, Brand D TSF and Target 1&2 TSF. The current planned Life of Mine (LOM) of the Free State operations exceed the available deposition capacity of these TSFs. As such, Harmony is undertaking a feasibility assessment to redeposit slurry on the footprint of Brand A TSF which has largely been reclaimed to date. This process will allow for the operations to continue safely. In addition, a reserve reclamation study which looked at the reclamation and treatment of the 774Mt of tailings contained in reserve status in TSFs in the Free State indicated that Harmony will require deposition space in future. **Table 7** present the needs and desirability analysis undertaken for the project.

Table 7: Needs and desirability analysis for the proposed TSF

Ref No.	Question	Answer
1	Securing ecological sustainable development and use of natural resources	
1.1	How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities.	Although the study area has been disturbed through the active mining operations, based on the proposed development and site sensitivity verification, several specialist studies form part of this environmental impact assessment including: • Soils and Agricultural Impact Assessment; • Visual Impact Assessment; • Air Quality Assessment; • Groundwater Assessment; • Climate Change Assessment • Social Impact Assessment • Terrestrial Biodiversity Assessment; • Health Risk and Radiological Impact Assessment; • Aquatics and Wetland Assessment; • Heritage Impact Assessment; • Palaeontology Impact Assessment; and • Closure and Rehabilitation Plan These studies will assist in identifying any Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Areas, Conservation Targets and Ecological drivers of the ecosystem. Where sensitive species or ecosystem drivers are identified, relevant mitigation measures will be put forward to prevent or minimise the impacts. The findings and impact assessment will be discussed during the EIA Phase,
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	The overall proposed development site inclusive of the TSF, RWD, pipelines and access roads is approximately 330ha. Based on the preliminary assessments, the study area is largely disturbed, it is not anticipated that there will be major areas of increased ecological importance that will be identified by the specialists. However, the proposed project entails the redeposition onto an existing footprint of a hazardous waste facility which can have detrimental environmental and health impacts. Therefore, should the specialists identify areas of species of conservation concern and/or major health risks, then best environmental practices will be recommended (mitigation hierarchy). As stipulated in the mitigation hierarchy, the EAP / specialist will recommend to first avoid adverse impacts, then minimize impacts that cannot be avoided, and lastly offset, or compensate for, unavoidable impacts.
1.3	How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	

Ref No.	Question	Answer
		Refer to baseline ecological statement in **Section 6** and the impact assessment in **Section 7** of this report.
1.4	What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	This development will possibly generate various general and minor hazardous waste, the majority of which will be generated during the construction phase. The general waste will be stored in designated areas and through the process of recovery and recycling, the volume of general waste being disposed to landfill will be minimised. The hazardous portion of the waste stream will also be adequately stored prior to disposal at a suitably licenced hazardous waste disposal facility. Safe disposal certificates will be obtained from the disposal facility used. Waste during the operational phase will largely be from the tailings material which will be managed accordingly through an integrated waste and tailings storage facility management approach. Waste has been identified as an impact and assessed in **Section 7**. However, it is anticipated that the following measures can be utilised to reduce the impact of the waste on the receiving environment: Waste must be stored correctly. All hazardous waste such as oil must be stored separately and disposed of at a registered facility. Proof of disposal must be kept by the Applicant.
1.5	How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	A heritage impact assessment is being conducted as part of the EIA to determine areas of archaeological and/or cultural heritage and associated mitigation measures. Based on the National Web-Based Screening Tool Report, the relative Archaeological and Cultural Heritage Theme relative sensitivity is *Very Low*. Therefore, the proposed project will likely not disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage. However, a Chance Find Protocol procedure will likely be recommended by the specialist.
1.6	How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the impact assessment in **Section 7** of this report. As a result of the fact that this project entails only a new TSF only it is anticipated that this project will not lead to a significant impact or depletion of non-renewable resources.
1.7	How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	It is anticipated that the project will have a low impact on the localised ecology. Refer to the impact assessment in **Section 7** of this report.

Ref No.	Question	Answer
1.7.1	Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e., de-materialised growth)?	The proposed project is only for additional deposition space required for Harmony's Free State operations.
1.7.2	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used?	The proposed project will not, at this stage, involve the use of the natural resources apart from the TSF footprint area to be cleared.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The proposed project is only for additional deposition space required for Harmony's Free State operations.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts:	
1.8.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	In order to prevent repetition, the reader is directed to the assumptions and limitations presented in **Section 1.2**.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is considered low at this stage.
1.8.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	At this stage it is anticipated that this project will not lead to a significant impact on the receiving environment. Refer to the impact assessment in **Section 7** of this report.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following?	
1.9.1	Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	The proposed activities are anticipated to have low negative ecological impacts. Refer to the impact assessment in **Section 7** in this report.
1.9.2	Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	A medium to low impact on third party wellbeing, livelihoods and ecosystem services is currently foreseen. Refer to the impact assessment in **Section 7** of this report.

Ref No.	Question	Answer
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	The proposed survey activities are anticipated to have generally low negative ecological impacts. Refer to the impact assessment in **Section 7** in this report.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	As part of the scoping phase, suitable alternatives are being considered and will be finalised in the EIA phase once due consideration of alternatives has been completed. Refer to **Section 4** for the details of the alternatives considered at this stage.
1.13	Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to **Section 7** of this report for the identified impacts, their assessment and recommended mitigation measures. This aspect will be further explored in the EIA phase and findings thereof presented in the EIA Report and EMPr
2	**Promoting justifiable economic and social development**	
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following:	
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area	Refer to **Section 6.6** of this report for a breakdown of the demographics and social environment in the project area. The Matjhabeng IDP identifies Economic infrastructure and development as one of the key mayoral strategic priorities (IDP 2023/24). More detail will be provided in the Social Assessment report that will form part of the EIA.
2.1.2	Spatial priorities and desired spatial patterns (e.g., need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Welkom. The Free State Provincial Growth and Development Strategy (FGDS) is based on six pillars, each with its own set of drivers (FSDF, 2012). One of the drivers included is to minimise the impact of the declining mining sector and ensure that existing mining potential is harnessed.
2.1.3	Spatial characteristics (e.g., existing land uses, planned land uses, cultural landscapes, etc.), and	Refer to the baseline environment in **Section 6** of this report.
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	Considering the location of the activities, it is not anticipated to significantly promote or facilitate spatial transformation and sustainable urban development.

Ref No.	Question	Answer
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	Refer to the impact assessment in **Section 7** in this report.
2.2.1	Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Welkom. In addition, Harmony has various social and LED initiatives required under their Social & Labour Plan (SLP) commitments.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to the public participation process and feedback contained in **Appendix C**.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to the impact assessment and mitigation measures in **Section 7** of this report.
2.5	**In terms of location, describe how the placement of the proposed development will:**	
2.5.1	Result in the creation of residential and employment opportunities in close proximity to or integrated with each other.	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Welkom.
2.5.2	Reduce the need for transport of people and goods.	The activities are not anticipated to have an impact on the transportation of goods and people.
2.5.3	Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport),	The activities are not anticipated to have any significant impact on the public transport.
2.5.4	Compliment other uses in the area,	The surrounding area is impacted by existing TSF facilities.
2.5.5	Be in line with the planning for the area.	Refer to item 2.1.1 of this table (above).
2.5.6	For urban related development, make use of underutilised land available with the urban edge.	Not applicable. The proposed project is not located in an urban area.
2.5.7	Optimise the use of existing resources and infrastructure,	Refer to **Section 2** of this report.

Ref No.	Question	Answer
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g., not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	Not applicable. The proposed project is not located within an urban area.
2.5.10	Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	Refer to items 2.5.7 – 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes	Refer to impact assessment in **Section 7** of this report.
2.5.12	Take into account special locational factors that might favour the specific location (e.g., the location of a strategic mineral resource, access to the port, access to rail, etc.),	Refer to alternative analysis in **Section 4**.
2.5.13	The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential).	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Welkom. In addition, Harmony has various social and LED initiatives required under their various SLP commitments.
2.5.14	Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	Refer to impact assessment in **Section 7** of this report.
2.5.15	In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Given the scale of the development it is not anticipated that the activities will contribute significantly to settlements or areas in terms of direct socio-economic returns however the development will allow operations at the Harmony One plant and various Harmony Welkom mining operations to continue.
2.6	**How was a risk-averse and cautious approach applied in terms of socio-economic impacts:**	
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Refer to **Section 1.2** of this report.
2.6.2	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions should the recommended mitigation and management measures be implemented and adhered to.

Ref No.	Question	Answer
2.6.3	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions should the recommended mitigation and management measures be implemented and adhered to.
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1	Negative impacts: e.g., health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Refer to the impact assessment in **Section 7** of this report.
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the impact assessment in **Section 7** of this report.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the impact assessment in **Section 7** of this report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment in **Section 7** of this report.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment in **Section** 7 of this report.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	By conducting an EIA Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment in **Section 7** of this report.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Refer to the impact assessment in **Section 7** of this report. The EMPr will specify timeframes within which mitigation measures must be implemented.

Ref No.	Question	Answer
2.13	What measures were taken to:	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to **Section 5** of this report, describing the public participation process undertaken for the proposed project.
2.13.2	Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	Refer to **Section 5** of this report, describing the public participation process undertaken for the proposed project. advertisement, notification letter and site notice have been made available in English, Afrikaans and Sesotho to assist in understanding of the project. Further public consultation will be held during the review period of the Scoping / EIA report for the project.
2.13.3	Ensure participation by vulnerable and disadvantaged persons,	
2.13.4	Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	
2.13.6	Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7	Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Refer to **Section 5** of this report, describing the public participation process undertaken for the proposed project.
2.15	What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Potential future workers will have to be educated on a regular basis as to the environmental and safety risks that may occur within their work environment. Furthermore, adequate measures will have to be taken to ensure that the appropriate personal protective equipment is issued to workers based on the conditions that they work in and the requirements of their job.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1	The number of temporary versus permanent jobs that will be created.	

Ref No.	Question	Answer
2.16.2	Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area).	It is anticipated that the use of local labour will be utilised as far as possible. Labourers will mostly be sourced from surrounding towns and areas such as Welkom. Details in terms of job figures and employment opportunities will be made available for the EIA-phase report.
2.16.3	The distance from where labourers will have to travel.	
2.16.4	The location of jobs opportunities versus the location of impacts.	
2.16.5	The opportunity costs in terms of job creation.	
2.17	What measures were taken to ensure:	
2.17.1	That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.	The EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments are notified at various phases of the project by the EAP.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to **Section 5** of this report, describing the public participation process implemented for the application, as well Section 6, the impact on any national estate.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in **Section 7** of this report.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The proposed survey activities are not anticipated to produce significant pollution, environmental damage or adverse health effects in the long term.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to **Section 4**, description of the process followed to reach the proposed preferred site.

Ref No.	Question	Answer
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to the impact assessment and mitigation measures in **Section 7**. The impacts will be further explored in the EIA phase and findings thereof presented in the EIA Report and EMPr.

3 POLICY AND LEGISLATIVE CONTEXT

This section provides an overview of the governing legislation identified which may relate to the proposed project. The primary legal requirement for this project stems from the need for an EA to be granted by the competent authority, which is the DMRE, in accordance with the requirements of the NEMA EIA Regulations 2014, as amended. In addition, there are numerous other pieces of legislation governed by many acts, regulations, standards, guidelines and treaties on an international, national, provincial and local level, which should be considered in order to assess the potential applicability of these for the proposed activity. The key legislation applicable to this project is discussed in the subsections below. The contents of this report are based on a review of the information that was available at the time of the compilation of the report. The discussion in this chapter is by no means an exhaustive list of the legal obligations of the applicant in respect of environmental management for the proposed Brand A TSF project.

3.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the proposed Brand A TSF operates is governed by many Acts, Regulations, Standards and Guidelines on a national level. Legislation applicable to the project includes (but is not limited to) those discussed below.

3.1.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act No. 108 of 1996) makes provisions for environmental issues and declares that: *"Everyone has the right -*

a) to an environment that is not harmful to their health or well-being; and

b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

i. prevent pollution and ecological degradation;

ii. promote conservation; and

iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

The State must therefore respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities. The Constitution therefore recognises that the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must cooperate with, consult and support one another if the State is to fulfil its constitutional mandate. The application for Environmental Authorisation for the proposed Brand A TSF will ensure that the environmental right enshrined in the Constitution contributes to the protection of the biophysical and social environment.

3.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998 – NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA. In South Africa, EIAs became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now Department of Forestry, Fisheries and the Environment – DFFE) promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were

amended several times between 2010 and 2022. The NEMA EIA Regulations, 2014, as amended, are applicable to this project.

The objective of the EIA Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the listed activities that are triggered by the proposed project. The purpose of these procedures is to provide the competent authority with adequate information to make informed decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorised, and that activities which are authorised are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIAs in order to apply for, and be considered for, the issuing of an EA. These EIA Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity (refer to **Figure 6**).

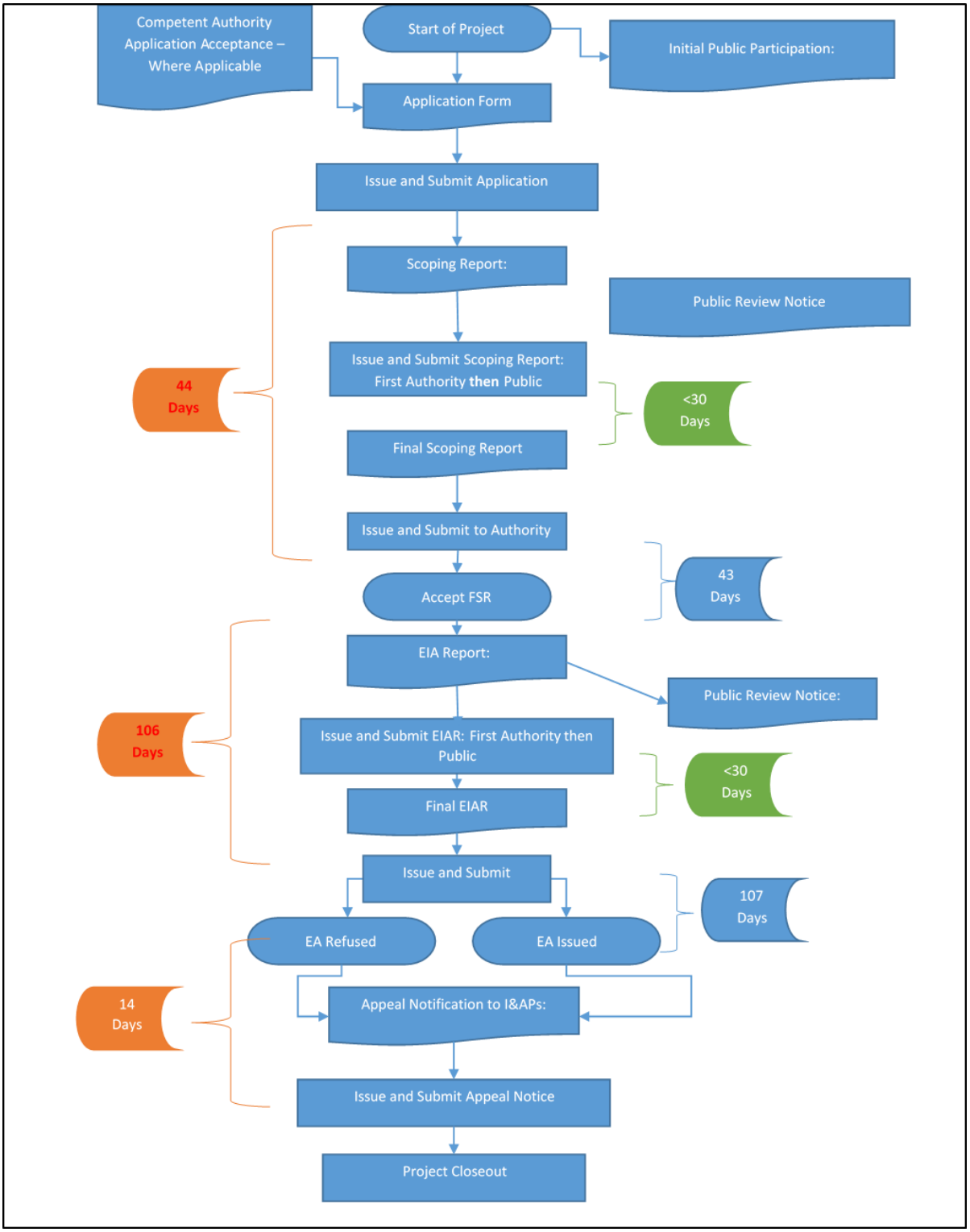

Figure 6: EIA process diagram.

An environmental Scoping and Impact Assessment process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and Impact Assessment studies accordingly provide a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts. **Figure 6** provides a graphic representation of all the components of a full EIA process.

Section 24P of the NEMA requires that an applicant for an environmental authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the EA, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning

management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and the method of financial provision indicated in line with the NEMA Financial Provision Regulations (2015). The financial provision costs will be presented in the EIA Report. The listed activities, the proposed project triggers and consequently requires authorisation prior to commencement are detailed in **Section 2.3** (**Table 5**).

NEMA is the main Environmental Legislation in South Africa and other Specific Environmental Management Acts (SEMA's) support its objectives. Examples of SEMA's include the following:

- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008);
- National Water Act, 1998 (Act No. 36 of 1998);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004); and
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

Some specific Environmental Management Legislation is discussed in **Sections 3.1.4 to 3.1.18.** The key principles of NEMA as outlined in Chapter 3 can be summarised as follows:

- sustainability must be pursued in all developments to ensure that biophysical and socio-economic aspects are protected; or
- there must be equal access to environmental resources, services and benefits for all citizens including the disadvantaged and the vulnerable. Adverse environmental impacts shall be distributed fairly among all citizens;
- environmental governance must include the participation of all interested and affected parties who must be catered for to allow their effective participation;
- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably; and

The polluter pays principle must be applied in all cases where any person has caused pollution or undertaken any action that led to the degradation of the environment.

3.1.3 NEMA ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED

In terms of section 24(2) of NEMA, the Minister and or any MEC in concurrence with the Minister may identify activities that require authorisation as these activities may negatively affect the environment. The Act requires that in such cases the impacts must be considered, investigated and assessed before their implementation, and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity. The NEMA EIA Regulations guide the processes required for the assessment of impacts of Listed Activities.

The requirement for the undertaking of Environmental Impact Assessments and Basic Assessments began in 1997 with the promulgation of the EIA Regulations under the Environment Conservation Act, 1989 (ECA) (Act No. 73 of 1989). These were followed by the 2006, 2010 and 2014 regulations. **Table 8** is a summary of the progression of the EIA regulations to date.

Table 8: Summary of the South African EIA regulations from inception to date

EIA Regulations	Government Gazette
EIA Regulations promulgated in terms of the ECA, Act No 73 of 1989	GNR 1182 & 1183: Government Gazette No 18261, 5 September 1997
Amendment of the ECA EIA Regulations	GNR 670 and GNR 672 of 10 May 2002, Government Gazette No 23401

2006 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 385, 386 and 387 Government Gazette No 28753, Pretoria, 21 April 2006
2010 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 543, 544, 545 and 546 Government Gazette No 33306, Pretoria, 18 June 2010
2014 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 982, 983, 984 and 985 Government Gazette No 38282, Pretoria, 04 December 2014
Current Amendment of the 2014 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 982, 983, 984 and 985 Government Gazette No 44701, Pretoria, 2021 as amended

The scoping and EIA process for the proposed Brand A TSF is undertaken in terms of the NEMA EIA Regulations, 2014, as amended.

3.1.4 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA further governs the sustainable utilisation of South Africa's mineral resources.

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment to Section 102 which concerns the amendment of rights, permits, programmes and plans, to requiring the written permission from the Minister for any amendment or alteration; and the Section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014 as was last amended in April 2017.

In support of the separate WML application specifically, the applicant is required to conduct an EIA process comprising of the preparation of environmental Scoping and EIA Reports, an EMPr, as well as Interested and Affected Party (I&AP) consultations, all of which must be submitted to the DMRE for adjudication. This report has been compiled in accordance with Regulation 49 of the MPRDA and Regulation 21 and Appendix 2 of the EIA Regulations (2014, as amended) in order to satisfy the criteria for a Scoping Report. This Scoping Report pertains to both the NEMA and WML application for the proposed Brand A TSF.

3.1.5 THE MINING AND BIODIVERSITY GUIDELINES, 2013

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the SANBI and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to "foster a strong relationship between biodiversity and mining, which will eventually translate into best practice within the mining sector. It provides a tool to facilitate the sustainable development of South Africa's mineral resources, in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where: mining-related impacts are legally prohibited; biodiversity priority areas may present high risks for mining projects; and biodiversity may limit the potential for mining.

In identifying biodiversity priority areas, which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

A) Legally protected areas, where mining is prohibited;

B) Areas of highest biodiversity importance, which are at the highest risk for mining;

C) Areas of high biodiversity importance, which are at a high risk for mining; and

D) Areas of moderate biodiversity importance, which are at a moderate risk for mining.

The study area location will be assessed against the Mining and Biodiversity Guidelines (2013) spatial dataset to determine which categories it falls within. Based on preliminary review of available information, it is likely that that the project area is located within Category D due to the existing mining activities in the area.

3.1.6 NATIONAL RADIOACTIVE WASTE DISPOSAL INSTITUTE ACT 53 OF 2008

In terms of this Act the generators of radioactive waste are responsible for technical, financial and administrative management of such waste within the national regulatory framework at their premises and when such waste is transported to an authorised waste disposal facility. The generators of radioactive waste are responsible for technical, financial and administrative management of such waste within the national regulatory framework at their premises and when such waste is transported to an authorised waste disposal facility.

Generators of radioactive waste must:

A) develop and implement site-specific waste management plans based on national policy;

B) provide all relevant information on radioactive waste as required by the chief executive officer;

C) demonstrate compliance with any conditions of a radioactive waste disposal certificate;

D) provide site access to staff of the Institute for inspection against any conditions of the radioactive waste disposal certificate.

The TSF slurry is considered radioactive waste. Generators of radioactive waste remain responsible for all liabilities in connection with such radioactive waste under their control.

3.1.7 THE NATIONAL WATER ACT, 1998

The National Water Act, 1998 (Act 36 of 1998 – NWA) makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the NEMA EIA Regulations. These water use processes are described in **Figure 7**. A person may use water if the use is –

- Permissible as a continuation of an existing lawful water use (ELWU);
- Permissible in terms of a general authorisation (GA);
- Permissible under Schedule 1; or
- Authorised by a licence.

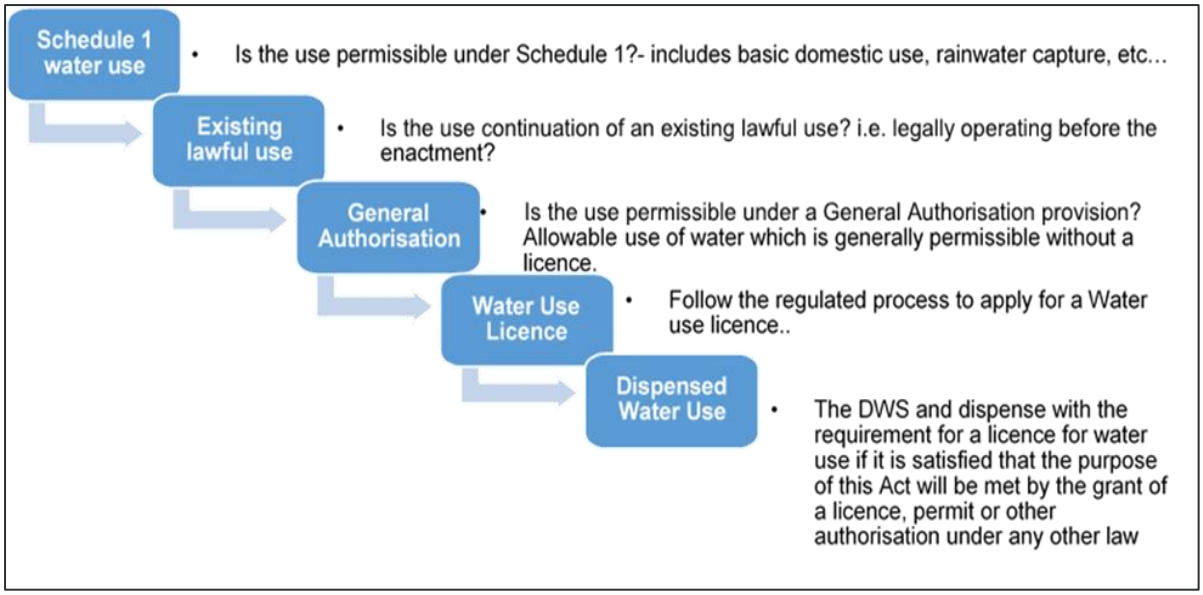

Figure 7: Authorisation processes for new water uses.

The purpose of the NWA is to ensure that the nation's water resources are protected, used, developed, conserved and managed in ways that take into account:

- Meeting basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest; facilitation social and economic development;
- Providing for the growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and drought.

The NWA defines 11 water uses in Section 21 of the Act. A water use may only be undertaken if authorised by the Department of Water and Sanitation (DWS). The water uses for which an authorisation or licence can be issued include:

a) Taking water from a water resource;

b) Storing water;

c) Impeding or diverting the flow of water in a watercourse;

d) Engaging in a stream flow reduction activity contemplated in section 36;

e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

g) Disposing of waste in a manner which may detrimentally impact on a water resource;

h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

i) Altering the bed, banks, course or characteristics of a watercourse;

j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

k) Using water for recreational purposes.

The regulated area of a watercourse for section 21 activities of the Act water uses is similarly defined in terms of the Act as follows:

a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or

c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

A review of the NWA Section 21 activities was undertaken to assess if the proposed development triggers any activity. Based on the information provided by the developer, the proposed development triggers Section 21c, Section 21i and Section 21g of the NWA. Subsequently, a Water Use License Application in concurrently underway for the project with the Department of Water and Sanitation, Free State Region.

3.1.7.1 THE NATIONAL WATER ACT, GOVERNMENT NOTICE 704, 1999

GN 704 (Government Gazette 20118 of June 1999) was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The five main principal conditions of GN 704 applicable to this project are:

- Condition 4 – which defines the area in which, mine workings or associated structures may be located, with reference to a watercourse and associated flooding. Any residue deposit, dam, reservoir together with any associated structure or any other facility should be situated outside the 1:100 year flood-line. Any underground or opencast mining, prospecting or any other operation or activity should be situated or undertaken outside of the 1:50 year flood-line. Where the flood-line is less than 100 metres away from the watercourse, then a minimum watercourse buffer distance of 100 metres is required for infrastructure and activities;
- Condition 5 – which indicates that no residue or substance which causes or is likely to cause pollution of a water resource may be used in the construction of any dams, impoundments or embankments or any other infrastructure which may cause pollution of a water resource;
- Condition 6 – which describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained and operated to ensure conveyance the 1:50 year peak flow. Clean and dirty water systems should not spill into each other more frequently than once in 50 years. Any dirty water dams should have a minimum freeboard of 0.8m above full supply level;
- Condition 7 – which describes the measures which must be taken to protect water resources. All dirty water or substances which may cause pollution should be prevented from entering a water resource (by spillage, seepage, erosion, etc.) and ensure that water used in any process is recycled as far as practicable; and

- Condition 10 – which describes the requirements for operations involving extraction of material from the channel of a watercourse. Measures should be taken to prevent impacts on the stability of the watercourse, prevent scour and erosion resulting from operations, prevent damage to in-stream habitat through erosion, sedimentation, alteration of vegetation and flow characteristics, construct treatment facilities to treat water before returning it to the watercourse, and implement control measures to prevent pollution by oil, grease, fuel and chemicals.

Based on preliminary assessment, it is unlikely that the Brand A TSF will be located within the 1:100 year floodline of a watercourse, however it may be located within 100m from the edge of a watercourse (i.e. wetlands). This will be confirmed in the EIA phase once the wetland delineations have been completed.

3.1.7.2 CATCHMENT MANAGEMENT STRATEGIES

South Africa is divided into nineteen Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level is achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA progressively develops a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a WMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources. The proposed development site is situated within quaternary catchment C43B which has an area of 723 km^2 and is located within the Middle Vaal WMA. The Sandrivier (approximately 3km south of the site) is the only defined river relevant to this assessment (when considering the more detailed 1:50,000 topographical map data).

According to the Middle Vaal WMA Internal Strategic Perspective (2004), The land use in the Middle Vaal WMA is characterised by agriculture with the main irrigation crops being wheat, maize, groundnuts, sorghum and sunflowers. There are also extensive gold mining activities located in the Middle Vaal water management area. These activities are generating substantial return flow volumes in the form of treated effluent from the urban areas and mine dewatering that are discharged into the river system. These discharges are having significant impacts on the water quality in the main stem of the Vaal River in the Middle Vaal WMA.

The Broad Management Objectives within the Middle Vaal WMA include:

- To manage the water quality by setting WQOs and developing a CMS as per the Water Quality Management Strategy.
- The monitoring of the system to provide management information for water quality management, abstraction control and input to the overarching operations and planning processes.
- Provide input into the supply of local authorities from local groundwater and surface water resources. This will be in the form of strategic level guidance as to where water can be obtained, and the level of study needed to be submitted with the license application.
- Promotion of WC&DM through the water service providers and local authorities to achieve efficient use of water. Only once efficient use has been achieved can further transfers be considered.

In a parallel application, Harmony Gold is currently applying for a Water Use License to ensure that any water resources (surface and groundwater as well as wetlands) affected by the proposed project activities are licensed and managed in accordance with the relevant water and environmental legislation.

3.1.8 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

The National Environmental Management: Waste Act, no 59 of 2008 (NEMWA) came into effect on the 1st of July 2009. The Waste Act places a general duty on a holder of waste to avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated; reduce, re-use, recycle and recover waste; where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner; manage the waste in such a manner that it does not endanger

the health or the environment or cause a nuisance through noise, odour or visual impacts; prevent any employee or any person under his or her supervision from contravening the Act; and prevent the waste from being used for an unauthorised purpose. Section 16 of the NEMWA must also be considered which states the following:

1. A holder of waste must, within the holder's power, take all reasonable measures to-

    a) "*Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*

    b) Reduce, re-use, recycle and recover waste;

    c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

    d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;

    e) Prevent any employee or any person under his or her supervision from contravening the Act; and

    f) *Prevent the waste from being used for unauthorised purposes.*"

These general principles of responsible waste management will be incorporated into the requirements in the EMPr to be implemented for this project.

Waste can be defined as either hazardous or general in accordance with Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste. In order to attempt to understand the implications of these waste groups, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "*any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles*."
- Residue deposits: means "*any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right*."
- Residue stockpile: means "*any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act*."
- General waste: means "*waste that does not pose an immediate hazard or threat to health or to the environment and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69*."

Furthermore, the NEMWA provides for specific waste management measures to be implemented, as well as providing for the licensing and control of waste management activities. The proposed Brand A TSF waste management activities in terms of Category B of GN R. 921 which states that "*a person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management licence application*."

The listed waste activities that are triggered by the Brand A TSF, and which form the basis of this waste management licence application, are presented in **Table 9**.

Table 9: List of waste activities that are triggered by the proposed TSF

Waste Category and Number	Description
Category B7	The disposal of any quantity of hazardous waste to land.
Category B10	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).
Category B11	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

3.1.8.1 NEMWA WASTE CLASSIFICATION AND MANAGEMENT REGULATIONS, 2013

These regulations pertain to waste classification and management, including the management and control of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation which is relevant to the proposed project. The purpose of these Regulations is to –

Regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;

Establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence;

- Prescribe requirements for the disposal of waste to landfill;
- Prescribe requirements and timeframes for the management of certain wastes; and
- Prescribe general duties of waste generators, transporters and managers.

Waste classification, as presented in Chapter 4 of these regulations, entails the following:

- Wastes listed in Annexure 1 of these Regulations do not require classification in terms of SANS 10234;
- Subject to sub regulation (1), all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation;
- Waste must be kept separate for the purposes of classification in terms of sub regulation (2), and must not be mixed prior to classification;
- Waste-must be re-classified in terms of sub regulation (2) every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors;
- Waste that has been subjected to any form of treatment must be re-classified in terms of sub regulation (2), including any waste from the treatment process.; and
- If the Minister reasonably believes that a waste has not been classified correctly in terms of sub regulation (2), he or she may require the waste generator to have the classification peer reviewed to confirm the classification.

Furthermore, Chapter 8 of the Regulations stipulates that unless otherwise directed by the Minister to ensure a better environmental outcome, or in response to an emergency so as to protect human health, property or the environment –

- Waste generators must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Act prior to the disposal of the waste to landfill;

- Waste generators must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Act; and
- Waste managers disposing of waste to landfill must only do so in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7 (1) of the Act.

The Brand TSF barrier system will be determined in consultation with the authorities and will be in compliance with these norms and standards.

3.1.8.2 NEMWA REGULATIONS REGARDING THE PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS AND ASSOCIATED AMENDMENT

These Regulations, which pertain to the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation, were published in 2015 and were amended in 2018. The Regulations and associated amendment relate to the assessment of impacts and the analyses of risks relating to the management of residue stockpiles and residue deposits, and involve the following:

The identification and assessment of environmental impacts arising from the establishment of residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);

A risk analysis based on the characteristics and the classification set out in regulation 4 (characterisation of residue stockpiles and residue deposits) and 5 (classification of residue stockpiles and residue deposits) of these regulations must be used to determine the appropriate mitigation and management measures; and

A competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis as contemplated in regulations 4 and 5 of these Regulations.

As stated in **Section 3.1.8.1**, the proposed redeposition onto Brand A TSF will be subject to these regulations. In this regard, the containment barrier design (including requirements for a liner and nature of the liner), will be addressed in accordance with chapter 3 of these Regulations and their associated amendments.

3.1.9 THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT, 2004

The National Environmental Management Biodiversity Act (Act No. 10 of 2004 – NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. A summary of these regulations is presented below.

3.1.9.1 THE LIST OF ECOSYSTEMS THAT ARE THREATENED AND NEED OF PROTECTION, 2011

The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:

- Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
- Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;
- Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and
- Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

3.1.9.2 THE THREATENED OR PROTECTED SPECIES REGULATIONS, 2007

The purpose of these regulations is to -

(a) further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species;

(b) provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;

(c) provide for the regulation of the carrying out of a specific restricted activity, namely hunting;

(d) provide for the prohibition of specific restricted activities involving specific listed threatened or protected species;

(e) provide for the protection of wild populations of listed threatened species; and

(f) provide for the composition and operating procedure of the Scientific Authority.

3.1.9.3 THE ALIEN AND INVASIVE SPECIES LIST, 2020

This Act is applicable since it protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- *Category 1a Listed Invasive Species*: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- *Category 1b Listed Invasive Species*: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- *Category 2 Listed Invasive Species:* Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- *Category 3 Listed Invasive Species*: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

Based on desktop information including the National Web-Based Environmental Screening Tool Report, the study area was assessed to be located within a Critical Biodiversity Area (CBA) 1 and within the listed endangered Vaal-Vet Sandy Grassland ecosystem. A Terrestrial Biodiversity Assessment (flora, fauna and avifaunal) is considered necessary and will be undertaken during the EIA Phase. The study will assist in identifying any Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Areas, Conservation Targets and Ecological drivers of the ecosystem as well as alien and invasive species. Where sensitive species or ecosystem drivers were identified, relevant mitigation measures will be put forward to prevent or minimise the impacts. The findings and impact assessment will be discussed during the EIA Phase. It must be noted that permits for protected species under the NEMBA may also be required.

3.1.10 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT, 2004

The National Environmental Management: Air Quality Act (Act No. 39 of 2004 as amended – NEMAQA) is the main legislative tool for the management of air pollution and related activities. The Object of the Act is:

To protect the environment by providing reasonable measures for –

i. the protection and enhancement of the quality of air in the republic;

ii. the prevention of air pollution and ecological degradation; and

iii. securing ecologically sustainable development while promoting justifiable economic and social development; and

iv. Generally, to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people.

The NEMAQA mandates the Minister of Environment to publish a list of activities which result in atmospheric emissions and consequently cause significant detrimental effects on the environment, human health and social welfare. All scheduled processes as previously stipulated under the Air Pollution Prevention Act (APPA) are included as listed activities with additional activities being added to the list. The updated Listed Activities and Minimum National Emission Standards were published on the 22nd November 2013 (Government Gazette No. 37054).

According to the NEMAQA, air quality management control and enforcement is in the hands of local government with District and Metropolitan Municipalities as the licensing authorities. Provincial government is primarily responsible for ambient monitoring and ensuring municipalities fulfil their legal obligations, with national government primarily as policy maker and co-ordinator. Each sphere of government must appoint an Air Quality Officer responsible for co-ordinating matters pertaining to air quality management. Given that air quality management under the old Act was the sole responsibility of national government, local authorities have in the past only been responsible for smoke and vehicle tailpipe emission control.

Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of the NEMAQA Published under GN 893 in GG 37054 of 22 November 2013 were assessed to determine if the proposed development triggers any of the identified activities. Based on the assessment, the proposed Brand A TSF does not trigger any Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of the NEMAQA. However, any changes to the project description which may trigger such listed activities must be assessed thoroughly for the applicant to check applicability for an Atmospheric Emission Licence (AEL).

3.1.10.1 THE NATIONAL DUST CONTROL REGULATIONS, 2013

Dustfall is assessed for nuisance impact and not for inhalation health impact. The National Dust Control Regulations (Department of Environmental Affairs, 2013) prescribes measures for the control of dust in residential and non-residential areas. Acceptable dustfall rates are measured (using American Standard Testing Methodology (ASTM) D1739:1970 or equivalent) at and beyond the boundary of the premises where dust originates. In addition to the dustfall limits, the National Dust Control Regulations prescribe monitoring procedures and reporting requirements. Dust that may be created from the proposed TSF will be managed in accordance with these Regulations.

3.1.10.2 THE NATIONAL GREEN HOUSE GASES EMISSION REPORTING REGULATIONS, 2017

On 14 March 2014, the following six Green House Gases (GHGs) were declared as priority air pollutants in South Africa:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous Oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Sulphur hexafluoride (SF_6).

National GHG Emission Reporting Regulations (Government Gazette No. 40762 of 3 April 2017), as amended (General Notice 994 in Government Notice 43712 of 11 September 2020), were published by the DFFE. A person identified as a Category A data provider in terms Annexure 1 of these regulations, must register their facilities using the online South African Greenhouse Gas Reporting System (SAGERS) (https://ghgreporting-public.environment.gov.za/GHGlanding/). Once registered the data provider must submit a GHG emissions inventory, activity data and report in the required format given under Annexure 3 of these regulations on an annual basis. All data must be provided annually, by the 31 March of the following year. Based on the EAPs preliminary assessment, the proposed Brand A TSF will not trigger GHG listed activities. However, any changes

to the project description which may trigger such listed activities, the applicant would need to quantify and report on the proposed plant's GHG emissions by the 31 March of each year.

3.1.11 THE NATIONAL HERITAGE RESOURCES ACT (NHRA)

The National Heritage Resources Act (Act 25 of 1999 – NHRA) stipulates that cultural heritage resources may not be disturbed without authorisation from the relevant heritage authority. Section 34(1) of the NHRA states that, "*no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…*" The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through the NEMA, MPRDA and the Development Facilitation Act (FDA) legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorisations are granted for a development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impact Processes required by the NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*". A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken into account of in the EIA Regulations under the NEMA relates to the Specialist Report requirements (Appendix 6 of EIA Regulations 2014, as amended) .

The MPRDA defines 'environment' as it is in the NEMA and, therefore, acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the NHRA that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008).

Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

(a) ***the construction of a road****, wall, powerline,* ***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 50 m in length;

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

(i) exceeding 5 000 m^2 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

According to the national web-based environmental screening tool (DFFE Screening Tool Report), the proposed development is located within an area of *low* relative archaeological and cultural heritage theme sensitivity. However, an assessment of the NHRA and preliminary project information revealed that the proposed development triggers Section 38(1) of the NHRA. Therefore, a Heritage Impact Assessment is required and will be undertaken in the EIA Phase. The South African Heritage Resources Agency (SAHRA), the Free State Provincial Heritage Resources Authority (FSHRA) and Association of Southern African Professional Archaeologists (ASAPA) are I&APs in the project and will be provided with a copy of the report for review and comment.

3.1.12 THE NATIONAL NOISE CONTROL REGULATIONS, 1992

In terms of section 25 of the ECA, the National Noise Control Regulations (GN R. 154 – NCRs) published in Government Gazette No. 13717 dated 10 January 1992, were promulgated. The NCRs were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Provincial noise control regulations have been promulgated in Gauteng, Free State and Western Cape Provinces.

The NCRs will need to be considered in relation to the potential noise that may be generated mainly during the construction phase of the proposed project. The two key aspects of the NCRs relate to disturbing noise and noise nuisance.

Section 4 of the Regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the Regulations as "*a noise level which exceeds the zone sound level or if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more*."

Section 5 of the NCRs in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as "*any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person".* The South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these Regulations.

3.1.12.1 THE NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

South African National Standard (SANS) 10103:2008 – 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';

- SANS 10210:2004 – 'Calculating and predicting road traffic noise';
- SANS 10328:2008 – 'Methods for environmental noise impact assessments';
- SANS 10357:2004 – 'The calculation of sound propagation by the Concave method';
- SANS 10181:2003 – 'The Measurement of Noise Emitted by Road Vehicles when Stationary'; and
- SANS 10205:2003 – 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.

3.1.13 THE NATIONAL WEB-BASED ENVIRONMENT SCREENING TOOL, 2019

On the 5th of July 2019, the Department of Forestry, Fisheries and the Environment (DFFE) issued a Notice of the requirement to submit a report generated by the National Web-based Environmental Screening Tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and Regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended. The submission of this report is compulsory when applying for environmental authorisation

in terms of Regulation 19 and Regulation 21 of the Environmental Impact Assessment Regulations, 2014 effective from the 4th of October 2019. The DFFE Screening Tool Report was generated on the 2nd of October 2023. The Screening report is provided in **Appendix D** of this report. The main findings to be discussed from the screening report are listed below.

The following summary of the study area's environmental sensitivities were identified in the Environmental Screening Report. The environmental sensitivities for the proposed development footprint are indicated on **Table 10**.

Table 10: Environmental Sensitivity of Project Area

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		X		
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation (Solar PV) Theme		X		
Defence Theme				X
Palaeontology Theme			X	
Plant Species Theme				X
Terrestrial Biodiversity Theme	X			

The information collected by the specialists and EAP's assessment may be used to confirm or dispute (as may be applicable) the environmental sensitivity ratings identified by the National Screening Tool. Although the specialist studies will be undertaken during the EIA phase, the EAP has already undertaken a site sensitivity verification (**Appendix E**) and EAPs assessments/theme and sensitivity ratings identified by the Screening Tool are summarized in **Table 11** below.

Page 6 and 7 on the DFFE Screening Report indicates that certain Specialist Assessments must be undertaken for the proposed development. There is however an allowance of the EAP to motivate for the reasons for not including certain assessments in the assessment report. **Table 12** presents these Specialist Assessments/Studies as well as the motivations behind the EAP's decision of recommending or not recommending the undertaking of certain Specialist Assessments.

Table 11: Specialist Assessments/themes and Sensitivity Ratings identified by DFFE's Web-based Screening Tool

Assessment Theme	Sensitivity Rating (Screening Report)	Sensitivity Rating (Site Verification)	Response
Agriculture Theme	High	Low	Relative Agricultural Sensitivity was assessed to be *Low-Sensitive* by the Site Sensitivity Verification (SSV) attached as **Appendix E**. The SSV found that there are some agricultural activities within the study area. However, where the Brand A TSF footprint is proposed is an area which was used for the same mining activity and the proposed residue pipelines and access road will be located parallel to existing pipelines and therefore, there will be minimal impact on agricultural activities and/or land. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on the agricultural potential provided that the mitigation measures highlighted in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Animal Species Theme	Medium	Low	Relative Animal Species Sensitivity was assessed to be *Low-Sensitive* as the SSV found that the proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the fauna habitats. Although the study area falls within Critical Biodiversity Area (CBA) 1 and a vulnerable ecosystem, the mining activities have significantly disturbed the natural ecosystem and therefore, there is a low likelihood of vulnerable, species of conservation concern (SCC) and/or protected fauna present within the area. However, even though the impacts on animal life is anticipated to be relatively *low,* the extent of the site and potential presence of important biodiversity cannot be excluded. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on the animal species provided that the mitigation measures highlighted in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Aquatic Biodiversity Theme	Very High	Medium	Relative Aquatic Biodiversity Theme Sensitivity was assessed to be *Medium-Sensitive.* Based on review of desktop information and site verification, it was found that there are pre-identified wetlands around the proposed development footprint. However, these wetlands were noted to have been already impacted upon by the mining activities and therefore not in their natural state. The closest river to the site is the Sandrivier which is approximately 3km south of the study area. In addition, the study area is not located within an Ecological Support Area. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be medium-low impacts on the wetlands provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Archaeological and Cultural Heritage Theme	Low	Low	Relative Archaeological and Cultural Heritage Theme Sensitivity was assessed to be *Low Sensitive* as the SSV found that there are no archaeological or physical cultural features within the proposed development footprint, there are no anticipated conflicts between archaeological or physical cultural features during the construction of the proposed Brand A TSF. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will

Assessment Theme	Sensitivity Rating (Screening Report)	Sensitivity Rating (Site Verification)	Response
			be low impacts on Archaeological and Cultural Heritage provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Civil Aviation Theme	High	Low	Relative Civil Aviation Theme Sensitivity was assessed to be *Low-Sensitive*. Although there is Harmony Airport FAHA approximately 3km south of the development site, the proposed development blends in with the existing land uses in the area and there is no anticipated impacts on civil aviation emanating from the project. The proposed development does not entail the establishment of high-rise structures, use of high frequency electromagnetic radiation nor reflecting infrastructure. Therefore, based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on Civil Aviation provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Defence Theme	Low	Low	Relative Defence Theme Sensitivity was assessed to be *Low-Sensitive* as there are no military bases / facilities present within the vicinity of the project site. The nearest defence facility is the military base in Kroonstad, approximately 60km northeast of the site. Therefore, based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on defence facilities and/or activities provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Palaeontology Theme	Medium	Low	Based on the PalaeoMap from SAHRIS, the Palaeontological Sensitivity of the proposed area of the project footprint occurs in an area with *Medium palaeo-sensitivity*. However, the study area is located on properties which have been significantly transformed and the proposed development only entails shallow excavations of the topsoil and subsoils (if necessary). Considering that no deep drilling or excavations will be required for the development of the Brand A TSF and the medium palaeo-sensitivity rating from the DFFE Screening Tool, the relative Palaeontology Theme Sensitivity was assessed to be *Low-Sensitive*. Therefore, based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on palaeontology provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Plant Species Theme	Low	Low	Relative Plant Species Sensitivity was assessed to be *Low-Sensitive* as the SSV found that the proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the plant habitats. Although the study area falls within Critical Biodiversity Area (CBA) 1 and a vulnerable ecosystem, the mining activities have significantly disturbed the natural ecosystem and therefore, there is a low likelihood of vulnerable, species of conservation concern (SCC) and/or protected flora present within the area. However, even though the impacts on plant species is anticipated to be relatively *low,* the extent of the site and potential presence of important biodiversity cannot be excluded. Based on the

Assessment Theme	Sensitivity Rating (Screening Report)	Sensitivity Rating (Site Verification)	Response
			aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be low impacts on the plant species provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.
Terrestrial Biodiversity Theme	Very High	Medium-Low	Relative Terrestrial Biodiversity Sensitivity was assessed to be *Medium-Low Sensitive* as the SSV found that the proposed development site has been transformed mainly due to the mining and agricultural activities which have disturbed the natural habitats and ecosystems. Although the study area falls within Critical Biodiversity Area (CBA) 1 and a vulnerable ecosystem, the mining activities have significantly disturbed the natural ecosystem and therefore, there is a low likelihood of vulnerable, species of conservation concern (SCC) and/or protected species present within the area. However, even though the impacts on plant species is anticipated to be relatively *medium-low,* the extent of the site and potential presence of important biodiversity cannot be excluded. Based on the aspects of the proposed development and current environmental conditions on site, it is anticipated that there will be medium-low impacts on terrestrial biodiversity provided that the mitigation measures highlighted in in brief in **Section 7.3** which will be detailed in the EMPr during the EIA Phase.

Table 12: Summary of discussions regarding the undertaking of specialist Assessments

SPECIALIST ASSESSMENT	DICUSSION AND MOTIVATION
Agricultural Impact Assessment	The SSV found that there are some agricultural activities within the study area. Although there are agricultural activities within close proximity of the site, the proposed reposition onto Brand A TSF is within a defined area and will have minimal impact on external activities outside its footprint. In addition, the crop fields were found not active and were largely infested by alien species. However, although the pipelines and maintenance road will largely follow existing pipeline routes, the new and additional routes will transect agricultural fields. Therefore, although it is anticipated that there will be minimal impact on agricultural activities and/or land and as such, **an Agricultural Impact Assessment is recommended by the EAP** to confirm the potential impacts and outline the necessary mitigation measures.
Archaeological and Cultural Heritage Impact Assessment	Although there are no pre-identified archaeological / physical cultural features within the proposed development footprint, Section 38(1)(a) of the NHRA is triggered (Refer to **Section 3.1.11**). Therefore, a **Heritage Impact Assessment (HIA) is recommended** by the EAP to identify the heritage features and provide mitigation measures (if any). It must be noted that the EAP only recommends Phase I HIA at this stage, no permits (Phase II) are applicable pending the findings of the Phase I HIA.
Palaeontology Impact Assessment	Based on the 1:250 000 SAHRIS PalaeoMap and the National Web-Based Screening Tool Report, the study area is located within a Medium Palaeo-Sensitivity area. The study area is located on an area which has been transformed and the proposed development entails shallow excavations of the topsoil with no deep excavations anticipated. Although no deep drilling or excavations will be required for construction of the Brand A TSF, due to the extent of the development footprint and the

SPECIALIST ASSESSMENT	DICUSSION AND MOTIVATION
	Medium palaeo-sensitivity rating, it is consequently the EAPs **recommendation that a Palaeontological Impact Assessment be undertaken** for the project as there may be impacts on palaeontology.
Terrestrial Biodiversity Impact Assessment	Although the study area falls within Critical Biodiversity Area (CBA) 1 and a vulnerable ecosystem, the mining activities have significantly disturbed the natural ecosystem and therefore, there is a low likelihood of vulnerable, species of conservation concern (SCC) and/or protected species present within the area. However, even though the impacts on plant species is anticipated to be relatively *medium-low,* the extent of the site and potential presence of important biodiversity cannot be excluded. Therefore, the EAP **recommends that a Terrestrial Biodiversity Impact Assessment** be undertaken to confirm if there are no Flora or Fauna SCC, or protected species within the development site and provide necessary mitigation measures.
Plant Species Assessment	Similarly, to the rationale above, the EAP recommends that a Terrestrial Biodiversity Assessment be undertaken to confirm if there are no Flora or Fauna SCC, or protected species within the development site. The **Plant Species Assessment will be covered by the Terrestrial Biodiversity Impact Assessment**.
Animal Species Assessment	Similarly, to the rationale above for Terrestrial Biodiversity Impact Assessment, the EAP recommends that a Terrestrial Biodiversity Assessment be undertaken to confirm if there are no Flora or Fauna SCC, or protected species within the development site. The **Animal Species Assessment will be covered by the Terrestrial Biodiversity Impact Assessment**.
Aquatic Biodiversity Impact Assessment	Based on review of desktop information and site verification, it was found that there are pre-identified wetlands around the proposed development footprint. Even though these wetlands were noted to have been already impacted upon by the mining activities and therefore not in their natural state, their Present Ecological State (PES) and Site Ecological Importance (SEI) cannot be undermined. Therefore, the EAP **recommends that an Aquatic Biodiversity Assessment be undertaken** to assess the PES, SEI, risk matrix and provide necessary mitigation measures.
Hydrology Assessment	The proposed development entails the establishment of a medium-high hazardous waste facility which its integrity can be influenced by hydrological conditions and inversely, it can impact the hydrological conditions. Provided that hydrological analysis can assist in analysing the scope of the flood, position the runoff pollution sources, and predict geomorphological change on runoff, the **EAP recommends a Hydrology Assessment be undertaken for the project**.
Noise Impact Assessment	A noise impact assessment (NIA) predicts the impact that noise, from a proposed development, is likely to have on the surrounding area. An NIA is usually associated with large industries or developments with excessive noise generation such engineering companies, printing presses, textile mills, and metal works which immensely generate noise pollution. The noise from the machine's mechanical pneumatic drills, saws, and rotating belts usually produces intolerable sounds and are a nuisance to the public. Considering that the proposed development is for a TSF within an area used for similar activities, the EAP **does not recommend a Noise Impact Assessment be undertaken for the project.**
Traffic Impact Assessment	A traffic impact study or traffic impact assessment is a study which assesses the effect that a particular development has on the transportation network. New developments are one of the major causes of traffic congestion in many of the major cities of developing countries, due to the absence of adequate mitigation measures. Developments usually increases and/or contributes to the traffic in the area during the construction phase as a result of construction vehicles going to and from the development site and traffic control measure such as 'Stop and Go'. It is anticipated that the proposed development of the TSF will not largely increase the traffic congestion as minimal construction vehicles will be used during the construction and operation phases. Based on the EAPs assessment during the site

SPECIALIST ASSESSMENT	DICUSSION AND MOTIVATION
	sensitivity verification, the existing road network was noted to be currently sufficient for the traffic load and no major congestions were noted. Therefore, the EAP **does not recommend a Traffic Impact Assessment be undertaken for the project.**
Health Impact Assessment	Health impact assessment (HIA) is a tool that can help communities, decision makers, and practitioners make choices that improve public health. HIA can be used to evaluate objectively the potential health effects of a project or policy before it is built or implemented. HIA is usually undertaken for projects which can have health impacts on the surrounding communities. Based on the proposed project description, the establishment of the TSF can be associated with health impacts especially cumulative health impacts considering the existing TSF's in the area. Therefore, the EAP **recommends a Health Impact Assessment be undertaken for the project.**
Socio-Economic Assessment	The overarching aim of undertaking a Socio-Economic Assessment of a projects is to develop an understanding of the current social and economic environment and aims to assess or assesses the potential impact of the project on the socio-economic environment. Socio-Economic Assessment are usually undertaken for projects which have an impact and/or affect the social and/or economic structures such as low-cost housing projects, mixed-use developments, upgrading of informal settlements, linear projects transecting different communities, etc. Based on the project information and the purpose of the development largely relating to the nature of the project being the same activity already undertaken on the site, minimal socio-economic influence / change is anticipated. However, the EAP **recommends a Socio-Economic Assessment** for the project due to the surrounding social structures and potential cumulative socio-economic impacts which may emerge from the project.
Ambient Air Quality Impact Assessment	Air Quality Impact Assessment (AQIA) is an evaluation, using approved computer models, of the ambient air quality impacts that the public may be expected to be exposed to due to air pollution emissions from one or more facilities. AQIA is an important technique for determining the relative contribution to ground level pollutant concentrations of specific current or future source emissions at receptor sites. AIQA is usually undertaken is for projects which will potentially emit and/or increase pollutant concentrations during construction and/or operational phases. Based on the project information, the EAP **recommends an Air Quality Impact Assessment** for the project as it will TSF processes will potentially emit and/or increase pollutant concentrations.
Additional Specialist Assessments Identified by the EAP	
Geohydrology Assessment	Hydrogeological assessments consider how proposed developments may be affected by groundwater and nearby surface water, in terms of potential flood risk and impact on structural foundations. Provided that the nature of the proposed development is a hazardous waste facility and it may affected and/or be affected by groundwater and the pre-identified nearby wetlands, the **EAP recommends a Geohydrology Assessment be undertaken for the project**.
Landscape/Visual Impact Assessment	Although the development is a TSF proposed within an area used for similar land uses, the specific area has been largely reclaimed and the redeposition of tailings will therefore re-affect the visual impression. Therefore, a **Landscape / Visual Impact Compliance Statement is recommended** by the EAP.

SPECIALIST ASSESSMENT	DICUSSION AND MOTIVATION
Financial Provisions Closure and Rehabilitation Plan	Financial provision plan is a form of security assessment. Before mining companies undertake mining activities, mining companies must assess what it will cost to rehabilitate the impact of their operations on the environment, and then they must set aside and secure the amount of money needed to cover that cost until the money is needed for rehabilitation. Therefore, a **Financial Provisions Closure and Rehabilitation Plan is recommended** by the EAP.
Health Risk and Radiological Assessment	A Health Risk Assessment is the process to estimate the nature and probability of adverse health effects in humans who may be exposed to harmful environmental conditions emanating from a specific source. A Radiological assessment is defined as the process of estimating dose and risk to humans from radioactive materials in the environment. Considering that the proposed development entails the storage of tailings which likely contain gold and uranium isotopes which are radioactive, the project poses a health risk to the staff and surrounding communities. Therefore, a **Health Risk and Radiological Assessment is recommended** by the EAP.
Climate Change Impact Assessment	Climate change impact assessments seek to characterize, diagnose, and project risks or impacts of environmental change on people, communities, economic activities, infrastructure, ecosystems, or valued natural resource. The need to undertake Climate Change Impact Assessments as part of a EIA Projects which may influence climate change has been on the rise as competent authorities seek to assess how the project has considered climate change. The EAP **recommends that a Climate Change Impact Assessment be undertaken** to evaluate how the TSF will impact on climate change.

3.1.14 THE NATIONAL VELD AND FOREST FIRE ACT, 1998

While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Brand A TSF, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.

3.1.15 THE NATIONAL FORESTS ACT, 1998

A licence is required for the removal of protected trees in terms of the NFA, (Act 84 of 1998). It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals. This will be covered by the Terrestrial Biodiversity Impact Assessment during the EIA Phase and the findings, implications and recommendations will be discussed in the EIA Report.

3.1.16 THE SUB-DIVISION OF AGRICULTURAL LAND ACT, 1970

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, and while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted. Rezoning of certain properties from agricultural use to mining use will may be required.

3.1.17 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA)

The law on Conservation of Agricultural Resources (Act 43 of 1983) aims to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. In order to achieve the objectives of this Act, control measures related to the following may be prescribed to land users to whom they apply:

- The cultivation of virgin soil;
- The utilisation and protection of land which is cultivated;
- The irrigation of land;
- The prevention or control of waterlogging or salination of land;
- The utilisation and protection of vleis, marshes, water sponges, water courses and water sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of the vegetation;
- The grazing capacity of veld, expressed as an area of veld per large stock unit;
- The maximum number and the kind of animals which may be kept on veld; The prevention and control of veld fires;
- The utilisation and protection of veld which has burned;
- The control of weeds and invader plants;
- The restoration or reclamation of eroded land or land which is otherwise disturbed or denuded;
- The protection of water sources against pollution on account of farming practices;
- The construction, maintenance, alteration or removal of soil conservation works or other structures on land; and
- Any other matter which the Minister may deem necessary or expedient in order that the objects of this Act may be achieved.

Further, different control measures may be prescribed in respect of different classes of land users or different areas or in such other respects as the Minister may determine. Preliminary impacts on the soil, biodiversity and

water resources have been identified with regards to the proposed Brand A TSF, and mitigation and management measures recommended. These will be updated during the EIA phase of this project as and where necessary.

3.1.18 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (SPLUMA)

The Spatial Planning and Land Use Management (Act 16 of 2013 – SPLUMA) is set to aid effective and efficient planning and land use management, as well as to promote optimal exploitation of minerals and mineral resources. The SPLUMA was developed to legislate for a single, integrated planning system for the entire country. Therefore, the Act provides a framework for a planning system for the country and introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes (LUS); and municipal planning tribunals. Furthermore, the SPLUMA strengthens the position of mining right holders when land needs to be re-zoned for mining purposes. Rezoning of certain properties from agricultural use to mining use may be required to cater for the proposed mining activity.

3.2 OTHER APPLICABLE ACTS AND GUIDELINES

Other applicable acts and guidelines include the Free State Nature Conservation Ordinance 8 of 1969, Free State Biodiversity Plan (DESTEA, 2015), and The Matjhabeng Local Municipality Land Use Scheme, 2021/22. In addition, the municipal planning documents such as The Matjhabeng Local Municipality Spatial Development Framework, and The Matjhabeng Local Municipality By-laws on Spatial Planning and Land Use Management are also applicable to the project. Which are discussed briefly in this report.

3.2.1 THE GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT (GISTM) AND SOCIAL PERFORMANCE

The Global Industry Standard on Tailings Management (GISTM) is organised around six Topic areas, 15 Principles and 77 auditable Requirements. The aim of the standard is to adopt an integrated approach to tailings management. Social performance spans all six Topic Areas of the Standard, with specialist components defined in 14 (18 %) of the Standard's 77 Requirements, with a further 18 Requirements (23 % of the Standard) requiring operators to integrate social performance inputs into processes, systems, and decisions about tailings facility management (Joyce & Kemp, 2020).

Under Topic I (**Figure 8**), Affected Communities there are four explicit social performance requirements namely consideration of human rights throughout the lifecycle of the TSF, Free, Prior, Informed Consent of indigenous and tribal people, meaningful engagement, and a grievance mechanism. Topic II, Integrated Knowledge Base package social, environmental, and local economic conditions together. Understanding of local context, human exposure and vulnerability is important in this topic. Impact assessment and mitigation plans fall under this topic. Although Topic III, Design, Construction, Operation and Monitoring deals mainly with technical aspects, social requirements are included when additional steps to minimise consequences are considered, and in the mention that international standards should be followed if involuntary resettlement is required.

Topic IV, Management and Governance requires the establishment of a tailings governance framework and confirms the Environmental and Social Management System (ESMS) as an integral component as indicated in **Figure 8**. This topic nominates one or more Accountable Executive(s) as responsible for, amongst other matters, avoiding or minimising the consequences of a tailings facility failure for local people. Other requirements include multi-disciplinary risk assessments, and the review and audit of the ESMS as it relates to the tailings facility.

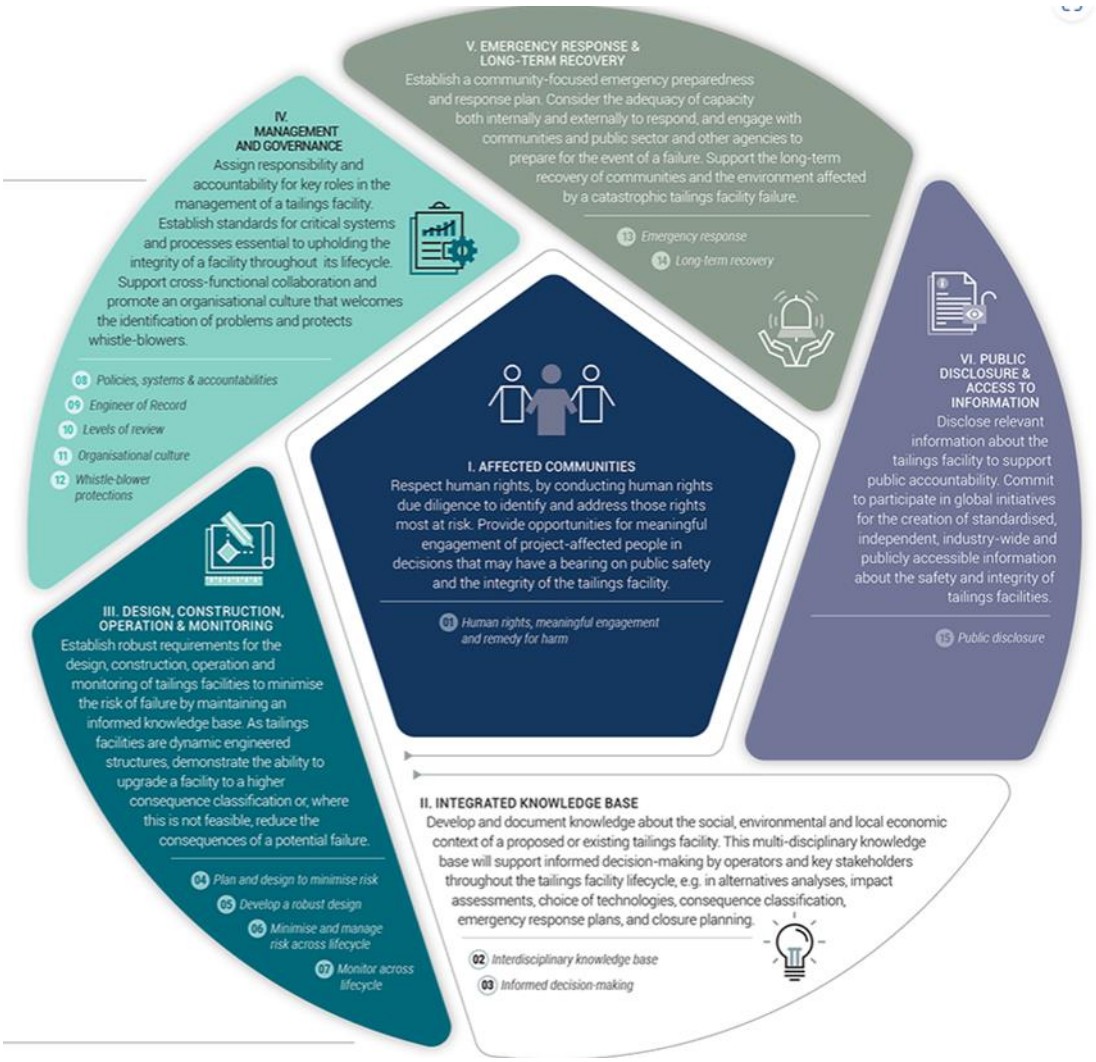

Figure 8: Summary of GISTM

Topic V, Emergency Preparedness and Recovery is critically important from a social performance perspective. It requires meaningful engagement with employees and contractors in the development of Emergency Preparedness and Response Plans, and 'locks in' the role of project-affected people in the co-development of community-focused emergency preparedness measures. Topic V also cover the long-term recovery of people and the environment in the event of a catastrophic failure event – a topic that is not covered in any other tailings or social performance standard. Requirement 14.1 asks operators to take reasonable steps, before a failure event, to meaningfully engage with public sector agencies and other organisations that would participate in medium- and long-term social and environmental post-failure response strategies. These agencies are likely to be quite different to the first responder groups engaged. Topic V would involve post hoc impact assessments, and stakeholder engagement to develop and implement plans that enable the participation of affected people in restoration and recovery works and ongoing monitoring activities.

The documents listed under Topic VI, Public Disclosure and Access to Information will likely be in the hands of other functions, such as external affairs and legal, many of these concerns fall within the purview of social performance. Regularly publishing and updating information and responding to reasonable requests for additional information is fundamental to meaningful engagement at the local-level, and for generating trust across the stakeholder spectrum (Joyce & Kemp, 2020). Harmony aims to align their operations with the requirements of the GISTM.

3.2.2 FREE STATE NATURE CONSERVATION ORDINANCE 8 OF 1969

This Ordinance makes provision with respect to the protection and conservation of wildlife in the Free State Province. It makes provision for, among other things, hunting and the protection of wild animals, fishing and the protection of aquatic resources, the protection of indigenous plants and the establishment and management of nature reserves. The Ordinance defines, in Schedule1, protected game and, in Schedule 2, ordinary game and sets out specific rules relating to hunting of each class of game. It also defines prohibited acts in respect of wild or exotic game and rules regarding the importation and exportation of endangered or exotic animals. According to the list of protected species under the Schedule, if any individuals of these plant species are to be disturbed, permits must be obtained from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (FSDESTEA). An assessment of floral species within the study area will be covered by the Terrestrial Biodiversity Assessment and will determine the type of species and their protection status (if any).

3.2.3 THE FREE STATE PROVINCIAL SPATIAL DEVELOPMENT PLAN

The Free State Provincial Spatial Development Framework (PSDF) is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Free State Provincial Growth and Development Strategy which has committed the Free State to 'building a prosperous, sustainable and growing provincial economy which reduces poverty and improves social development'. The PSDF includes comprehensive plans and strategies that collectively indicate which type of land-use should be promoted in the Province, where such land-use should take place, and how it should be implemented and managed. The proposed project is a mining activity within an area already being used for mining activities in addition to agricultural activities.

3.2.4 FREE STATE BIODIVERSITY PLAN (DESTEA, 2015)

The development of provincial biodiversity plans is a key component of the systematic biodiversity planning in South Africa and therefore a strong focus of the Biodiversity Planning Forum. Many of the innovative approaches and methodologies have been initiated and established through the development of these provincial biodiversity plans. A key objective of the PSDF is to integrate and standardize planning at all spheres of government in the province with specific reference to amongst others facilitating land-use classification of the entire land surface of the province. To this extent a set of dedicated Spatial Planning Categories (SPCs) were developed which provide a spatial framework to guide decision-making regarding land-use at all levels of planning. The SPCs represent a classification system that indicates the most suitable, or a range of, land use options for a certain piece of land. Associated with each SPC category is land use guidelines which when implemented ensures a balance between development and conservation. Mainstreaming of the biodiversity plan into spatial planning process will be achieved by aligning the biodiversity plan categories with those of the SPCs so that planning according to SPC will then automatically also adopt the biodiversity plan categories and their associated land use guidelines. Various biodiversity layers were overlaid to the study area and used to determine the sensitivity and/or certain requirements thereof. The results are provided in various sections in this report such as **Section 3.1.9**.

3.2.5 THE MATJHABENG LOCAL MUNICIPALITY LAND USE SCHEME, 2021/22

These Scheme Regulations were compiled to align with Section 156 of the Constitution and to comply with the requirements of Chapter 5 of the Spatial Planning and Land Use Management Act, Act 16 of 2013. The general objective of these regulations and accompanying zoning scheme is to determine the rights of use of all land within the boundaries of the area, and for control over the execution of these rights and the utilization of this land. Land Use Zones are divided into land use zoning categories which specify the purposes for which buildings and land in each of the categories may be erected and/or used. Within a specific Land Use Zone, "Permitted Land Uses" are allowed without any approval of the MPT of the Municipality. Within a specific Land Use Zone, "Consent Land Uses" are allowed with the approval of the Authorised Employee, which is a Registered Professional Town and Regional Planner. If the Authorised Employee is not a Registered Professional Town and Regional Planner, the MPT must approve these applications. All other buildings or land uses not included as permitted land uses or consent land uses may not be erected and/or used in the relevant land use zone. Based

on the six (6) “SPC’s categories as described in the PSDF and SDF, the proposed mining activity is located within an appropriate land use (Industrial Area).

3.2.6 THE MATJHABENG LOCAL MUNICIPALITY SPATIAL DEVELOPMENT FRAMEWORK, 2013

All Municipalities are by law required to prepare Integrated Development Plans, which should include a Spatial Development Framework. A Spatial Development Framework is strategic and indicative in nature and is prepared at a broad scale. It is meant to guide and inform land development and management. The Spatial Development Framework (SDF) for Matjhabeng Local Municipality was reviewed and adopted by Council in 2013. The SDF that forms part of an integrated development plan, indicates the spatial implications thereof and lay down strategies, proposals, and guidelines for the future spatial development of the area to which it relates (including, without being limited to, development objectives, proposals for land reform, urban renewal, reconstruction, integration, environmental planning, transport planning, infrastructural planning, and urban design) so that the general well-being of the particular community and orderly planning of the area are promoted in the most effective manner. Considering the nature of the proposed activity within the nature of the receiving environment, the proposed activity is in line with the SDF.

3.2.7 THE MATJHABENG LOCAL MUNICIPALITY BY-LAWS ON SPATIAL PLANNING AND LAND USE MANAGEMENT, 2015

A by-law is a law that is passed by the Council of a municipality to regulate the affairs and the services it provides within its area of jurisdiction. They must be passed by a majority vote of a municipal council. In terms of the Constitution the executive and legislative authority of a municipality is exercised by the municipal council', and one of the methods by which this is done is by passing by-laws. A municipality may only make by-laws on matters that it has the right to administer. These matters are set out in Schedules 4B and SB of the Constitution. The Matjhabeng Local Municipality By-Laws on Spatial Planning and Land Use Management, 2015 By-Law applies to all land situated within the municipal area, including land owned by the state and by organs of state. It is applicable on all land where mining activities has taken place, a mining right has been issued and or any land zoned in any town planning scheme as “mining”, or other similar zoning, allowing mining activities. Considering that the proposed project is a mining activity, the by-laws are applicable to the project and the applicant must ensure compliance with them.

4 PROJECT ALTERNATIVES

In terms of the EIA Regulations published in Government Notice (GN) R982 of 2014, as amended, feasible and reasonable alternatives must be identified and considered within the environmental assessment process. An alternative is defined as "…in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:

(a) property on which or location where it is proposed to undertake the activity;

(b) type of activity to be undertaken;

(c) design or layout of the activity;

(d) technology to be used in the activity;

(e) operational aspects of the activity; and

(f) Includes the option of not implementing the activity."

In terms of Section 24 of NEMA, the proponent is required to demonstrate that alternatives have been described and investigated in sufficient detail during the EIA process. It is important to highlight that alternatives must be practical, feasible, reasonable and viable to cater for an unbiased approach to the project and in turn to ensure environmental protection. In order to ensure full disclosure of alternative activities, it is important that various role players contribute to their identification and evaluation. Stakeholders have an important contribution to make during the EIA Process and each role is detailed as follows:

The role of the environmental assessment practitioner is to:

- encourage the proponent to consider all feasible alternatives;
- Identify reasonable alternatives;
- provide opportunities for stakeholder input to the identification and evaluation of alternatives;
- document the process of identification and selection of alternatives;
- provide a comprehensive consideration of the impacts of each of the alternatives; and
- document the process of evaluation of alternatives.

The role of the proponent is to:

- assist in the identification of alternatives, particularly where these may be of a technical nature;
- disclose all information relevant to the identification and evaluation of alternatives;
- be open to the consideration of all reasonable alternatives; and
- be prepared for possible modifications to the project proposal before settling on a preferred option.

The role of the public is to:

- assist in the identification of alternatives, particularly where local knowledge is required;
- be open to the consideration of all reasonable alternatives; and
- recognise that there is rarely one favoured alternative that suits all stakeholders and that alternatives will be evaluated across a broad range of criteria, including environmental, social and economic aspects.

Table 13 outlines the various alternative types that must be considered for each development. The extent of the applicability of each of these is further presented. It must be highlighted that the alternatives presented in the table are derived from both the the EIA Regulations (2014) as amended as well as the the Department of Environmental Affairs and Tourism's (now Department of Environmental, Fisheries and Forestry) 2004 Integrated Environmental Information Series on the Criteria for determining alternatives in EIA. Where the alternative is applicable to the project, it will be further discussed in this Scoping Report. The alternatives discussed further in this SR are as follows:

- The No-Go Option;
- Process alternatives;
- Design alternatives; and
- Routing alternatives.

Table 13: Project alternatives as per NEMA EIA Regulations, 2014 as amended.

ALTERNATIVE	COMMENT
No-go Option	The 'no-go' alternative is sometimes referred to as the 'no-action' alternative (Glasson *et al.,* 1999) and at other times the 'zero-alternative'. It assumes that the activity does not go ahead, implying a continuation of the current situation or the status quo. This alternative must be discussed on all projects as it allows for an assessment of impacts should the activity not be undertaken. **This alternative is discussed in this report.**
Activity alternatives	These are sometimes referred to as project alternatives, although the term activity can be used in a broad sense to embrace policies, plans and programmes as well as projects. Consideration of such alternatives requires a change in the nature of the proposed activity. This would entail a process where a different project is proposed instead of the Brand A TSF. **Based on project information, there is one proposed activity and no other activity alternative. Therefore, this alternative will not be discussed in this report.**
Location / property alternatives	Location alternatives could be considered for the entire proposal or for a component of a proposal, for example the location of a processing plant within the property boundary. The latter is sometimes considered under site layout alternatives. A distinction should also be drawn between alternative locations that are geographically quite separate, and alternative locations that are in proximity. In the case of the latter, alternative locations in the same geographic area are often referred to as alternative sites. Several alternative sites were identified and assessed as part of a 2008 study completed by Golder Environmental. As part of the 2008 Golder Study various specialist input was obtained from ecological, surface water and groundwater specialists. During a Steering Committee meeting involving various stakeholders including DWS that was convened on the 25 October 2007 the site selection findings were discussed and an optimal site selected. Brand A TSF was agreed upon as the preferred site for a new TSF, in conjunction with the proposed Nooitgedacht TSF (as agreed by the Steering Committee). The reason for this is that the proposed footprint is largely brownfields. The resultant negative impacts on agriculture and ecosystems are considered to be negligible but outweighed by the positive attributes of the site. Therefore, based on the project description, the one viable location has been

ALTERNATIVE	COMMENT
	identified for the Brand A TSF and therefore **the location/property alternatives are not applicable to this project.**
Process alternatives	Various terms are used for this category, including technological alternative and equipment alternative. The purpose of considering such alternatives is to include the option of achieving the same goal by using a different method or process. An industrial process could be changed, or an alternative technology could be used. These are also known as technological and equipment alternative and will be discussed as they are applicable to the Brand A TSF. **These will be discussed in this report.**
Demand alternatives	Demand alternatives arise when a demand for a certain product or service can be met by some alternative means. This is applicable to the demand for a product or service. An example of this would be where there is a need to provide housing units. Examples of alternatives can be through managing demand through various methods or providing additional housing through either single dwelling residential units or mixed-use developments. Specific to the proposed project, **alternatives regarding the demand are not applicable and will not be discussed in this report.**
Scheduling alternatives	These are sometimes known as sequencing or phasing alternatives. In this case an activity may comprise several components, which can be scheduled in a different order or at different times and as such produce different impacts. **These are not applicable to the project and will not be discussed.**
Input alternatives	By their nature, input alternatives are most applicable to industrial applications that may use different raw materials or energy sources in their processes. Considering that the proposed development is a TSF which does not involve the conversion of raw materials into finished products, **feasible input alternatives are not applicable to the project and will be discussed.**
Routing alternatives	Consideration of alternative routes generally applies to linear developments such as power lines, transport, and pipeline routes. One of the residue pipelines (Saaiplaas Plant to Brand A TSF), consists of two optional routes around the Saaiplaas 6 TSF. **Therefore, routing alternatives are applicable to this development and will be discussed.**
Site layout alternatives	Site layout alternatives permit consideration of different spatial configurations of an activity on a particular site. This may include particular components of a proposed development or may include the entire activity. One suitable layout has been proposed for the Brand A TSF. **Based on this, site layout alternatives will not be covered in this report.**
Scale alternatives	In some cases, activities that can be broken down into smaller units can be undertaken on different scales. For example, a housing development within an overall mixed-used development could have the option of 1 000, 2 000 or 4 000 housing units. Each of these scale alternatives may have different impacts. However, the proposed TSF cannot be broken down into smaller units. **For this reason, scale alternatives will not be discussed in this report.**
Design alternatives	This entails the consideration of different designs for aesthetic purposes or different construction materials to optimise local benefits and sustainability would constitute design alternatives. Appropriate applications of design alternatives are

ALTERNATIVE	COMMENT
	communication towers. In such cases, all designs are assumed to have different impacts. Generally, the design alternatives could be incorporated into the project proposal and so be part of the project description and need not be evaluated as separate alternatives. Based on project description and background information, engineering designs are still under assessment and will be available during the EIA Phase. **Therefore, design alternatives will be slightly discussed in this SR and detailed in the EIA Phase**.
Operational alternatives	The Operational Alternative is where you can specify controls on the operational aspects of the project such as pressure pipes, pumps, as well as valves. In the case of the proposed TSF, **feasible operational alternatives were not identified and are not discussed in this report.**

As this application relates only to a TSF which is being developed on the disturbed footprint of a reclaimed facility, there are limited feasible and/or reasonable alternatives that can be considered and which are described and motivated below.

4.1 DESIGN ALTERNATIVES

Design alternatives are the consideration of different designs for technical efficiency, aesthetic purposes or different construction materials in an attempt to optimise local benefits and sustainability. The following design alternatives were considered for the project.

Tailings can be stored in a variety of ways: which way depends on numerous factors, for instance the local topography, how much rainfall an area gets, whether there is regular or irregular seismic activity recorded, the type of metal or mineral being mined and how close the mine is to populated areas. There is no one-size-fits-all solution, each tailings storage facility is unique. Considering that the engineering designs are still in progress, the assessment made in this report is based on the following TSF designs aspects which are discussed below:

(a) **Wall construction designs**:

i) Downstream;

ii) Upstream; and

iii) Centreline.

(b) **Lining Desings**:

i) Lined TSF; and

ii) Unlined TSF.

4.1.1 WALL CONSTRUCTION DESIGNS

4.1.1.1 DOWNSTREAM

Downstream designs start with an impervious starter dam. Tailings are then discharged into the dam and as the embankment is raised, each new wall is constructed and supported on top of the downstream slope of the previous section, so the dam crest moves downstream with each raise (refer to **Figure 9**). The downstream design was developed for areas with seismic activity and high rainfall or water collection.

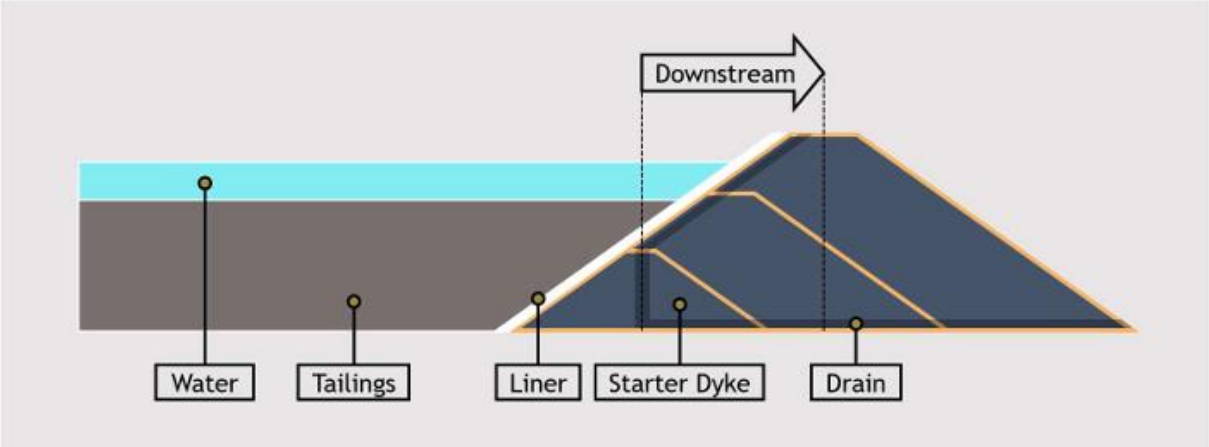

Figure 9: Downstream Tailing Storage Facility design (Yanama Gold, 2023)

Downstream tailings dams resemble typical water retaining structures, but are raised in stages during operations. Downstream tailings dams are raised following a downstream direction, starting at the starter dyke, and growing away from the initial impoundment area. Tailings slurry discharged behind each new section of the dam is not used to support successive raises of the dam.

4.1.1.2 UPSTREAM

Upstream construction begins with a starter dam. The tailings are then discharged into the facility where they form a tailings beach. The deposited tailings adjacent to the dam wall is allowed to drain and then can be compacted to be used to form the foundation for subsequent levels of the wall as the dam is raised. As such, the crest of the dam moves upstream with each raise. Upstream tailings dams need to be raised slowly, to allow the solid tailings time to dry and consolidate enough to support a new level of the dam (refer to **Figure 10**). These are suitable for facilities in areas of low rainfall and low seismic activity.

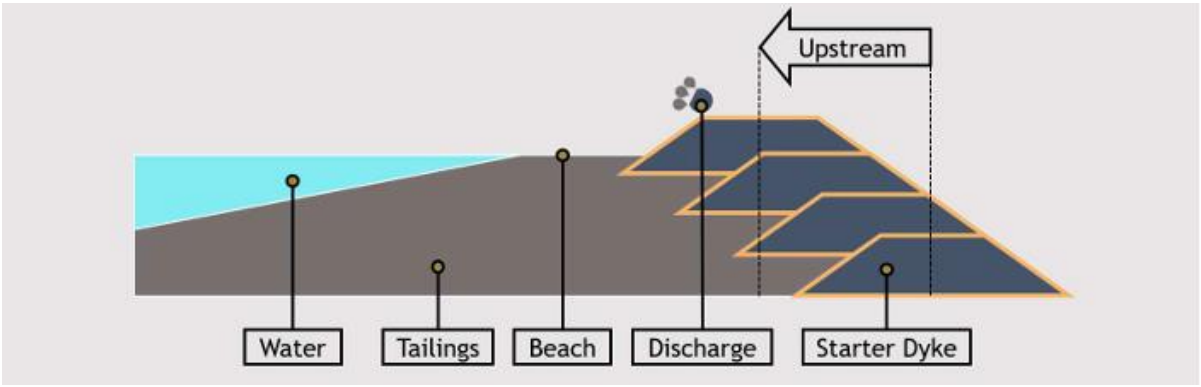

Figure 10: Upstream Tailing Storage Facility design (Yanama Gold, 2023)

An upstream tailings dam is raised in the upstream direction of the starter dyke. Tailings discharged from the starter dike are deposited at an angle away from the dam crest and allowed to drain, forming a dry beach that is used as a partial foundation for the construction of a successive embankment raise. This process is continued in stages until the dam is raised to its ultimate elevation. Adequate water management is important in this design to create a beach area close to the embankment and keep water as far as possible from the embankment. The use of thickeners and other dewatering technologies is common.

4.1.1.3 CENTRELINE

The centreline method is a hybrid of upstream and downstream designs. In centreline construction, the dam is raised vertically from the starter dam. The dam crest therefore remains fixed relative to upstream and downstream directions as the dam is sequentially raised (refer to **Figure 11**). Internal drainage can be incorporated to improve stability.

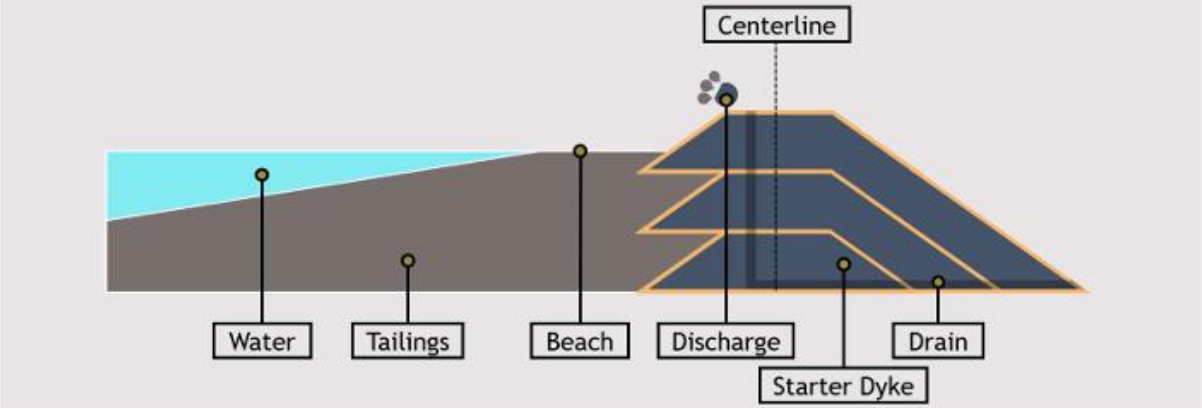

Figure 11: Centreline Tailing Storage Facility design (Yanama Gold, 2023)

A centerline tailings dam is raised vertically and its construction combines the principles of both downstream and upstream design concepts. Similar to the upstream construction method, tailings are discharged behind each dam section and allowed to dry to form a beach. This tailings beach later supports the upstream slope of the successive embankment raise. Dewatering technologies such as thickening are commonly used to improve the construction of these structures.

4.1.1.4 FILTERED TAILINGS OR DRY STACKING

Following crushing, grinding and chemical leaching to separate the target mineral from the ore, tailings are dewatered in a plant, using a thickening tank followed by filters. Most of the process water in the tailings is recovered and returned to the plant for reuse in the processing of new ore material. The unsaturated filtered tailings, also known as filter cake, are deposited and compacted to form a stable dry stack (refer to **Figure 12**). Dry stack tailings do not require the construction of a tailings dam, as these structures do not retain any slurry or water.

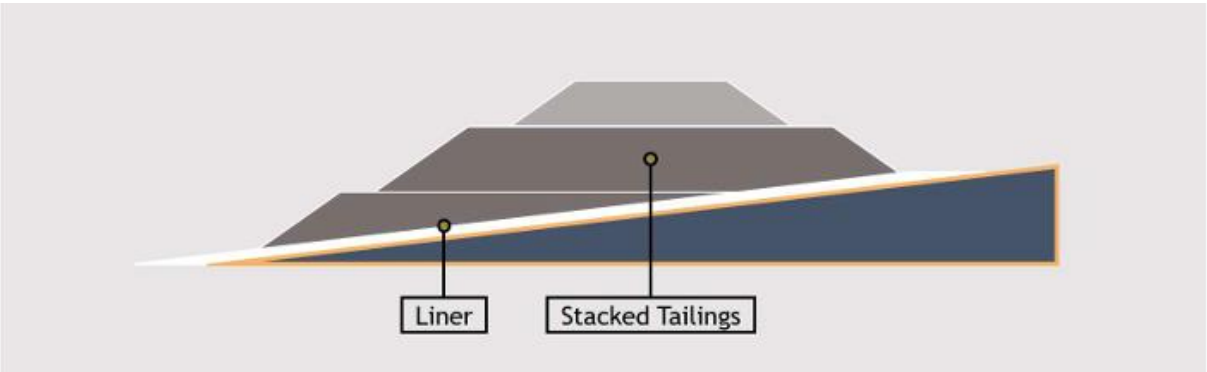

Figure 12: Filtered / Dry Stacking Tailing Storage Facility design (Yanama Gold, 2023)

The advantages and disadvantages of each of the TSF designs are indicated in **Table 14**.

Table 14: Advantages and disadvantages different TSF Designs (*ICCM, 2022 & Yanama Gold, 2023)*

ADVANTAGE	DISADVANTAGE
Downstream	
Downstream design can have unrestricted heights due to each raise being structurally independent of the tailings.	This construction method requires larger areas and greater volumes of construction materials
Downstream tailings dams are considered the most stable.	Method requires larger areas and greater volumes of construction materials

ADVANTAGE	DISADVANTAGE
Upstream	
Upstream tailings dams generally require less construction materials.	Upstream method is the most common design to fail causing huge environmental consequences.
Upstream method is the lowest initial cost and most popular design for a raised tailings embankment in low-risk seismic areas.	Upstream embankments are not suited to areas of seismic activity as the risk of liquefaction increases.
Centreline	
More stable than upstream tailings dams and require less construction material than downstream tailings dams	A centreline dam cannot be used as a large water retention facility solely due to the subsequent raises being partially built on consolidated tailings
Free water can encroach closer to the dam crest than the upstream method without the worry of increasing the phreatic surface and causing a potential failure risk.	A suitable decant system needs to be installed to prevent the free water submerging the beach around the dam crest.
Filtered Tailings/Dry-Stack Tailings	
Dry stack tailings do not require the construction of a tailings dam.	Filtration technology generally makes this method more complex to operate.
Most of the process water in the tailings is recovered and returned to the plant for reuse in the processing of new ore material.	Requires close monitoring for dust management and clay content in the tailings materials.
Generally, occupies a smaller footprint and allows for improved water management.	Nil.
Filtered tailings can also support concurrent reclamation.	Nil.

Based on the advantages and disadvantages indicated in **Table 14** above, **Filtered Tailings / Dry-Stack Tailings appear to be the more favourable designs**. The wall construction option will be identified in the design report once completed and this information will form part of the EIA report.

4.1.2 LINING DESINGS

Under current environmental legislation in South Africa, tailings are viewed as potentially hazardous waste that needs to be disposed of in compliance with the appropriate minimum requirements. Traditionally, tailings in South Africa have been built on top of the *in-situ* soils. The use of composite liners is relatively new in tailings dam construction in South Africa and brings with it its own set of challenges. The requirement for a barrier system in South Africa regulations were promulgated under the National Environmental Management Act - Regulations 632, 634, 635 and 636. These are currently administered by the Department of Water and Sanitation (DWS). Under these regulations waste, including tailings, is assessed under Waste Acceptance Criteria for Disposal to Landfill, which determines the requirements for disposal of different types of waste. Under these regulations, many mineral residue deposits are found to require a barrier system, which typically includes a geomembrane. It is usually not practical, and currently not mandatory, to retrofit a barrier system to existing tailings dams. However, there is an increase in the number of new tailings dams being constructed to include a barrier system.

The Department (DWS) no longer condones South Africa's philosophy of the past 20 years, in terms of which dilution of water contamination and dispersion relying on attenuation was regarded as acceptable (Legge, 2019). Protection of water resources, and prevention of contamination in the first place (source) is now being sought

in preference to mitigating contamination spread (pathway) and pollution cleanup (receptor). Apart from preventing polluted leachate from seeping into the groundwater, an additional benefit of lining a tailings dam is that more water in the tailings system can be captured and returned to the plant. This is useful in a water-scarce country such as South Africa. Since the tailings industry has not always included barrier systems in design or construction, there are learnings to be acquired, even by seasoned tailings consultants and contractors, on how to work with these systems. A proposed amendment to Regulation 632 (2016) has been drafted whereby there could in future be a relaxation of the regulations on a case-by-case basis, following a risk-based approach. However, such regulations have yet to be promulgated into law. In the meantime, the current regulations apply to the disposal of tailings in the same way they apply to the disposal of any other waste to landfill.

The alternatives relate to the liner design for the TSF. However, the liner requirements are based on the waste classification of the material, geohydrological modelling and risk assessment. Tailings use liners to prevent the release of concentrated mine chemicals into the environment. Many regulatory agencies request lined Tailings Storage Facilities in hopes of better protecting groundwater resources. Liners are not always desirable, however, tailings solution containment is critical to meeting environmental requirements and the necessary assessments and measures must be undertaken to ensure best environmental practices. The necessity of liners for TSF are subject to the type, nature and surrounding geohydrological conditions in consultation with the 2013 regulations published in terms of the National Environmental Management: Waste Act, notably GN R. 634 to GN R. 636 relevant to Waste Classification and Management, National Norms and Standards for the Assessment of Waste for Landfill Disposal and National Norms and Standards for Disposal of Waste to Landfill.

For important reasons, hazardous waste landfills are the most closely regulated and structured landfills. They are specifically designed to hold hazardous wastes in a way that virtually eliminates the chance of it being released into the environment. Some of the design requirements for hazardous waste landfills include:

- Double liners;
- Double leachate collection and removal systems;
- Leak detection systems;
- Run on, runoff and wind dispersal controls; and
- Construction quality assurance programs.

In addition to these design requirements, hazardous waste landfills are often inspected multiple times a year to make sure that the facility is up to code and the standards are top-notch. The advantages and disadvantages of lined and unlined TSFs are indicated in **Table 15**.

Table 15: Advantages and disadvantages Lined and Unlined TSF

ADVANTAGE	DISADVANTAGE
Lined TSF	
A lining under a tailings also allows more water in the tailings system to be captured and returned to the plant for reuse.	Liners are very expensive to install and maintain.
Liners contain the tailings and associated fluids or materials while preventing transference into neighbouring soil and water.	Liners need to be properly installed for maximum pollution prevention.
Unlined TSF	
Cheaper and quicker to establish a TSF.	No pollution prevention.
Lower installation costs	Water use inefficiency - No recycling of water.

Based on the advantages and disadvantages indicated in **Table 15** above, **Lined TSF's are more favourable designs**. However, unlined TSF's are at certain circumstances the more viable option when considering the underlying geological and geohydrological conditions. Based on the preliminary information, for the proposed Brand A TSF a barrier systems with class C performance is proposed. Detailed conditions, advantages and disadvantages will obtained from the geohydrological study and presented in the EIA Report.

4.1.3 PIPELINE DESIGNS

In order to allow for slurry deposition on Brand A from either of the operational plants, a number of new residue deposition pipelines may be required (**Figure 5**). The residue deposition pipelines will have a NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. The pipelines will be flanged steel pipelines and installed above-ground on pre-cast concrete plinths. Slurry pipelines can be made of many different materials such as carbon steel, alloy steel, hardened steel, stainless steel, abrasion resistant lined pipes, and non-ferrous pipes, HDPE etc. The material of the pipeline is generally selected based on the application, material being pumped, and cost. The assessment of slurry pipelines design alternative on this report is based on relative location to the ground; aboveground and underground. Based on the analysis of the same type of pipelines proposed for the project, the advantages and disadvantages of the pipeline in relation to the ground is provided in **Table 16**.

Table 16: Advantages and disadvantages Pipelines Design

ADVANTAGE	DISADVANTAGE
Aboveground Pipelines	
Above ground pipelines are much easier and cheaper to build and install.	Can be easily damaged, requires constant monitoring and maintenance.
Above ground pipelines are much easier and cheaper to monitor and maintain.	Generally, have a shorter lifespan.
Above ground pipelines have lesser environmental impacts as there are shallow distal excavations and no deep excavations or blasting requirements.	Easily accessible, there is also the concern of vandalism and the chance that damage may lead to leaks and impacts on the environment.
Below Ground Pipelines	
Security: pipelines are less likely to be affected by weather phenomenon and/or vandalism.	Pipelines are more difficult and expensive to build and install.
Pipelines generally require less frequent monitoring and maintenance.	Pipelines are more difficult and expensive to maintain.
The land above the pipeline can be rehabilitated to blend in with the surrounding landscape / land use.	Pipelines have more environmental impacts as there is a need for excavations and/or blasting requirements. Any leak directly contaminates the environment and may be only recognized after a period of time.

Based on the advantages and disadvantages indicated in **Table 16** above, it is the **EAPs opinion that above ground pipelines are the more favourable designs**. Based on the project description, the proposed Brand A TSF will follow the above ground pipelines design.

4.2 PROCESS ALTERNATIVES

4.2.1 CONVENTIONAL DISPOSAL METHODS

There are various deposition techniques which are applicable to tailings storage facilities. Once the tailings slurry (dilute or paste consistency) has arrived at the tailings storage area, there are several possible ways it can be deposited. These include the spigotting method, cyclone deposition and the paddocking method.

4.2.1.1 SPIGOTTING METHOD

Spigots are multiple outlets along a delivery pipeline. They are used when it is easily possible to cause a gravitational grading split between the coarse and the tailings' fine fractions. Reticulation along the TSF embankment is achieved through spigot pipes extending from delivery stations located on the pre-constructed embankment crest (**Figure 13 left**). The spigot pipes are laid along the main wall, allowing deposition to occur from any point on the crest. In the course of a deposition cycle, a batch of adjacent spigots is opened, sufficient to cater for the slurry flow rate (**Figure 13 right**). Spigots break up the tailings delivery stream into smaller streams, thus causing a drop in stream velocity. This velocity drop lets the coarser fractions settle close to the deposition point. As the beach fills, spigots at one end of the batch are opened while the equivalent number at the other end is closed so that the deposition gradually moves along the spigot pipe and around the tailings dam.

Figure 13: Example of spigot deposition. Spigot at a pre-constructed embankment crest (left) and spigot pipes laid along the main wall (right) (Goldfields, 2023)

A variation to this method is where the spigot pipeline is located on the embankment crest, and the perimeter bund is raised to coincide with the tailings deposition cycle. The spigot lines usually have a series of nozzles located along the delivery pipeline at intervals of 2 m to 3 m. During each deposition cycle, a section of the spigot pipe is dismantled and moved to one side to allow the perimeter bund's raising, which is usually constructed of the beach tailings.

4.2.1.2 PADDOCK OR DAYWALL DEPOSITION

The daywall is so-called as it is that portion of the dam used during the day when there is supervision available and daylight to see what is going on. The conventional daywall is used to deposit uniformly graded tailings through an open-ended discharge located at one end of the paddock daywall (**Figure 14 left**). The principle of a paddock or daywall is to create or form small impoundments or containment berms with dried-out tailings borrowed from the previous layer deposited around the perimeter or edge of the paddock (**Figure 14 right**). These shallow paddocks are then filled preferentially with dilute (± 30-50 % solids) slurry. The tailings solids settle out of suspension, releasing clear water, the bulk of which can be decanted from the surface of the

paddock into the basin via a drain or "vent" pipe. The resulting layer of slimes continues to dry out through some seepage, but mainly through evaporation resulting in shrinkage cracking of the surface.

Figure 14: Example of daywall deposition. An open-ended discharge at one end of the paddock daywall (left) and small impoundments with dried-out tailings (right) (Goldfields, 2023)

Since each subsequent layer deposited is formed on top of the previous layer, a paddock or daywall can essentially only be developed in an upstream manner. By definition, the upstream wall development stability depends on the strength of the earlier deposited underlying layers. Thus, it is essential to develop a daywall facility in thin layers (maximum 200 mm) to allow consolidation.

4.2.1.3 CYCLONE DEPOSITION

In **cyclone deposition** is a cyclone deposition device consisting of conical housing equipped with a feed pipe that enters the cone at its larger diameter closed end. A second pipe enters the cone and intrudes into the body of the cone. The slurry feed enters under pressure and is forced to swirl with a spiral motion towards the smaller end. In the process, centrifugal forces cause the larger particles in the slurry to move down and away from the axis, towards the narrow exit of the cone. The net effect is that the finer particles and most of the water leave the cyclone through the vortex finder and form the "overflow," while the partially dewatered larger particles leave at the opposite end as the coarser "underflow (**Figure 15**). The purpose of using a cyclone is to create underflow material that has good geotechnical characteristics, i.e., high permeability, fast consolidation and strength gain rate than the original tailings so that the underflow can be used to form an impoundment wall to the tailings storage facility. Effective operations of a cyclone TSF can also result in high water recoveries.

Figure 15: Example of cyclone deposition (Goldfields, 2023)

Currently cyclone deposition is the vastly preferred method of deposition for the majority of Harmony's current TSF operations due to the reasons described above. The environmental impacts associated with each deposition method are similar, however cy**clone deposition has higher water recovery rates and is also preferred from a geotechnical perspective**.

4.2.2 ALTERNATIVE TAILINGS DISPOSAL DETHODS

Despite technological advances in mineral processing, mining companies still face challenges in how to best manage tailings materials. In addition, mining of lower grades of ore has resulted in increased water use per unit of production; at certain sites, water availability is the single greatest constraint on mine development. In some cases, alternative tailings disposal (ATD) has been viewed as a 'silver bullet' that will address all tailings management issues, especially water concerns. In addition, in some cases ATD technologies also promise a smaller footprint and reduced environmental impact and risks. Despite the perceived advantages, there are a number of factors that determine whether an ATD technology including:

- Energy supply: removing water from a slurry requires significant energy, with increased energy, expenditure comes with additional costs;
- Production rates: conventional tailings deposition remains the only proven technology at mines with high production rates;
- Project economics: a reduced footprint and less water used come at the expense of higher initial capital;
- Operational predictability: mines operating under narrow production constraints may be prohibited from employing ATD technologies because of the possibility of operational instability;
- Topography: some ATD technologies lend themselves to flat topographies and are usually not feasible (without embankment support) at sites with even moderately steep terrain; and

- Water: in many cases, the water saved by the ATD technology is only marginally better than conventional disposal methods.

Based on the above listed challenges, Conventional Disposal Methods are preferable over the Alternative Tailings Disposal methods.

4.3 PIPELINE ROUTING ALTERNATIVES

Consideration of alternative routes generally applies to linear developments such as power lines, transport and pipeline routes. In route investigations, various corridors are investigated and compared in terms of their impacts. Although the project is largely a footprint development and route alternatives are usually not applicable to such developments, route alternatives are applicable to this project due to the proposed residue pipeline from Saaiplaas Plant to Brand A TSF which has two optional routes.

There are existing pipes running between Saaiplaas Plant and Brand A TSF, which include the residue pipeline from Saaiplaas Plant to the St. Helena 123 TSF and the Reclamation pipeline from Brand A TSF to Saaiplaas Plant. Alternative Route 1 is approximately 4.6km long and Alternative Route 2 is approximately 4.4km long. The alternatives both start at Saaiplaas Plant at coordinates 28° 2'10.69"S; 26°51'57.44"E and end at Brand A TSF at coordinates 28° 1'21.81"S; 26°49'52.31"E with the deviation of approximately 1.km. The alternatives only deviate around the south eastern end of 27 Saaiplaas 6 TSF (28° 1'54.16"S; 26°51'36.50"E) where Alternative Route 1 travels around the northern end of 27 Saaiplaas 6 TSF and Alternative Route 2 travels around the southern end of 27 Saaiplaas 6 TSF. Both alternatives re-aligning on the same route again at north western end of 27 Saaiplaas 6 TSF (28° 1'49.95"S; 26°50'45.46"E). The residue line from Saaiplaas Plant to Brand A TSF could follow either of these routes.

Based on preliminary assessment, the pipeline design is the same for either alternative and the environment along the two alternatives is similar. Therefore, there are similar advantages and disadvantages for the alternative assessments. However, there is a high likelihood of presence of several wetlands closer to the Alternative Route 2, therefore **Alternative Route 1 is more preferable at this stage**. Specialist studies will be undertaken in the EIA phase to confirm the preferred route.

4.4 NO GO ALTERNATIVE

The no go alternative would imply that no TSF is constructed for the safe deposition of new mine tailings from Harmony's Welkom operations. The current planned Life of Mine (LOM) of the Free State operations exceed the available deposition capacity of these TSFs. As such, Harmony is undertaking a feasibility assessment to redeposit slurry on the footprint of Brand A TSF which has largely been reclaimed to date to cater for this additional capacity. The no go option would mean that the Brand A TSF project would not proceed and this would therefore negatively affect the future viability of Harmony's Welkom mining operations from July 2024 and beyond due to lack of deposition space. This would have a significant financial impact on not only Harmony, but also have a direct negative impact on the workforce on the mine and surrounding businesses and communities that are directly or indirectly linked to the operations. As such, **the no go alternative is <u>not</u> considered feasible or reasonable**.

5 STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered, and a record included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

5.1 PRE-CONSULTATION WITH THE COMPETENT AUTHORITY

A pre-application meeting with the competent authority (DMRE) was requested by the EAP on the 5th of October 2023. The pre-application meeting was held on the 21st of November 2023. The purpose of the pre-consultation was to provide the authorities with background information of the proposed project, confirm NEMA EIA triggered listed activities, the process to be followed and plan of study for the EIA such as specialist studies and public participation.

5.2 GENERAL APPROACH TO SCOPING AND PUBLIC PARTICIPATION

The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA and NEMA EIA Regulations (2014), and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

An initial I&AP database has been compiled based on known key I&AP's, Windeed searches, and stakeholder databases provided by the mine. The I&AP database includes amongst others, landowners, communities, regulatory authorities and other special interest groups.

5.2.1 LIST OF PRE-IDENTIFIED ORGANS OF STATE/ KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

Government Authorities were notified of the proposed project and include:

- Civil Aviation Authority;
- Endangered Wildlife Trust;
- Eskom Holdings SOC Limited;
- Lejweleputswa District Municipality;
- Matjhabeng Local Municipality;
- Free State Department of Agriculture& Rural Development;
- Free State Department of Cooperative Governance and Traditional Affairs;
- Free State Department of Public Works and Infrastructure;
- Free State Department of Police, Roads and Transport;
- Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs;
- Free State Development Corporation;
- Free State Department of Mineral Resources and Energy;
- Free State Department of Small Business, Tourism, and Environmental Affairs;
- National Department of Agriculture, Forestry and Fisheries;
- National Department of Mineral Resources and Energy;
- National Department of Rural Development and Land Reform;
- National Department of Human Settlements Water and Sanitation;
- South African Civil Aviation Authority;
- South African Heritage Resources Agency;
- South African National Roads Agency Limited; and
- Transnet SOC Limited.

5.2.2 INITIAL NOTIFICATION

The PPP commenced on the 9th of November 2023 with an initial notification, call to register and comment on the Scoping Report for a period of 30 days. The notification was given in the following manner:

5.2.2.1 **REGISTERED LETTERS, FAXES AND EMAILS**

Notification letters (English, Afrikaans and Sesotho), faxes, and emails were distributed to all pre-identified key I&APs including government organisations, NGOs, relevant municipalities, ward councillors, landowners and other organisations that might be affected.

The notification letters included the following information to I&APs:

- List of anticipated activities to be authorised;
- Scale and extent of activities to be authorised;
- Information on the intended mining operation to enable I&APs to assess/surmise what impact the activities will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the affected properties (including details of where a locality map could be obtained);
- Details of the relevant NEMA Regulations;
- Initial registration period timeframes;

- Scoping Report commenting and Review period; and
- Contact details of the EAP.

5.2.2.2 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements describing the proposed project and EIA process were placed in the local newspaper with circulation in the vicinity of the study area. The initial advertisement was placed in the Vista Newspaper (in English, Afrikaans and Sesotho) on the 9th of November 2023. The newspaper advert included the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity and application
- Availability of Scoping Report; and
- Relevant EIMS contact person for the project.

5.2.2.3 SITE NOTICE PLACEMENT

A1 Correx site notices in English, Afrikaans and Sesotho were placed at 15 locations within the local project area on the 9th of November 2023. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

5.2.2.4 POSTER PLACEMENT

A3 posters in English, Afrikaans and Sesotho were placed at local public gathering places in Welkom namely the Thabong Public Library, Bronville Public Library, Virginia Public Library and Saaiplaas Supermarket.

The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their comments of the Scoping Report and indicate the contact details of any other potential I&APs that they feel should be contacted. The contact person at EIMS, contact number, email and faxes were stated on the posters. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

- Electronically (fax, email);
- Telephonically; and/or
- Written letters.

5.2.3 AVAILABILITY OF SCOPING REPORT

Notification regarding the availability of this Scoping Report for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the scoping report can be obtained and/or reviewed, public meeting date and time, EIMS contact details as well as the public review comment period;

- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

The scoping report will be available for public review from the 8th of January 2024 to the 8th of February 2024 for a period of 30 days.

5.3 PUBLIC PARTICIPATION PROGRESS

Comments raised to date have been addressed in a transparent manner and included in the Public Participation Report (**Appendix C**). To date, summary of comments received are as follows:

- Requests to register as I&AP;
- Request for project reports; and
- Confirmation from stakeholders that they are not affected by the proposed project.

All comments that will be received during the review of the Scoping Report will be captured and responded to through a Comments and Response Report that will be included in the report. Comments received to date have been included in this report. All I&APs registered on the Project database will be informed of the availability of the Scoping Report for public review. I&APs will be provided with another opportunity to submit their comments during the Environmental Impact Assessment (EIA) Phase of the project. Refer to see **Appendix C** for all Public Participation related documents**.**

5.4 REVIEW OF THE SCOPING REPORT BY COMPETENT AUTHORITIES

DMRE as the competent Authority for the listed activity must, within 43 days of receipt of the Final Scoping Report that has been subjected to 30 days of public review as a Draft Report, accept the Final Scoping Report and Plan of Study for EIA in writing should no amendments be required, or shortcomings be identified therein. Upon acceptance of the Scoping Report, the Environmental Assessment Practitioner (EAP) may then proceed with the tasks contemplated in the Plan of Study for EIA.

The authority can also reject the Scoping Report for not following legislative procedure if any of the required steps were not undertaken. In terms of Regulation 22 (b) of Government Notice R. 982, the Scoping Report may be amended and resubmitted by the EAP should it be rejected. On receipt of the amended Scoping Report and Plan of Study for EIA, the competent authority will then reconsider the application. Should the Scoping Report be approved, the amended Scoping Report will then be made available for public review and comment prior to submission to the Competent Authority.

The authority may also advise the EAP of matters that may hinder the success of the EIA application or matters that may prejudice the success of the application.

5.5 PUBLIC PARTICIPATION PROCESS FOR EIA PHASE

The Public Participation Process (PPP) will be documented and included in the Environmental Impact Report (EIR). The PPP will be undertaken in accordance with the Plan of Study for EIA. The project I&APs will be updated on all project developments throughout the EIA Phase. A summary of comments received from the registered I&APs, the date of their receipt and responses of the EAP to those comments will be provided in the Comments and Response Report that will be updated during all project phases. All copies of any representations, objections and comments received will also be submitted to the competent authority together with the EIR.

5.6 APPEAL PERIOD

After a decision has been reached by DMRE, Chapter 2 of the National Appeal Regulations 2014 makes provision for any affected person to appeal against the decision. Within 20 days of being notified of the decision by the competent authority, the appellant must submit the appeal to the appeal administrator. An appeal panel may

be appointed at the discretion of the delegated or organ of state to handle the case and it would then submit its recommendations to that organ of state for a final decision on the appeal to be reached. EIMS will communicate the decision of the Provincial Authority and the way appeals should be submitted to the Minister and to all I&APs as soon as reasonably possible after the final decision has been received.

6 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the Scoping Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area as well as baseline information received from certain specialists assessments. Please note that detailed specialist assessments are being completed to inform the EIA-phase report. The DFFE screening tool was also used to inform this section and a copy of the screening report is included in **Appendix D**.

6.1 LOCATION

The study area falls within a landscape that contains pipelines and existing TSFs, thus the area can be described as largely disturbed. The landscape has historically been used for informal cattle grazing. Other elements of disturbance identified within the study area include farms, provincial roads and other infrastructure associated with the existing pipelines and other mining activities such as the existing TSFs. The TSF will cover an area of approximately 328 ha. The study area falls within the Matjhabeng Local Municipality Wards 8, 11 and 24 (Lejweleputswa District Municipality) administrative area. The project area is situated within 22 farm properties distributed between Farm Harmony 222, Farm Klippan 14, Farm La Riviera 289, Farm Rustgevonden 564, Farm Saaiplaas 690, Farm Saaiplaas 771, and Farm Vaalkranz 220. The locality map is included in **Figure 1**. The study area is serviced by the R730 provincial road, unknown surfaced road leading to Saaiplaas Plant and several gravel access roads. Existing infrastructure includes mine infrastructure such as existing TSFs, substations and electricity transmission lines, telephone lines, fences and other recent structures.

6.2 TOPOGRAPHY

The topography of the location of the proposed TSF is fairly flat, comprising of undulating terrain due to the several TSF's within the study are. Surrounding elevations range from approximately 1 355 – 1 402m above sea level (**Figure 16**). The Brand A TSF is located at approximately 1 360m above sea level.

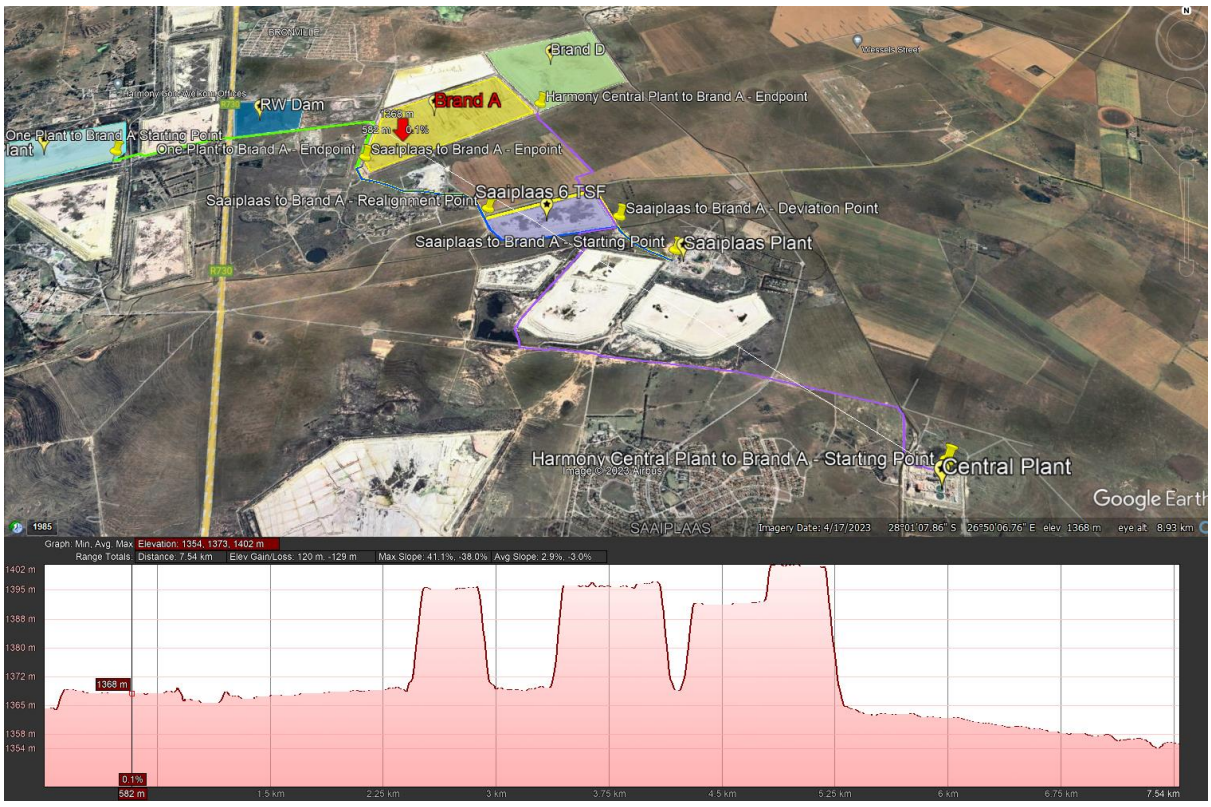

Figure 16: General topography of the study area

6.3 GENERAL SITE CONDITIONS

The proposed Brand A TSF development is situated within an area consisting mainly of mining activities, crop farming and grazing and naturally occurring pans. Residential areas, waterbodies, wetlands, mines and quarries and forested land are also located in the extended surrounding areas. The larger area surrounding the proposed plant is classified as industrial in nature. The site has been transformed with vegetation reduced to largely low laying grassland with pockets and isolated Eucalyptus trees and Wattle trees. **Figure 17** shows the extent of the reclamation of Brand A TSF where the Brand A TSF is being proposed. Several wetlands are present within the study area especially along the southern extent of the Brand A TSF (**Figure 18**). The area can be described as moderately transformed with near-natural vegetation and grassland with pockets of Eucalyptus globulus (blue gum) trees and scattered aliens. The study area also includes electrical infrastructure such as substation and powerlines (refer to **Figure 19**). The adjacent land uses in addition to the mining activities include crop farming and grazing activities (**Figure 20**).

Figure 17: Aerial view of the Brand A TSF (active reclamation underway)

Figure 18: Wetland parallel to Brand A TSF

Figure 19: General conditions of the study area

Figure 20: Grazing activities within the site

6.4 GEOLOGY

The Free State Goldfield which forms a triangle between Allanridge, Welkom and Virginia, produces gold from auriferous bearing reefs situated within sediments of the Central Rand Group of the Witwatersrand Supergroup. A detailed description of the geology of the Welkom Goldfields is provided by in Minter *et. al*; (1986). The mine geology, from shallow to deep, consist of the following:

- Karoo Supergroup.
- Ventersdorp Supergroup; and
- Witwatersrand Supergroup.

Sediments of the Vryheid Formation of the Ecca Group underlie the study area. The Vryheid Formation (Ecca Group) mainly comprises mudstone, siltstone and fine- to coarse-grained sandstone (pebbly in places).

Within the Free State Goldfield, the Ventersdorp Supergroup can be divided into the Pniel sequence, the Platberg Group and the basal Klipriviersberg Group consisting of alternating sediments, amygdaloidal and non-

amygdaloidal andesitic lavas, tuffs and agglomerates (Minter et.al; 1986). Based on the prospecting / exploration drilling the Ventersdorp Supergroup has an average thickness of 1 319m in the study area.

The Witwatersrand Supergroup is unconformably overlain by the volcanic and sedimentary rock of the Ventersdorp Supergroup. Within the Free State Goldfield, the Witwatersrand Supergroup, comprising a thick succession of clastic sediments with minor intercalated lava flows, rests on the granites and schist of the Archean Basement. The Central Rand Group of the Witwatersrand Supergroup contains the economic reef horizons mined throughout the basin. The Central Rand Group is dominated by quartzite with minor shale and conglomerate. Several unconformities in the succession are overlain by the economic auriferous paleoplacers (reefs). Refer to Figure 21 for a map showing the regional geology.

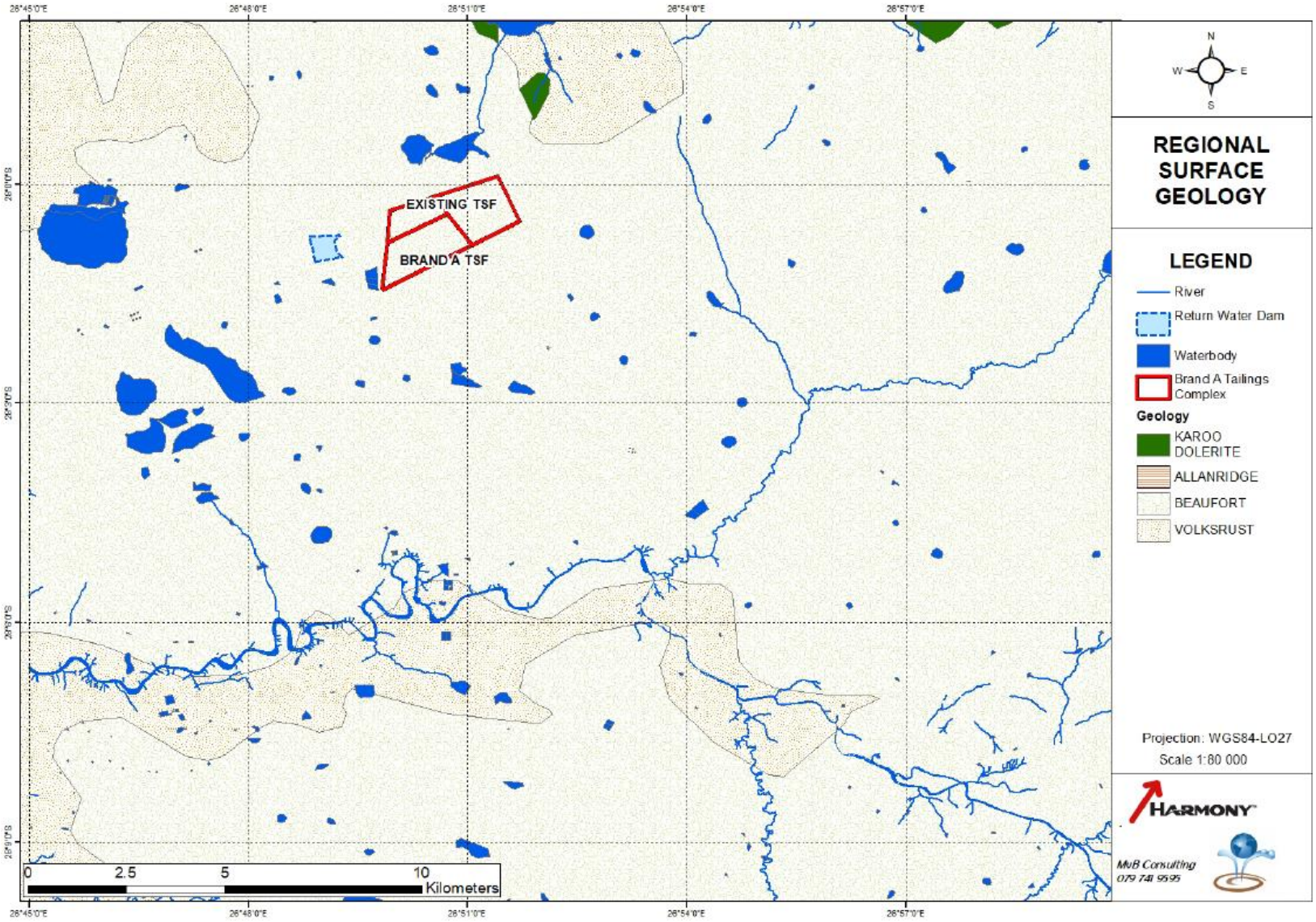

Figure 21: Regional surface geology (MvB Consulting, 2023)

6.5 CLIMATE

The average climate for the site is presented in **Figure 22** using the outcome of the investigation into rainfall and evaporation for the site. The combination of rainfall (Pegram, 2016) and evaporation and temperature (Schulze and Lynch, 2006) result in a cold arid steppe climate according to the Köppen-Geiger climate classification 1.

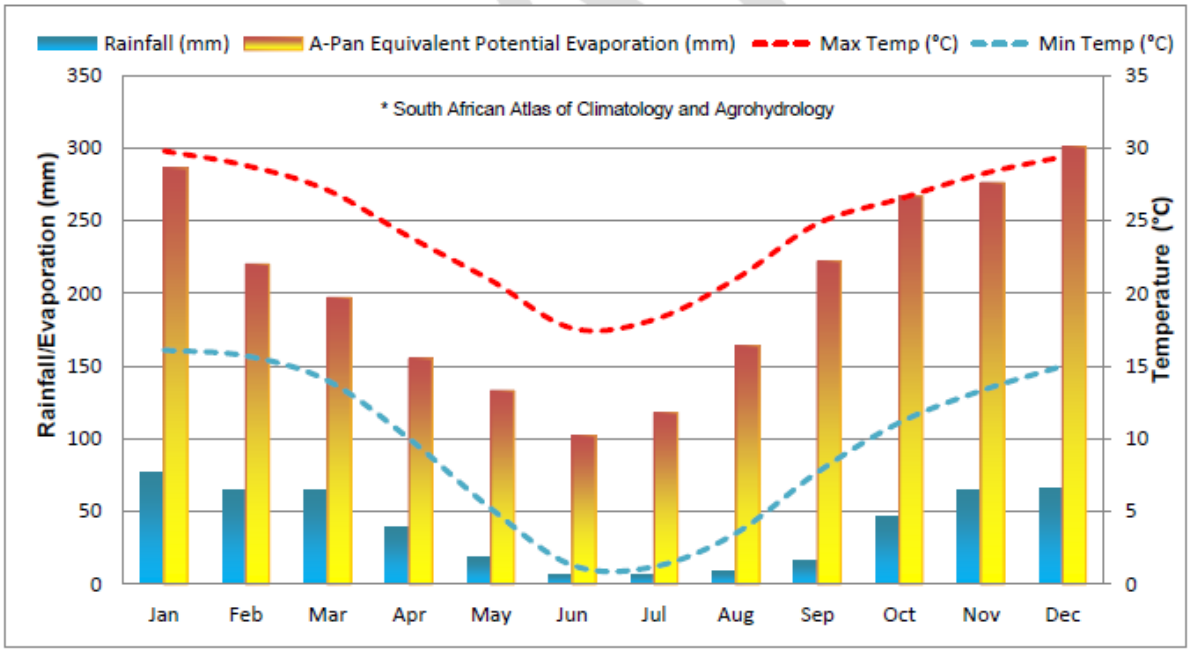

Figure 22: Climate summary

Evaporation data was sourced from the South African Atlas of Climatology and Agrohydrology (Schulze and Lynch, 2006) in the form of A-Pan equivalent potential evaporation. The average monthly evaporation distribution is presented in **Table 17** and shows the site has an annual potential evaporation of 2,441mm.

Table 17: Average Monthly A-Pan Equivalent Evaporation

Month	Evaporation (mm)
January	286
February	220
March	197
April	155
May	133
June	102
July	118
August	164
September	222
October	267
November	276
December	301

6.6 SOCIO-ECONOMIC

A social scoping report compiled by Equispectives (2023) for a similar project (Nooitgedacht TSF) in the same area (Matjhabeng Local Municipality) and thus the information has been adopted for this report as the project aspects and assessment area are the same. The information in that report was used to inform this section of the scoping report.

The Lejweleputswa District Municipality (LDM) is situated in the north western part of the Free State and borders the North West Province to the north; the Fezile Dabi and Thabo Mofutsanyane District Municipalities to the north-east and east respectively; the Xhariep District Municipality and Mangaung Metropolitan Municipality to the south; and the Northern Cape Province to the west. The LDM is accessible from Johannesburg, Cape Town, Klerksdorp and Kimberley through one of South Africa's main national roads, the N1. The district covers an area of 32 286 km^2 and make up almost a third of the Free State province. It consists of the Masilonyana, Matjhabeng, Nala, Tokologo and Tswelopele Local Municipalities (www.lejweleputswa.co.za). The economy of the district relies heavily on the gold mining sector which is dominant in the Matjhabeng and Masilonyana Local Municipalities (Lejweleputswa DM IDP 2021/22). The mining sector is on a downward trend and many businesses that have traditionally depended on the mining sector have either closed down are in the process of closing down. The other municipalities are dominated by agriculture.

The main towns in the Matjhabeng Local Municipality are Welkom, Odendaalsrus, Virginia, Hennenman, Allanridge and Ventersburg (www.matjhabeng.fs.gov.za). The economy of the municipality is centred on mining activities in and around Welkom, Allanridge, Odendaalsrus and Virginia. Manufacturing aimed at the mining sector exists to a limited extent in the above towns, with other activities being limited. Other main economic sectors include manufacturing, tourism, agriculture, gold jewellery, transportation (logistics), and retail (Matjhabeng LM IDP 2022/2023).

The number of households in the study area has increased on all levels (**Table 18**). The proportionate increase in households were greater than the increase in population on all levels and exceeded the growth in households of 12.3% on a national level. The average household size has shown a decrease on all levels, which means there are more households, but with less members.

Table 18: Population density and growth estimates (sources: Census 2011, Community Survey 2016)

Area	Size in km2	Population 2011	Population 2016	Population density 2011	Population density 2016	Growth in population (%)
Free State Province	129,825	2,745,590	2,834,714	21.15	21.83	3.25
Lejweleputswa DM	31,930	627,626	649,964	19.66	20.36	3.56
Matjhabeng LM	5,155	406,461	428,843	78.85	83.19	5.51

The intensity of poverty experienced refers to the average proportion of indicators in which poor households are deprived (Statistics South Africa, 2014). The intensity of poverty has increased slightly on all levels. The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. The SAMPI score in the Matjhabeng LM area has decreased, suggesting an improvement in some aspects relating to poverty in this area (**Table 19**).

Table 19: Poverty and SAMPI scores (sources: Census 2011 and Community Survey 2016)

Area	Poverty headcount 2011 (%)	Poverty intensity 2011 (%)	SAMPI 2011	Poverty headcount 2016 (%)	Poverty intensity 2016 (%)	SAMPI 2016
Free State Province	5.5	42.2	0.023	5.5	41.7	0.023
Lejweleputswa DM	5.6	42.8	0.024	4.8	42.2	0.020
Matjhabeng LM	5.5	43.0	0.024	4.3	41.8	0.018

Ward 35 has the highest proportion of people of economically active age (aged between 15 years and 65 years) that are employed (Figure 9). Since 2010 employment in the gold mining industry showed a steady decline from 157 019 in 2010 to 93 841 in 2022 (www.mineralscouncil.org.za). As such the proportion unemployed people in the area are likely to have increased since 2011. Ward 35 has the highest average household income (Figure 23), indicating more employed people than on local, district or provincial level.

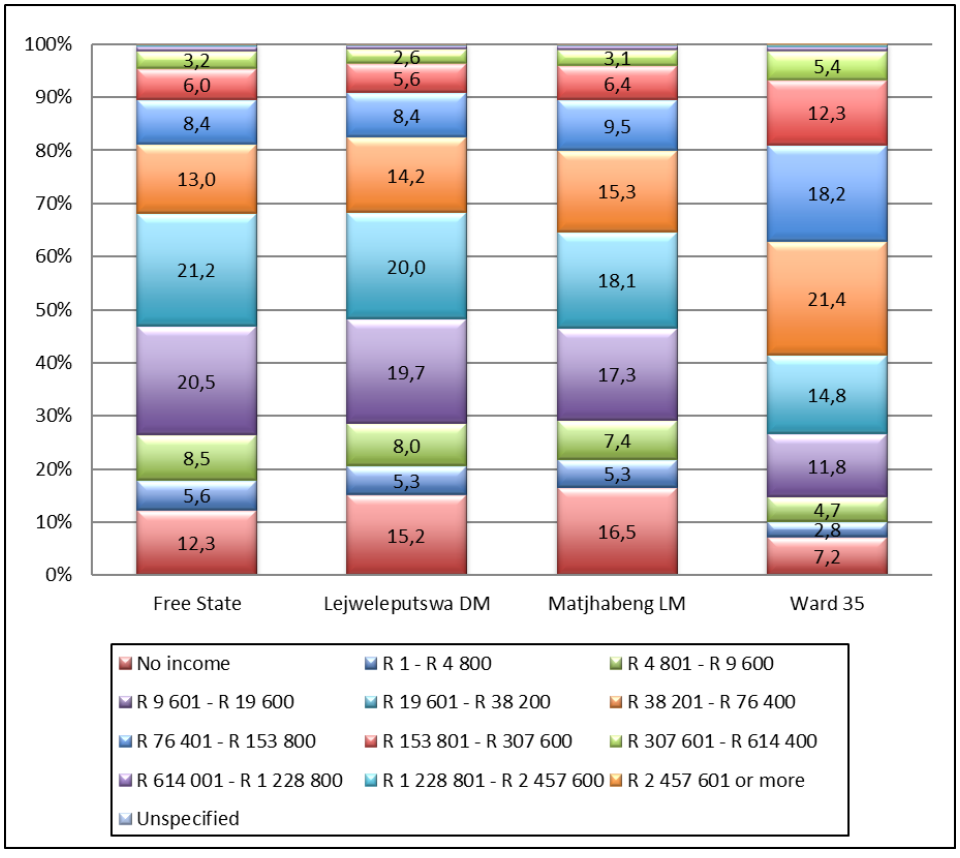

Figure 23: Annual household income (shown in percentage, source: Census 2011)

6.7 CULTURAL HERITAGE RESOURCES

The objective of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) is to introduce an integrated system for the management of national heritage resources. The Act defines a 'heritage resource' as any place or

object of cultural significance (aesthetic, architectural, historical, scientific, social, spiritual, linguistic, or technological value or significance). The identification, evaluation and assessment of any cultural heritage site, artefact or find in South Africa is required by this Act. This section of the report presents the heritage status of the proposed Brand A TSF in Welkom.

According to the Heritage Impact Assessment Report for the Nooitgedacht TSF (PGS Heritage, 2023), the Free State has a rich archaeological and historical history going back millions of years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter-gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915). The Free State has a rich archaeological and historical history going back millions of years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter- gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915).

According to the national web-based environmental screening tool (DFFE Screening Tool Report), the proposed development is located within an area of *low* relative archaeological and cultural heritage theme sensitivity (see **Figure 24**). An assessment of the NHRA and preliminary project information revealed that the proposed development triggers Section 38(1) of the NHRA. Therefore, a Heritage Impact Assessment is required and will be undertaken in the EIA Phase. The South African Heritage Resources Agency (SAHRA), the Free State Heritage Resources Authority (FSPHRA) and Association of Southern African Professional Archaeologists (ASAPA) are I&APs in the project and will be provided with a copy of the report for review and comment.

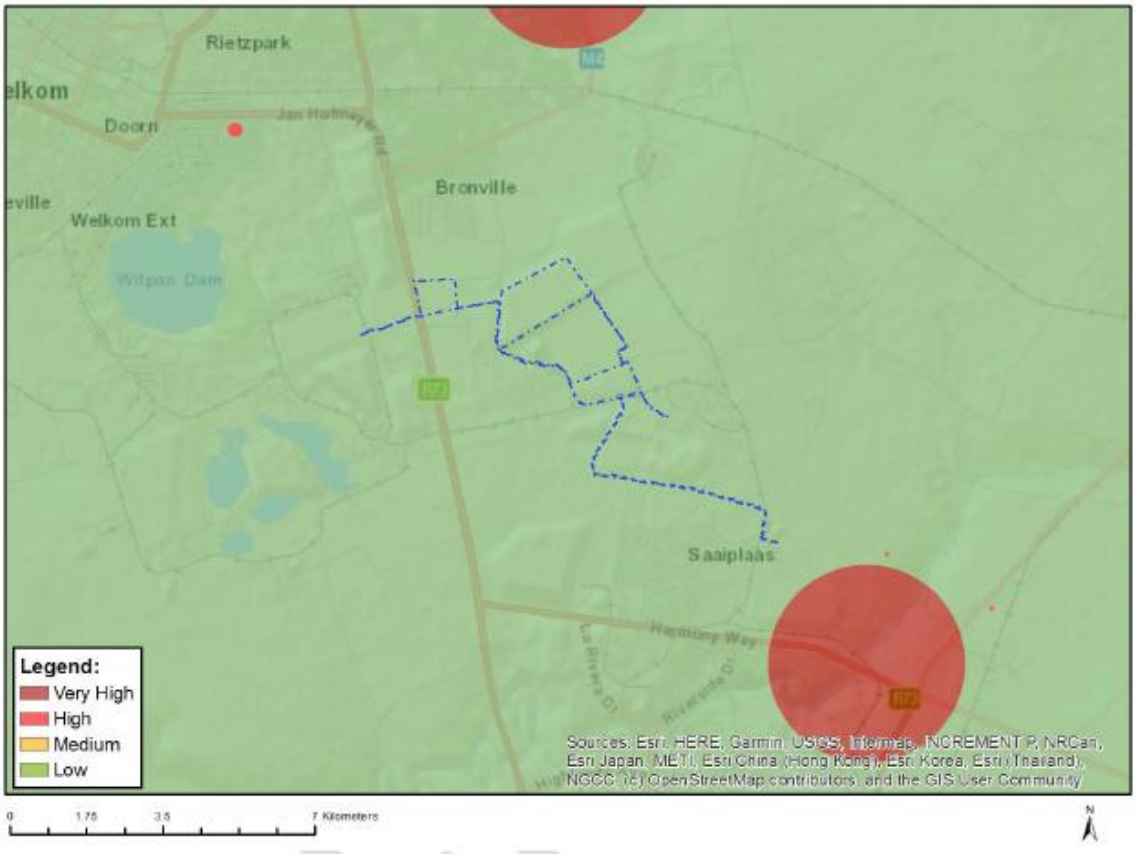

Figure 24: Map of relative archaeological and cultural heritage theme sensitivity (DFFE, 2023)

6.8 PALAEONTOLOGY

Cultural Heritage in South Africa, including 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 exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, 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.

According to the Palaeontological Impact Assessment Report for the Nooitgedacht TSF (Banzai Environmental, 2023), the area is underlain by the aeolian sand as well as the Permian Volksrust Formation (Ecca Group, Karoo Supergroup). The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of the aeolian sand is moderate while that of the Volksrust Formation (Ecca Group, Karoo Supergroup) is High (Almond *et al*, 2013; SAHRIS website). However, the Palaeotechnical report of the Free State (Groenewald et al, 2014) allocated a Moderate Palaeontological Sensitivity to the development site. Updated geology (Council of Geosciences, Pretoria) indicates that the development area is underlain by superficial alluvium, colluvium, elluvium and gravel as well as the Volksrust Formation (Ecca Group).

Based on the 1:250 000 SAHRIS PalaeoMap and the National Web-Based Screening Tool Report, the study area is located within a *Medium* Palaeo-Sensitivity area (see **Figure 25**). The study area is located on an area which has largely been transformed and the proposed development entails excavations of the topsoil with no deep excavations anticipated as the pipelines will be aboveground on concrete plinths. A Palaeontological Impact Assessment (PIA) will be undertaken for the project to confirm the preliminary findings and/or identify fossil resources and the potential impact by the proposed development as well as mitigation measures. The findings and mitigation measures of the PIA will be discussed in the EIA phase.

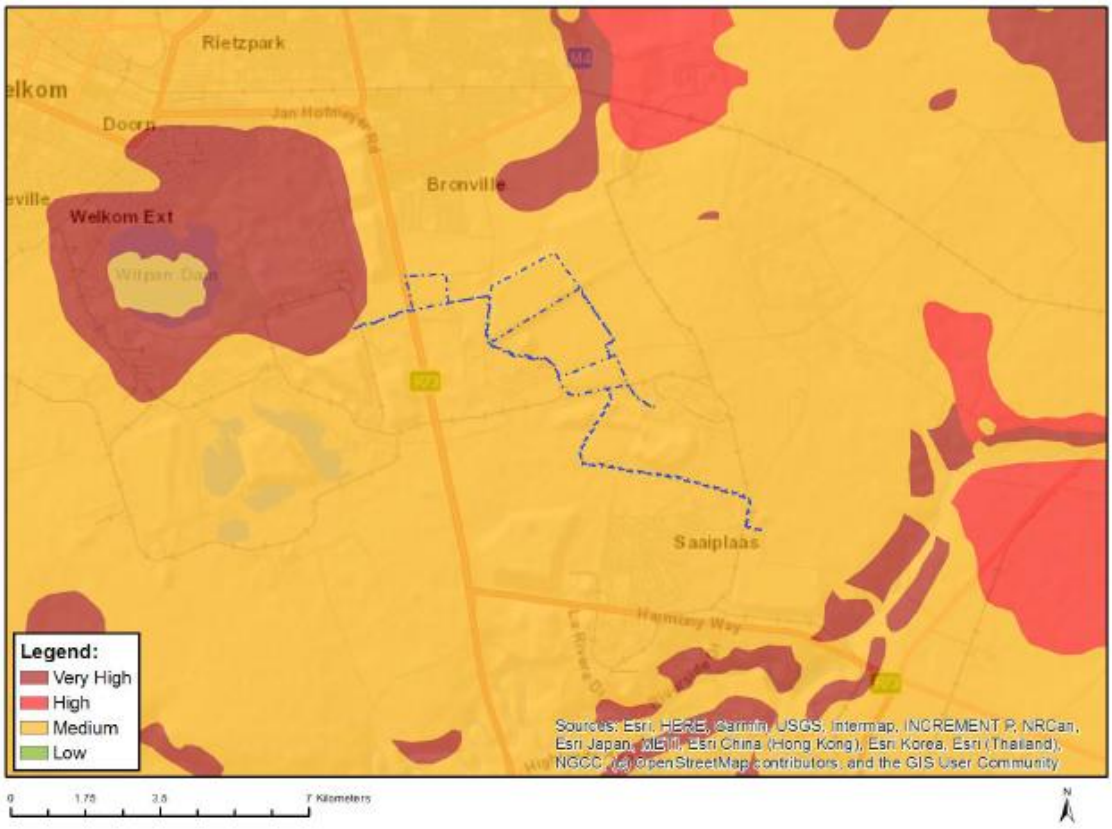

Figure 25: Map of relative palaeontology theme sensitivity (DFFE, 2023)

6.9 SOILS AND AGRICULTURAL POTENTIAL

In considering the Soil Conservation Service for South Africa dataset of the site, soils are classified as being mainly hydrological soil group C (moderately high runoff potential). The soils in the TSF area are mostly medium potential agricultural soils with some scattered high potential areas. The natural vegetation of the site is classified as Vaal-Vet Sandy Grassland (according to SANBI, 2018). 'Grassland' is predominant over the site according to the DFFE's 2020 land-cover dataset, with 'mines & quarries' positioned within close proximity of the study area (FSN 4.2). Based on the soils database, the study area is characterised by the ferric luvisols as indicated in **Figure 26**.

According to Britannica (2023), the Reference Soil Group of the Luvisols holds soils whose dominant characteristic is a marked textural differentiation within the soil profile, with the surface horizon being depleted of clay and accumulation of clay in a subsurface 'argic' horizon. Luvisols have high activity clays throughout and lack the abrupt textural change of Planosols, albeluvic tonguing as in Albeluvisols, a mollic surface horizon as in steppe soils, and the alic properties of Alisols. The mixed mineralogy, high nutrient content, and good drainage of these soils make them suitable for a wide range of agriculture, from grains to orchards to vineyards. Luvisols form on flat or gently sloping landscapes under climatic regimes that range from cool temperate to warm Mediterranean (Britannica, 2023). Although there are agricultural activities within close proximity of the site, the proposed Brand A TSF is within a defined area and will have minimal impact on external activities outside its footprint. In addition, the crop fields were found not active and were largely infested by alien species. Furthermore, the additional pipelines will largely follow existing pipeline routes, new routes will be within already disturbed areas along the access roads.

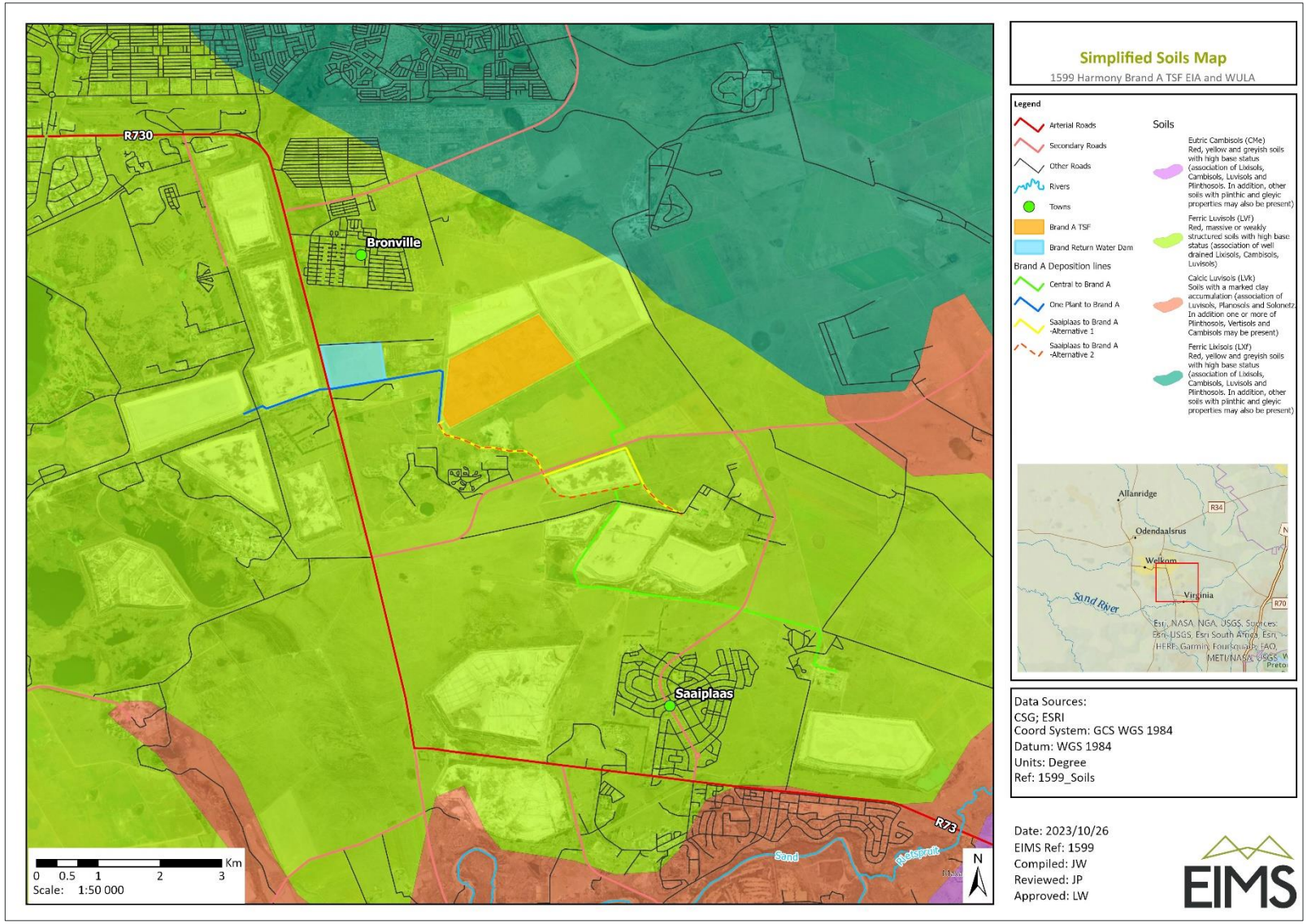

Figure 26: Soil types within the study area

6.10 TERRESTRIAL BIODIVERSITY AND VEGETATION

Terrestrial biodiversity is the variety of life forms on the land surface of the Earth. High biodiversity is an indicator of a healthy ecosystem, which is directly linked to human health. Animals and plants are responsible for many vital services our lives depend on, including:

- oxygen production;
- water regulation;
- soil retaining; and
- providing flood protection.

Biodiversity is both a part of nature and affected by it. Some biodiversity loss is because of events such as seasonal changes or ecological disturbances (wildfires, floods, etc.), but these effects are usually temporary, and ecosystems have managed to adapt to these threats. Human-driven biodiversity loss, in contrast, tends to be more severe and long-lasting. The human-made climate crisis is leading to environmental destruction, habitat loss, and species extinction. Terrestrial biodiversity is decreasing rapidly through habitat loss: a process where a natural habitat becomes incapable of supporting its native species, which are consequently displaced or killed. In the recent past, there have Increased efforts implemented to prevent further loss of terrestrial biodiversity and the ecosystem services they provide. The characteristics and implications of the terrestrial biodiversity within the Brand A TSF site are discussed below.

6.10.1 ECOLOGICALLY IMPORTANT LANDSCAPE FEATURES

The following features describe the general area and habitat, this assessment is based on spatial data that are provided by various sources such as the provincial environmental authority and SANBI.

Table 20: Desktop and background spatial features examined

Desktop Information Considered	Relevant/Irrelevant
Critical Biodiversity Area	Relevant. The study area transects CBA1.
Ecosystem Threat Status	Relevant. The study area is located within the Vaal-Vet Sandy Grassland which According to the National List of Threatened Terrestrial Ecosystems (Government Gazette, 2011), is an Endangered A1 ecosystem, where the A1 criterion denotes irreversible loss of natural habitat.
Ecosystem Protection Level	Relevant. The Vaal-Vet Sandy Grassland (Gh10) is an Endangered Ecosystem which has to be protected, but is not a protected ecosystem under NEMBA.
Protected Areas	Irrelevant. The study area does not transect any protected areas. Study area is approximately 20km to the closest protected area. There are no Ramsar sites within the local municipality.
National Protected Area Expansion Strategy	Irrelevant. The study area does not transect any National Protected Area Expansion Strategy area.
Important Bird and Biodiversity Areas	Irrelevant. The study area does not transect Important Bird and Biodiversity Areas. The closest formal important bird and biodiversity area is the Willem Pretorius Nature Reserve (approximately 70km southeast of the study area).
South African Inventory of Inland Aquatic Ecosystems	Irrelevant. The study area does not transect any nor is within close proximity of South African Inventory of Inland Aquatic Ecosystems.
National Freshwater Ecosystem Priority Areas	Irrelevant. The study area does not transect any nor is within close proximity of National Freshwater Ecosystem Priority Areas.
Strategic Water Source Areas	Irrelevant. The study area does not transect Strategic Water Source Areas (SWSA).

6.10.2 FREE STATE BIODIVERSITY PLAN

Bioregional plans are one of a range of decision support tools provided for in the Biodiversity Act that can be used to enable biodiversity conservation in priority areas. The purpose of a bioregional plan is to inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity (Desmet et al., 2013). The purpose of the conservation plans is to inform land-use planning and development on a provincial scale and to aid in natural resource management, with one of the outputs being a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely Protected Areas, CBA1 areas, CBA2 areas, ESA1 areas, ESA2 areas, Other Natural Areas (ONAs) and areas with No Natural Habitat Remaining (NNR) based on biodiversity characteristics, spatial configuration and requirements for meeting targets for both biodiversity patterns and ecological processes.

Critical Biodiversity Areas (CBAs) – Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. Ecological Support Areas (ESAs) - Areas are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not necessarily pristine natural areas. They are however required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and which also contributes significantly to the maintenance of Ecological Infrastructure.

The Free State Department of Environment and Nature Conservation has developed a Free State Biodiversity Sector Plan, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape. The identification of Critical Biodiversity Areas for the Free State was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated. Based on the Free State Biodiversity Sector Plan, the proposed study area is located within CBA1 (**Figure 27**).

Critical Biodiversity Areas 1 are irreplaceable areas which includes threatened species, threatened ecosystems that need to be kept in their natural or near natural state. However, the proposed Brand A TSF development is situated in within an area consisting mainly of mining activities, crop farming and grazing and naturally occurring pans. Residential areas, waterbodies, wetlands, mines and quarries and forested land are also located in the extended surrounding areas. The larger area surrounding the proposed plant is classified as industrial in nature. The site has been transformed with vegetation reduced to largely low laying grassland with pockets and isolated Eucalyptus trees and Wattle trees (see **Section 6.3**).

A terrestrial biodiversity impact assessment will be undertaken to the presence, type, implications and/or mitigation measures of biodiversity species within the study area. The findings will be presented and discussed in the EIA Report. The approach that will be adopted for the fauna and flora assessment will take cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”.

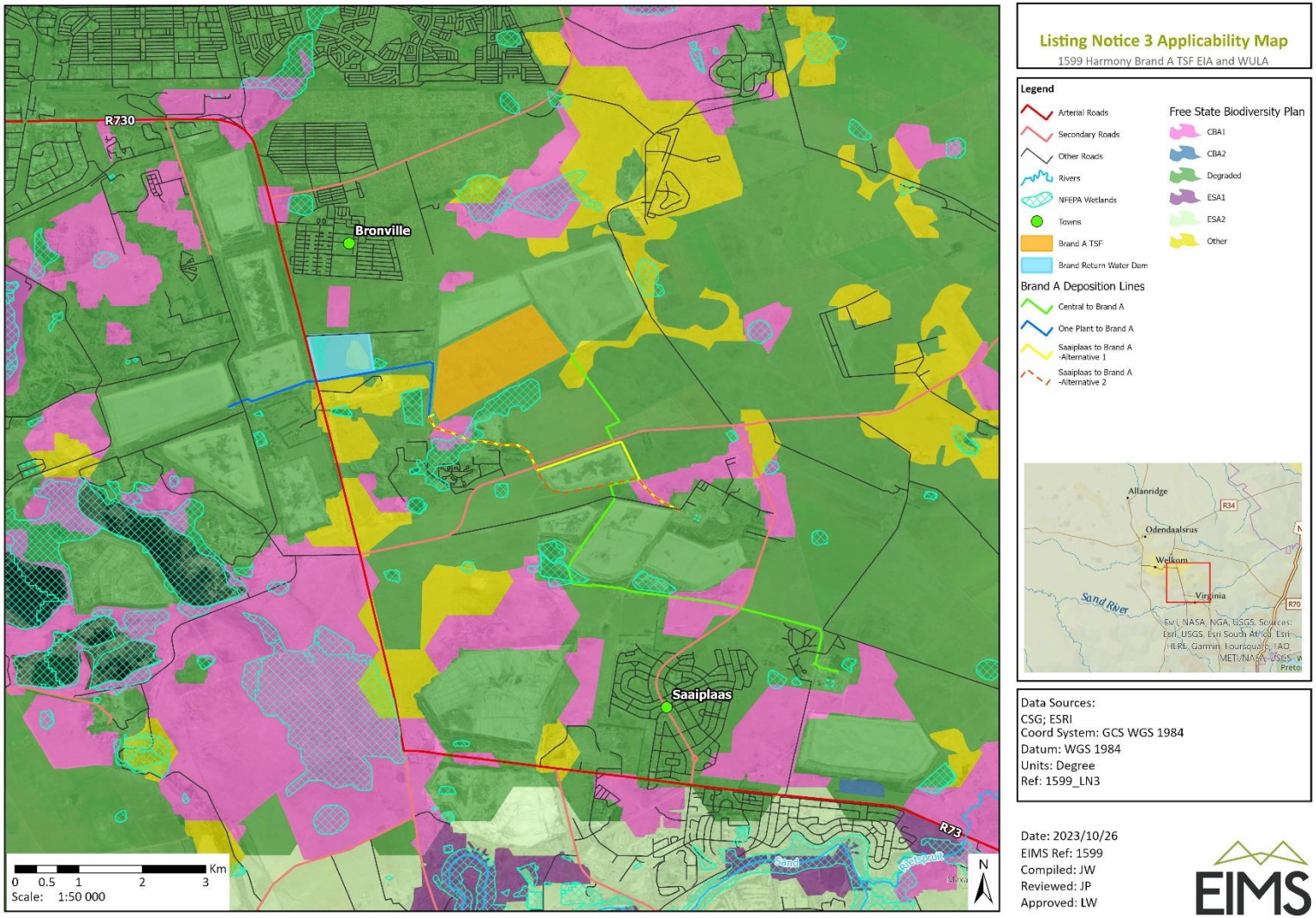

Figure 27: Site Conservation Plan Map

The project area has historically transformed by mining activities. A change to the land use is not envisioned to have any notable negative effect on the proposed footprint area due to the current transformed state of the area, and due to the project area being isolated from any natural surrounding areas. The project area represents a low plant sensitivity as per the screening report (**Appendix D**), as it has been determined to be mostly very low based on site sensitivity verification report (**Appendix E**).

6.10.3 THE NATIONAL BIODIVERSITY ASSESSMENT

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the DFFE and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period. The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors.

The two headline indicators assessed in the NBA are Ecosystem Threat Status and Ecosystem Protection Level (Skowno et al., 2019).

6.10.3.1 ECOSYSTEM THREAT STATUS

Ecosystem Threat Status (ETS) outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in a good or healthy ecological condition (Skowno et al., 2019). CR, EN, or VU ecosystem types are collectively referred to as threatened ecosystems. According to the National Vegetation Data (2018) obtained from SANBI, the proposed development site is located within the Vaal-Vet Sandy Grassland (**Figure 28**).

The Vaal-Vet Sandy Grassland occur within the North West and Free State Provinces, south of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort area north of Bloemfontein. The altitude varies between 1220m andc1560m, with an average altitude of 1260-1360m (Mucina and Rutherford, 2010).

Vaal-Vet Sandy Grassland is characterised by warm temperate, summer rainfall, with an overall Mean Annual Precipitation (MAP) of 530mm. The region experiences high summer temperatures, and in winter undergoes severe frost (on average 37 days per annum) (Mucina and Rutherford, 2010).

The Vaal-Vet Sandy Grassland is characterised by Aeolian and colluvial sand overlaying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group) as well as the older Ventersdorp Supergroup andesite and basement gneiss in the north. These soils form part of Avalon, Westleigh and Clovelly. The dominant land type of this region is Bd, which is closely followed by Bc, Ae and Ba (Mucina and Rutherford, 2010).

Vaal-Vet Sandy Grassland is considered Endangered (Target 24%). Only a very small fraction (0.3%) is statutorily conserved in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. More than 60% of the area is transformed primarily for cultivation of commercial crops, whereas the remaining 40% is under strong grazing pressure from cattle and sheep. Erosion is very low (85.3%) and low (11%) (Mucina and Rutherford, 2010).

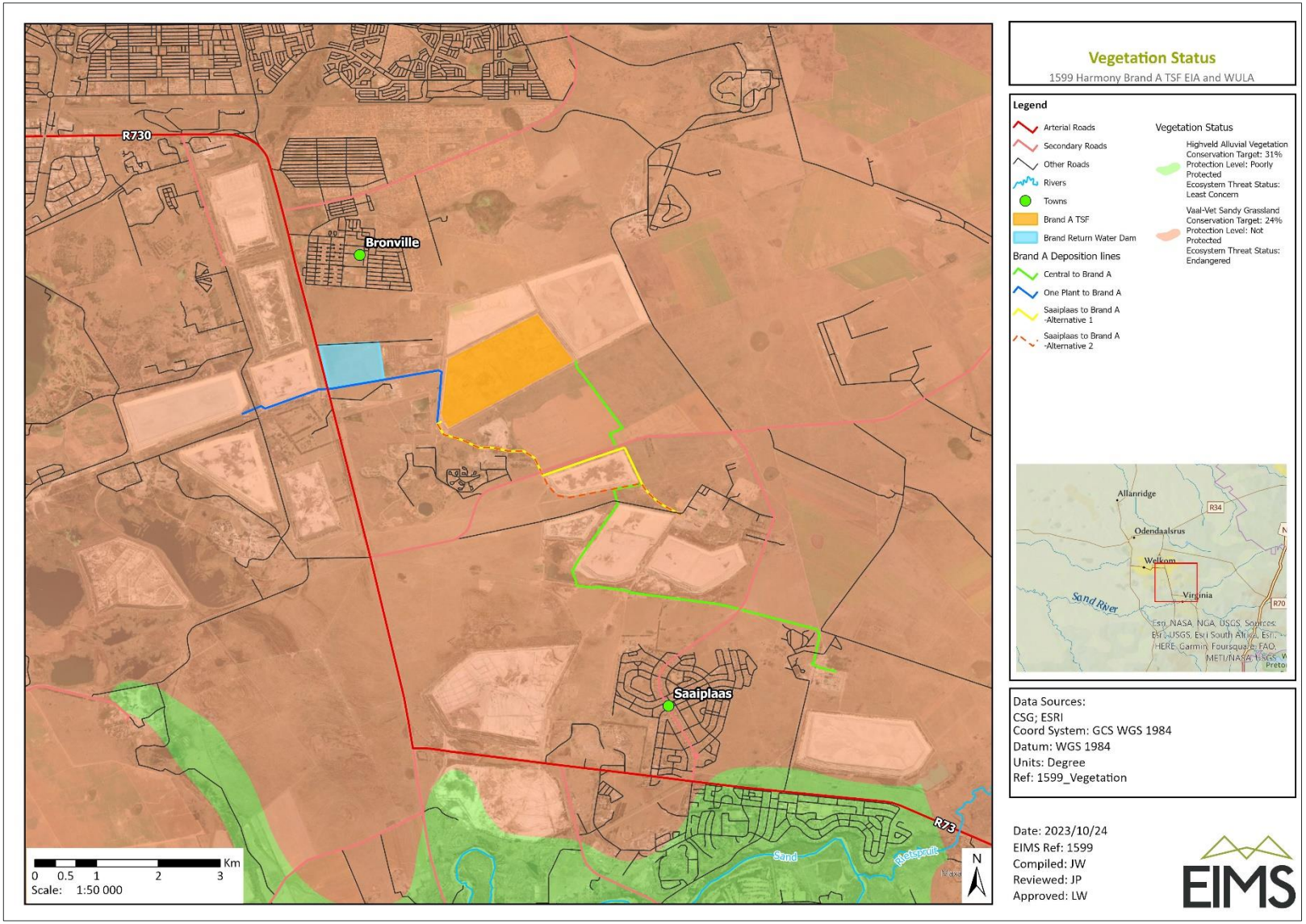

Figure 28: Site Vegetation Map

6.10.3.2 ECOSYSTEM PROTECTION LEVEL

Ecosystem Protection level (EPL) informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno et al., 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. According to the National Vegetation Data (2018) obtained from SANBI, the proposed development site is located within the Vaal-Vet Sandy Grassland (**Figure 28**). The Vaal-Vet Sandy Grassland (Gh10) is an Endangered Ecosystem which has to be protected, but is not a protected ecosystem under NEMBA.

6.10.3.3 FLORA, FAUNA AND AVIFAUNA

According to the Terrestrial Ecology Assessment for the nearby Nooitgedacht TSF by the Biodiversity Company (2023), the IUCN Red List Spatial Data and the MammalMap database lists 89 mammal species that could be expected to occur within the area. The list excludes large mammal species that are normally limited to protected areas. Ten (10) of these expected species are regarded as Species of Conservation Concern (SCC). Based on the IUCN Red List Spatial Data and the ReptileMAP database, 48 reptile species are expected to occur within the area. Based on the IUCN Red List Spatial Data and AmphibianMap, 17 amphibian species are expected to occur within the area. The List of fauna species of conservation importance expected to occur within the extended study area as modified from the nearby Nooitgedacht TSF Terrestrial Ecology Assessment undertaken by the Biodiversity Company (2023) is indicated in **Table 23**.

Table 21: List of fauna species of conservation importance expected to occur within the extended study area (The Biodiversity Company, 2023)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional	Global	
Mammal species of conservation concern that may occur the extended study area				
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Low
Leptailurus serval	Serval	NT	LC	Moderate
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Moderate
Threatened reptile species that are expected to occur within the extended study area				
Sensitive Species 15	-	VU	VU	Confirmed
Threatened amphibian species that are expected to occur within the extended study area				
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	High

Based on the same Harmony Nooitgedacht TSF Terrestrial Ecology Assessment Report (The Biodiversity Company, 2023), the vegetation assessment approximately sixty (60) tree, shrub, herbaceous and graminoid plant species are expected to occur within the extended study area. No SCC species were recorded nor are expected due to the nature of the project area (mining activities). Two species of protected plant species (*Eucomis autumnalis* and *Ammocharis coranica*) which are protected by the Free State Nature Conservation Ordinance 8 of 1969 were observed within the extended study area and may likely occur within the Brand A TSF

area. According to the list of protected species under Schedule 6, if any individuals of these plant species are to be disturbed, permits must be obtained from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (FSDESTEA). Twenty-three (23) Alien Invasive Plants (AIP) species were recorded within the extended TSF's area. These species are listed under the Alien and Invasive Species List 2020, Government Gazette No. GN1003 as Category 1b and Not Indigenous (Exotic) respectively. The twelve (12) species indicated in **Table 37** are AIP species that must be controlled by implementing an AIP Management Programme, in compliance of section 75 of the NEMBA.

Table 22: List of Category 1b AIP species expected to occur within the extended study area (The Biodiversity Company, 2023)

Family	Scientific Name	Alien Category
Asteraceae	*Cirsium vulgare*	NEMBA Category 1b.
Asteraceae	*Xanthium spinosum*	NEMBA Category 1b.
Asteraceae	*Flaveria bidentis*	NEMBA Category 1b.
Meliaceae	*Melia azedarach*	NEMBA Category 1b.
Myrtaceae	*Eucalyptus camaldulensis*	NEMBA Category 1b
Papaveraceae	*Argemone ochroleuca*	NEMBA Category 1b.
Poaceae	*Arundo donax*	NEMBA Category 1b.
Poaceae	*Cortaderia selloana*	NEMBA Category 1b.
Poaceae	*Pennisetum clandestinum*	NEMBA Category 1b.
Solanaceae	*Datura ferox*	NEMBA Category 1b.
Tamaricaceae	*Tamarix chinensis*	NEMBA Category 1b.
Verbenaceae	*Verbena bonariensis*	NEMBA Category 1b.

According to the Terrestrial Ecology Assessment for the nearby Nooitgedacht TSF by the Biodiversity Company (2023), based on the Plants of Southern Africa (BODATSA-POSA, 2022) database, about 455 plant species have the potential to occur within the exaggerated TSF's assessment area and its surroundings. Of these 455 plant species, no species are listed as being Species of Conservation Concern (SCC). Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, about 236 bird species have the potential to occur in the vicinity of the extended TSF's assessment area. The SCC expected can be seen in **Table 23** and eleven of these have a moderate-high likelihood of occurrence based on the suitable habitat and food sources present in the study area. Several bird species were noted by the EAP during the Site Sensitivity Verification. However, the bird species could not be identified.

Table 23: List of bird species of conservation importance expected to occur within the extended study area (The Biodiversity Company, 2023)

Species	Common Name	Conservation Status		Likelihood of occurrence	Screening Tool Sensitivity
		Regional	Global		
Calidris ferruginea	Sandpiper, Curlew	LC	NT	High	
Charadrius pallidus	Plover, Chestnut-banded	NT	NT	Moderate	
Ciconia abdimii	Stork, Abdim's	NT	LC	Low	
Ciconia nigra	Stork, Black	VU	LC	Low	
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Moderate	
Falco biarmicus	Falcon, Lanner	VU	LC	Moderate	
Gyps africanus	Vulture, White-backed	CR	CR	Moderate	

Species	Common Name	Conservation Status		Likelihood of occurrence	Screening Tool Sensitivity
		Regional	Global		
Hydroprogne caspia	Tern, Caspian	VU	LC	Moderate	Medium
Mycteria ibis	Stork, Yellow-billed	EN	LC	Confirmed	High
Oxyura maccoa	Duck, Maccoa	NT	VU	High	
Phoeniconaias minor	Flamingo, Lesser	NT	NT	High	
Phoenicopterus roseus	Flamingo, Greater	NT	LC	High	
Rostratula benghalensis	Painted-snipe, Greater	NT	LC	High	
Sagittarius serpentarius	Secretarybird	EN	EN	Moderate	

The natural grassland within the proposed site is mainly used for mining and grazing purposes. The grasslands, possess medium to low vegetation species diversity as well as a high percentage of invader species. Even though the impacts on fauna and flora is anticipated to be relatively medium-low, the extent of the site and potential presence of important biodiversity cannot be excluded. Therefore, this area is classified as moderately disturbed, with a medium ecological quality. A Terrestrial Biodiversity Impact Assessment with components of flora, fauna and avifauna will be undertaken during the EIA phase. The study will identify the type, sensitivity and conservation status and/or implications thereof of the site specific species and the potential impacts and mitigation associated with the proposed project.

6.11 SURFACE WATER AND WETLANDS

South Africa is divided into nineteen (19) Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level is achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA progressively develops a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a WMA is the CMS which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources.

According to MvB Consulting (2023), the Brand A TSF is located within the quaternary catchment C42J, which is primarily drained by the Sand River. The Sand River forms the main and largest drainage feature in the region and is located approximately 8km south of the TSF. The origin of the Sand River is some 120 kilometres southeast from the study area in the Senekal District. The Sand River eventually discharges its water flow into the Bloemhof Dam, which is situated some 120 kilometres to the northwest of the study area. The drainage area forms part of the Middle Vaal Water Management Area (see **Figure 29**). There are small to large waterbodies, wetlands and pans in addition to the return water dams within the surrounding areas as indicated in **Section 6.3** and can be seen on **Figure 29** and **Figure 30**.

The Middle Vaal WMA is located downstream of the confluence of the Vaal and the Rietspruit Rivers and upstream of Bloemhof Dam; It extends to the headwaters of the Schoonspruit River in the north and the Vet River in the south, covering a total catchment area of 52 563 km^2 (DWS, 2004). The Middle Vaal WMA includes parts of Free State and North-West provinces. The Middle Vaal WMA is part of a larger water supply system which includes adjacent WMAs. This system is generally referred to as the Vaal River System. The Vaal Overarching Internal Strategic Perspective (ISP) has been developed to deal with the strategies for this system. The Middle Vaal WMA is one of three WMAs in the Vaal River System, which is the drainage area of the Vaal River from its headwaters to the confluence of the Vaal and Orange Rivers. The Middle Vaal ISP should be read in conjunction with the Vaal Overarching ISP (DWAF, 2004b) to gain a complete understanding of the strategies for the WMA.

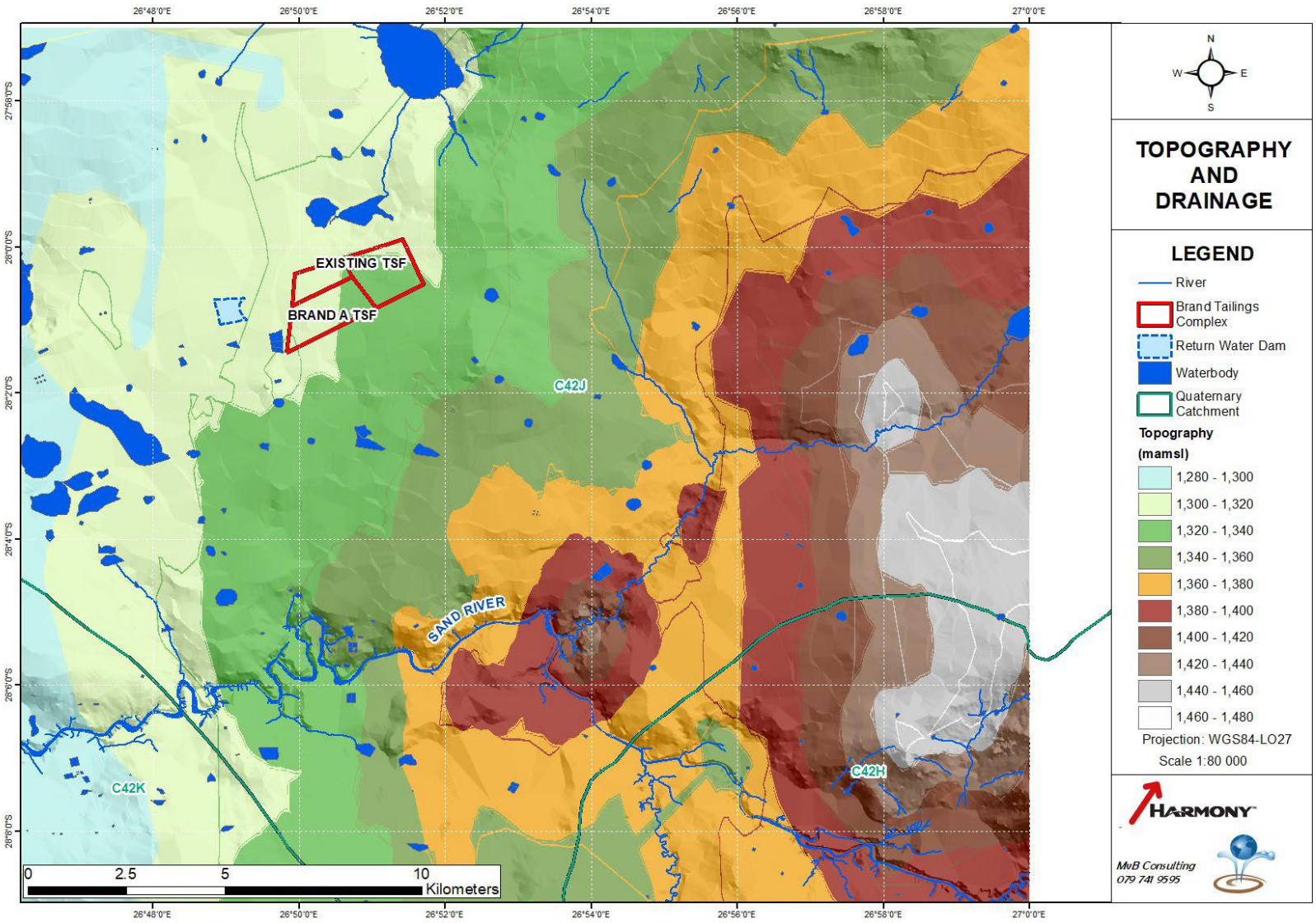

Figure 29: Surrounding surface water features and elevations (MvB Consulting, 2023)

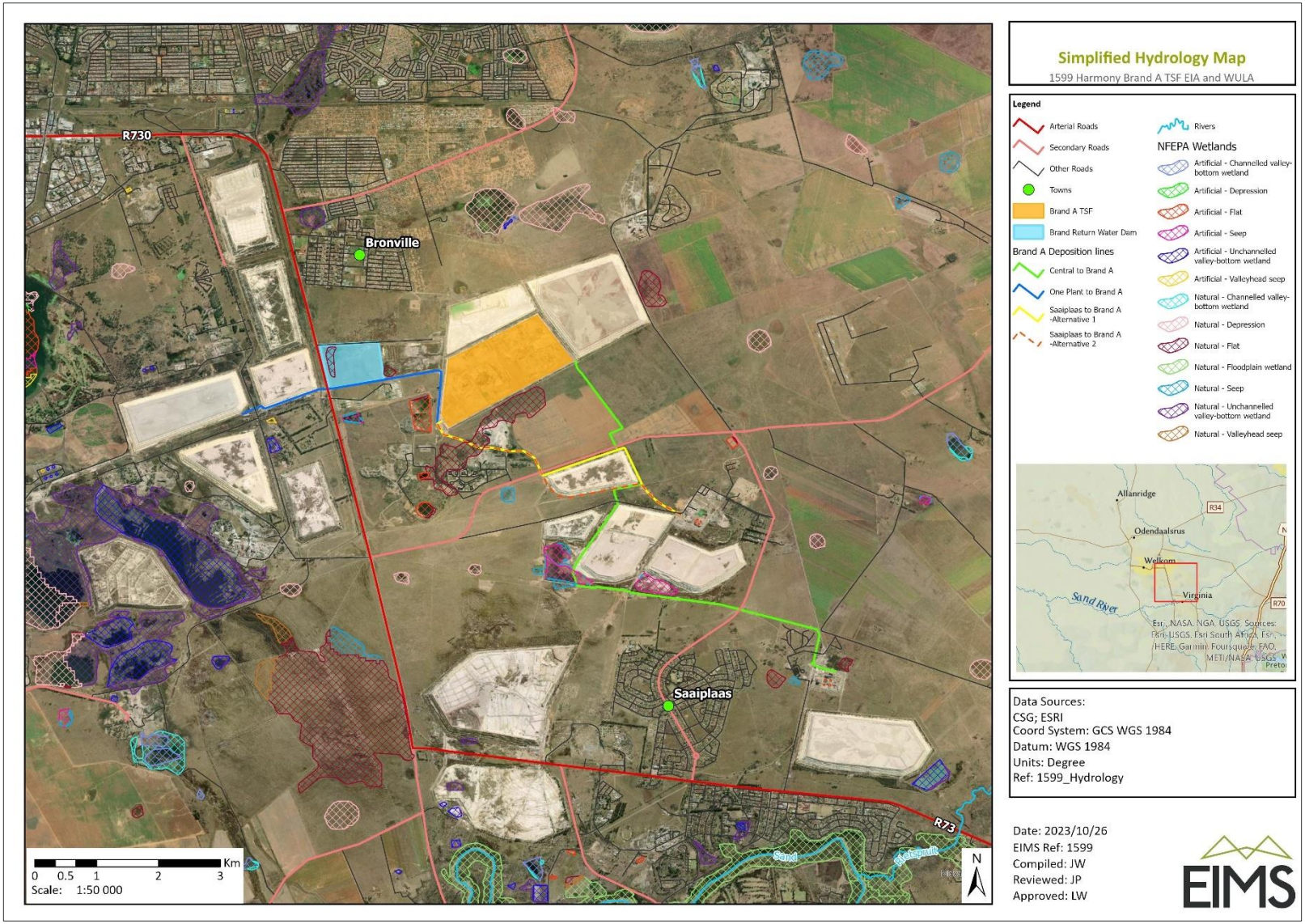

Figure 30: Site Hydrological Map

The land use in the Middle Vaal WMA is characterised by agriculture with the main irrigation crops being wheat, maize, groundnuts, sorghum and sunflowers. There are also extensive gold mining activities located in the Middle Vaal water management area. These activities are generating substantial return flow volumes in the form of treated effluent from the urban areas and mine dewatering that are discharged into the river system. These discharges are having significant impacts on the water quality in the main stem of the Vaal River in the Middle Vaal WMA (DWS, 2004).

Due to the extensive development in the Vaal River System , the local surface water resources in all three the Vaal WMAs have been fully exploited, more than three decades ago. It was therefore necessary to augment the supply by developing various transfer schemes importing water from the Thukela and Usutu to Mhlathuze WMAs, as well as from the Kingdom of Lesotho through the Lesotho Highlands Water Project (LHWP) (DWS, 2004).

6.12 GROUNDWATER

A final geohydrological specialist study will be conducted as part of this EIA and included in the EIA phase report. The geohydrological setting and conceptual model of the study area is described according to the following criteria:

- Borehole information;
- Aquifer type;
- Groundwater use;
- Aquifer parameters;
- Aquifer recharge;
- Groundwater gradients and flow;
- Groundwater quality; and
- Aquifer classification.

6.12.1 BOREHOLE INFORMATION

Ten investigative boreholes were drilled as part of this study. The purpose of the drilling was to investigate the geology and type of aquifer underlying the TSF and to allow access to the aquifer/s to evaluate the aquifer parameters and the groundwater quality. The boreholes were placed not only to investigate the above, but also to assess and monitor the current impacts from the TSF. The boreholes were drilled in pairs to investigate the shallow, weathered aquifer, and the deeper fractured aquifer separately. The boreholes were also placed such that the potential impacts from the Brand A TSF can be assessed, but also the cumulative impact from the existing tailings facilities. Harmony's routine groundwater monitoring boreholes were also included in the geohydrological assessment. The borehole information is summarised in **Table 24** and **Table 25**.

Table 24: Investigative Borehole Information (MvB Consulting, 2023)

Borehole ID	Longitude	Latitude	Approximate Collar Elevation	Date drilled	Depth m	Borehole Diameter (mm)	Casing Diameter	Groundwater Level	
								mbs	mamsl
Investigative Borehole									
BBH 1 D	26.83052	-28.01900	1361.12	04/08/2023	40	0 - 6m: 215mm 6 - 40m: 165mm	0 - 6m: 177mm Steel 0 - 12m: 140mm PVC Casing 12 - 40m: 140mm PVC Screen	3.91	1357.21
BBH 1 S	26.83052	-28.01907	1361.14	04/08/2023	12	0 - 12m: 165mm	0 - 1m: 140mm PVC Casing 1 - 12m: 140mm PVC Screen	3.54	1357.60
BBH 2 D	26.83159	-28.00258	1360.50	07/08/2023	40	0 - 6m: 215mm 6 - 40m: 165mm	0 - 6m: 177mm Steel 0 - 18m: 140mm PVC Casing 18 - 40m: 140mm PVC Screen	2.12	1358.38
BBH 2 S	26.83166	-28.00255	1360.53	07/08/2023	15	0 - 15m: 165mm	0 - 4m: 140mm PVC Casing 4 - 15m: 140mm PVC Screen	2.33	1358.20
BBH 3 D	26.84698	-28.01675	1369.97	08/08/2023	40	0 - 6m: 215mm 6 - 40m: 165mm	0 - 6m: 177mm Steel 0 - 18m: 140mm PVC Casing 18 - 40m: 140mm PVC Screen	4.27	1365.70
BBH 3 S	26.84692	-28.01677	1369.97	08/08/2023	15	0 - 15m: 165mm	0 - 4m: 140mm PVC Casing 4 - 15m: 140mm PVC Screen	4.29	1365.68
BBH 4 D	26.86175	-28.00210	1379.45	08/08/2023	40	0 - 6m: 215mm 6 - 40m: 165mm	0 - 6m: 177mm Steel 0 - 18m: 140mm PVC Casing 18 - 40m: 140mm PVC Screen	0.05	1379.40
BBH 4 S	26.86179	-28.00213	1379.53	08/08/2023	15	0 - 15m: 165mm	0 - 4m: 140mm PVC Casing 4 - 15m: 140mm PVC Screen	0.00	1379.53
BBH 5 D	26.84620	-27.99890	1363.80	07/08/2023	40	0 - 6m: 215mm 6 - 40m: 165mm	0 - 6m: 177mm Steel 0 - 18m: 140mm PVC Casing 18 - 40m: 140mm PVC Screen	2.44	1361.36
BBH 5 S	26.84624	-27.99887	1363.80	07/08/2023	15	0 - 15m: 165mm	0 - 15m: 140mm PVC Screen	3.32	1360.48

**Note: mbs = metres below surface*

Table 25: Mine Monitoring Borehole Information (MvB Consulting, 2023)

Borehole ID	Longitude	Latitude	Approximate Collar Elevation	Date drilled	Depth m	Borehole Diameter (mm)	Casing Diameter	Groundwater Level	
								mbs	mamsl
Mine Monitoring Borehole									
BH1	26.80243	-28.01020	1349	Unknown				2.65	1346.35
BH27	26.83873	-28.02880	1365					5.49	1359.51
BH123	26.81265	-28.04580	1345					2.27	1342.73
BH183	26.78389	-28.02800	1340					2.65	1337.35
BH11	26.81994	-28.01980	1355					3.89	1351.11
BH1A	26.80773	-28.02090	1348	June 2018	20	165	0-6m: 140mm Solid PVC 6-20m: 140mm Slotted PVC	3.22	1344.78
BH1B	26.80773	-28.02090	1348	June 2018	57	165	0-30m: 140mm Solid PVC 30-57m: 140mm Slotted PVC	3.08	1344.92
BH2A	26.80556	-28.02620	1354	June 2018	15	165	0-3m: 140mm Solid PVC 3-15m: 140mm Slotted PVC	3.74	1350.26
BH2B	26.80556	-28.02620	1354	June 2018	50	0-9m: 215mm 9-50m: 165mm	0-9m: 177mm Solid Steel 0-25m: 140mm Solid PVC 25-50m: 140mm Slotted PVC	3.76	1350.24
BH3A	26.81611	-28.02790	1365	June 2018	25	165	0-15m: 140mm Solid PVC 15-25m: 140mm Slotted PVC	6.54	1358.46
BH3B	26.81611	-28.02790	1365	June 2018	50	165	0-30m: 140mm Solid PVC 30-50m: 140mm Slotted PVC	6.04	1358.96

**Note: mbs = metres below surface*

6.12.2 AQUIFER TYPE

The mine infrastructure is situated on interbedded siltstone/sandstone and shale of the Vryheid Formation. Even though the shale and sandstone are not known to contain economic aquifers, groundwater contributes to stream flow and in some instances, high yielding boreholes have been recorded. The following three aquifers underlie the site:

- **Weathered Aquifer (Karoo Formations)**: A shallow, weathered aquifer exists in the weathered shale and sandstone at an average depth of 10m – 20m below ground level. The most consistent water strike is located at the fresh bedrock / weathering interface. The hydraulic conductivity of the weathered aquifer is estimated at 0.005 m/day. The vertical permeability is in the order of 0.001 m/day to 0.00010 m/day, which is sufficiently low to confine the groundwater in the underlying fractured rock aquifer.
- **Fractured Aquifer (Karoo Formations)**: The primary porosity of the Vryheid Formation is very low. Any water bearing capacity is therefore associated with secondary joints, bedding planes and faults. The contact zones of dolerite intrusions are characterised by cooling joints and fractures, which are considered the primary source of groundwater flow within the deeper formations. The hydraulic conductivity of the fractured rock aquifer is estimated at 0.162 m/day to 0.1 m/day. The depth to groundwater in this aquifer can be variable due to confining layers in parts of the study area. The two aquifers may or may not be hydraulically connected, dependent on the local geology.
- **Witwatersrand / Ventersdorp Aquifer**: The deep brine Witwatersrand aquifer is situated approximately 300m below surface. Mining prospecting boreholes indicated this level to be between 170m to 270m (EMP, 2009). This aquifer is thought to be connate (i.e. original formation water) or extremely old (fossil) water and is usually concentrated on geological structures such as fault zones or igneous intrusions (e.g. dykes).
    - The time gap between the end of the Central Rand Group and the start of the Karoo deposition was in the order of 2.3Ga. There is also a significant time gap between the Central Rand Group and the Ventersdorp Supergroup. During these intervening periods, the older rocks were uplifted and exposed to erosion and the near surface rocks to pressure release. This resulted in the forming of fractures in approximately the upper 150m of the rock succession. Subsequent land surface changes and inundation by a shallow sea allowed marine water to percolate into the network of fractures in the Witwatersrand and Ventersdorp rocks (Young, 1990).
    - The major fractures that formed during the Ventersdorp tectonic events were filled with water to a depth of several kilometres. The impermeable nature of the overlying Karoo sediments, particularly the Dwyka Formation at the base of the Karoo, effectively sealed of the aquifer (Van Biljon, 1995). Post-Karoo movement and intrusions provided conduits for leakage from the Karoo aquifers to the deep Witwatersrand aquifer. However, the deep aquifer recharge from surface is regarded as negligible and at best localised (Van Biljon, 1995).
    - The Witwatersrand aquifer has been largely dewatered during the past 40 years of mining and the water levels in the aquifer dropped significantly. In spite of the dewatering of the Witwatersrand aquifer, there is no evidence of dewatering of the Karoo aquifers. If there was a connection between the two aquifers the groundwater level in the Karoo aquifer would have dropped, but we still record very shallow groundwater levels in the Karoo aquifer.

It is therefore concluded that:

- There is no or very limited hydraulic connectivity between the Karoo aquifers and the deeper Witwatersrand aquifer.
- Recharge to the Witwatersrand aquifer is negligible.

- Once the Witwatersrand aquifer is dewatered (or the water level lowered) it will not recover. The estimated post-mining water level in the Witwatersrand aquifer will therefore be deeper than the pre-mining water level of ~200m below surface.

A graphical illustration of the aquifers is presented in **Figure 31**.

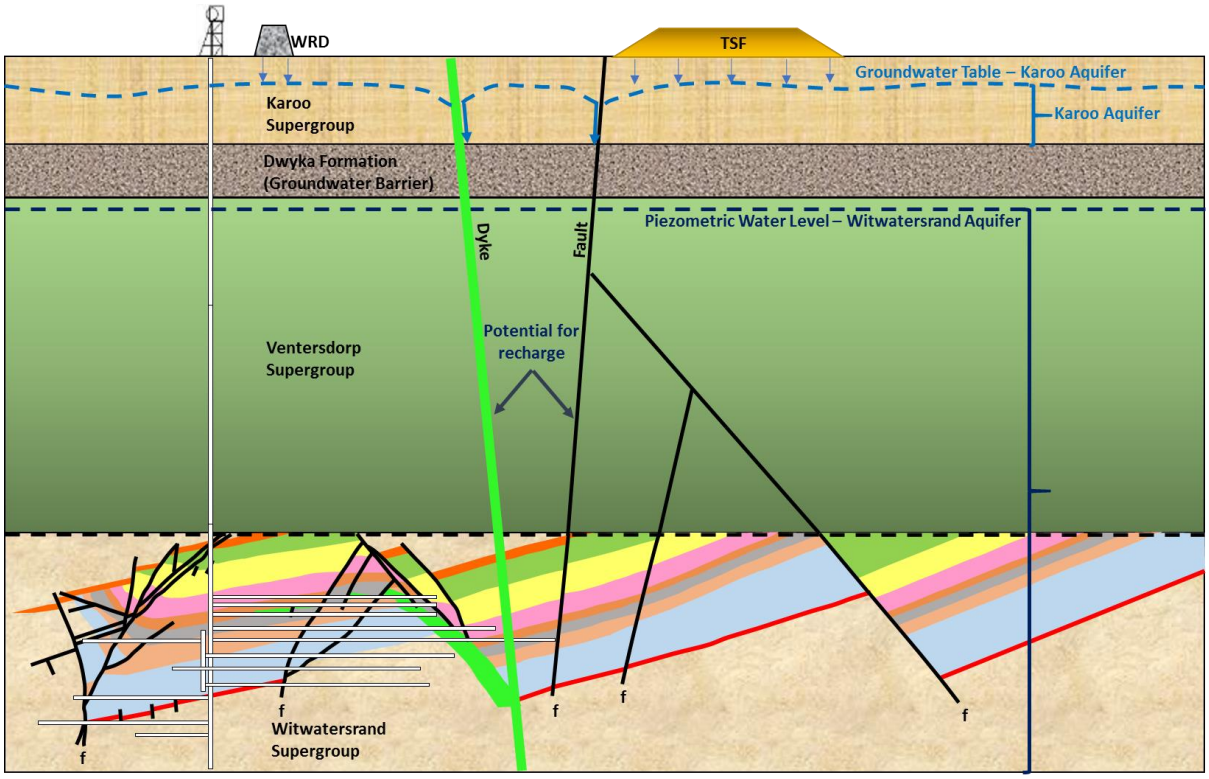

Figure 31: Graphical illustration of the aquifers in the study area (MvB Consulting, 2023)

6.12.3 GROUNDWATER USE

There are no large-scale groundwater supply boreholes within the immediate study area. Farmers are, however, reliant on boreholes for domestic use and stock watering. Windmills have traditionally been utilised in the area. There are no springs recorded. Percussion boreholes drilled through the Karoo established the following information (EMP, 2009):

- Number of Boreholes: 43
- Average Thickness of Karoo: 117m
- Percentage of boreholes intersecting dolerite in Karoo: 33%
- Average depth of dolerite from surface: 74m

The drilling indicated that groundwater occurrence is predominantly on the contact zones with dolerite intrusions and on the contact between the Karoo sediments and the Ventersdorp lavas. Measured yields vary from 0.10 litre per second (ℓ/sec) to 22 ℓ/sec.

6.12.4 AQUIFER PARAMETERS

The newly drilled boreholes were pump tested. Important parameters that can be obtained from borehole or test pumping include Hydraulic Conductivity (K), Transmissivity (T) and Storativity (S). These parameters are defined as follows (Krusemann and De Ridder, 1991):

- Hydraulic Conductivity: This is the volume of water that will move through a porous medium in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. It is normally expressed in metres per day (m/day).
- Transmissivity: This is the rate of flow under a unit hydraulic gradient through a cross-section of unit width over the full, saturated thickness of the aquifer. Transmissivity is the product of the average hydraulic conductivity and the saturated thickness of the aquifer. Transmissivity is expressed in metres squared per day (m2/day).
- Storativity: The storativity of a saturated confined aquifer is the volume of water released from storage per unit surface area of the aquifer per unit decline in the component of hydraulic head normal to that surface. Storativity is a dimensionless quantity.

Based on the information of the test pump information, the average transmissivity of the shallow aquifer is estimated at 0.050 m^2/day, while that of the deep aquifer is estimated at 5.391 m^2/day.

6.12.5 AQUIFER RECHARGE

Recharge is defined as the process by which water is added from outside to the zone of saturation of an aquifer, either directly into a formation, or indirectly by way of another formation. According to the Groundwater Assessment Phase II (GRAII) the recharge is approximately 4% of mean annual precipitation. Groundwater recharge (*R*) for the area is also calculated using the chloride method (Bredenkamp *et al.*, 1995) and is expressed as a percentage of the Mean Annual Precipitation (MAP). The method is based on the following equation:

$$R = \frac{Chloride\ concentration\ in\ rainfall}{Chloride\ concentration\ in\ ground\ water} x\ 100$$

The average rainfall in the area is approximately 540 mm/a. The average chloride in rainfall for areas inland is approximately 1.5 mg/l therefore according to the equation:

$$R = \frac{1{,}5}{94} x\ 100$$

where 94 mg/l is the chloride concentration in background boreholes. This implies that approximately 8.64 mm/annum of precipitation recharges the groundwater system which is lower than the GRAII values.

6.12.6 GROUNDWATER GRADIENTS AND FLOW

The first important aspect when evaluating the hydrogeological regime and groundwater flow mechanisms is the groundwater gradients. Groundwater gradients, taking into consideration fluid pressure, are used to determine the hydraulic head which is the driving force behind groundwater flow. The flow governs the migration of contaminants and a detailed assessment of the flow was required to determine subsurface flow directions from the TSF or any other potential contaminant source.

In most geological terrains, the groundwater mimics the topography and to test if this is the case within the study area the available groundwater levels were plotted against the topography (represented by the borehole collar elevations). This relationship is known as the Bayesian relationship, and where this exists, the regional topography can be used to interpolate (Bayesian interpolation) a regional groundwater gradient map. **Figure 32** depicts the groundwater level elevations, which as expected mimic the surface contours. Groundwater flow is perpendicular to the groundwater contours and flows predominantly towards the south-west.

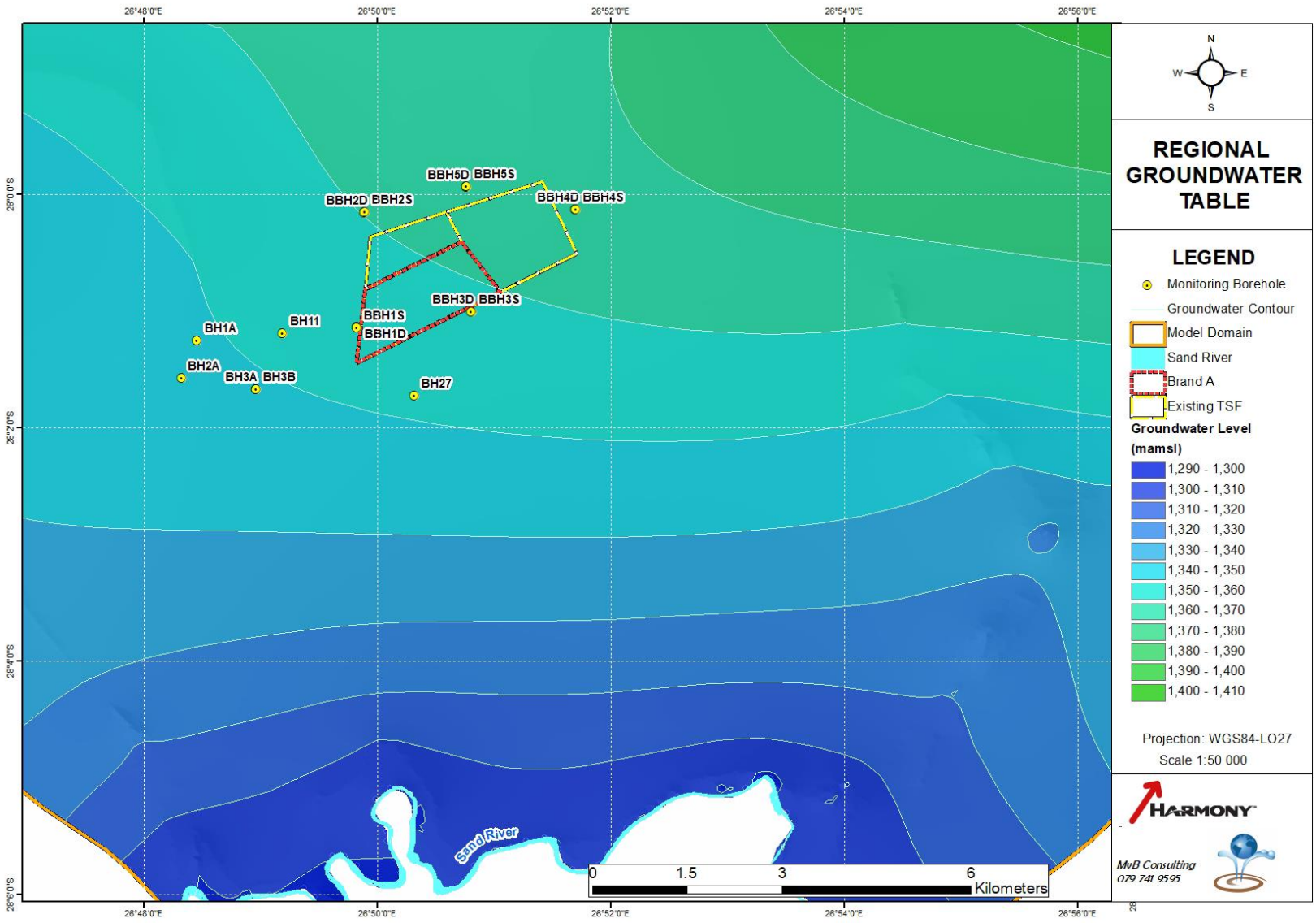

Figure 32: Regional groundwater gradient and borehole locations

6.12.7 GROUNDWATER QUALITY

The newly drilled boreholes were sampled, and the samples submitted to Waterlab (Pty) Ltd, a SANAS accredited laboratory. The mine monitoring boreholes are also included in the assessment. The groundwater chemistry is compared to the South African Water Quality Guidelines (second edition) Volume 5: Agricultural Use: Livestock Watering (Department of Water Affairs and Forestry, 1996), as well as the SANS 241 (2015). The **SANS 241 Drinking Water Specification** is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides guideline levels for a range of water quality characteristics. The SANS 241 (2015) Drinking-Water Specification effectively summarises the suitability of water for drinking water purposes for lifetime consumption.

The chemical concentrations are compared to the Guidelines for Livestock Watering. Where these guidelines are exceeded, the values are highlighted in red. In the absence of limits for livestock watering the chemical concentrations are compared to the SANS 241 (2015) Guidelines for Drinking Water.

There are no domestic groundwater users in the immediate vicinity of the Brand A TSF and the chemical concentrations are therefore primarily compared to the Livestock Watering Guidelines. Values that exceed these guidelines are highlighted in red. The Livestock Watering Guidelines are less stringent than the SANS Guidelines, but concentrations that exceed the SANS drinking water limits are also highlighted (blue).The chemistry of the groundwater is presented in **Table 26**. The following is observed:

- The groundwater in the Free State is generally saline and most of the boreholes have Electrical Conductivity (EC) and Total Dissolved Solids (TDS) concentrations that exceed the guideline limits. Very high TDS concentrations are recorded in borehole BH46. This borehole is situated very close to a stream indicating that spillage is occurring or has occurred into this stream. The high concentrations are not attributed to natural plume migration.
- The high salt concentrations are primarily attributed to chloride, sulphate and sodium.
- Borehole BH 11 is situated on a chicken farm and is the only borehole that is used for domestic and livestock watering. The water quality in this borehole is good and none of the parameters exceed any of the guidelines.
- The existing tailings facilities have impacted on the surrounding groundwater environment. The extent of this impact is best illustrated through the sulphate
- (SO_4) concentrations in the monitoring boreholes (**Figure 33**).
- There is no clear trend regarding the impact to the various aquifers. In some areas the weathered aquifer is more impacted and in other areas the fractured aquifer is more impacted. It is evident though that the two aquifers are mostly, or at least locally, separated.
- The boreholes to the north and east of the existing TSF have sulphate concentrations higher than expected. This may be due to spillages from TSF rather than through groundwater migration. The presence of a preferential flow path in this area can also not be excluded.
- Very high iron concentrations were measured in borehole BBH4S/D, but several metal concentrations are elevated in the monitoring boreholes close to the tailings facility.
- It is important to note that the entire region has been disturbed my mining and other activities and the poor-quality water cannot be only attributed to the Brand A tailings complex.

Table 26: Groundwater chemistry (MvB Consulting, 2023)

Parameter (mg/ℓ)	SANS 241	DWAF	BBH 1D	BBH 1S	BBH 2D	BBH 2S	BBH 3D	BBH 3S	BBH 4D	BBH 4S	BBH 5D	BBH 5S	BH 1A	BH 2A	BH 3A	BH 3B	BH 11	BH 27
Physical and aesthetic determinants																		
pH	<5 - >9.7	NG	7.2	6.8	6.9	7.1	7.2	7.1	7.2	7.1	7.5	7.2	8.0	7.6	8.3	6.1	7.8	7.9
EC mS/m	170	NG	333	827	587	341	434	297	506	380	488	315	622	601	470	654	139	411
TDS	1 200	1 000	2350	6494	4544	2284	3294	2178	4010	2790	3260	1982	4021	4025	2832	335O	900	2429
Total Alk	NG	NG	228	360	252	340	284	292	240	292	420	472	212	234	259	7	168	383
Chemical determinants — macro-determinants																		
Chloride	300	1 500	647	2191	1322	687	1049	698	1193	852	1096	538	1084	1131	949	1704	240	1054
Sulphate	500	1 000	665	1502	1524	483	647	250	1098	688	775	432	1418	1409	763	279	244	323
Fluoride	1.5	2	0.2	0.2	0.3	0.4	0.4	0.4	0.5	0.6	0.6	0.8	-	-	-	-	-	
Nitrate	11	100	<0.1	<0.1	<0.1	0.8	<0.1	2.9	0.6	0.4	0.1	2.5	0.9	0.6	4.6	68.9	2.5	2.8
Ortho Phosphate	1.5	NG	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
Ammonia	NG	NG	0.7	1.1	0.8	0.6	0.5	0.5	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-
Sodium	200	2 000	247	522	413	336	255	185	263	195	616	397	618	309	327	320	101	241
Potassium	NG	NG	10	44	28	31	30	37	49	43	13	11	23	22	23	38	13	38
Calcium	NG	1 000	320	879	563	229	438	243	513	356	212	112	511	742	462	460	128	402
Magnesium	NG	500	70	284	233	96	138	92	209	153	125	74	199	220	130	228	60	125
Zinc	5	20	1.140	0.510	0.126	0.127	1.150	0.337	0.181	0.247	0.251	0.785	<0.005	<0.005	<0.005	<0.005	0.059	2.411
Chemical determinants — micro-determinants																		
Aluminium	3	NG	6.560	8.900	0.219	4.910	0.148	7.000	16.000	27.00O	1.670	2.800	0.934	1.001	<0.005	0.888	<0.005	<0.005

Parameter (mg/ℓ)	SANS 241	DWAF	BBH 1D	BBH 1S	BBH 2D	BBH 2S	BBH 3D	BBH 3S	BBH 4D	BBH 4S	BBH 5D	BBH 5S	BH 1A	BH 2A	BH 3A	BH 3B	BH 11	BH 27
Arsenic	0.01	1	0.003	0.004	0.001	0.002	0.001	0.003	0.005	0.011	0.009	0.001	-	-	-	-	-	-
Barium	0.7	NG	0.177	0.244	0.084	0.189	0.160	0.261	0.193	0.177	0.120	0.086	-	0.438	0.152	-	0.081	-
Boron	2.4	5	0.330	0.176	0.212	0.268	0.147	0.169	0.207	0.131	0.539	0.428	-	0.019	0.036	-	0.094	-
Chromium	0.05	NG	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.030	<0.025	<0.025	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Cobalt	NG	1	0.226	0.227	0.227	0.185	0.198	0.142	0.190	0.169	<0.025	0.046	0.053	0.529	0.461	0.105	0.007	0.280
Copper	2	0.5	<0.010	0.011	<0.010	<0.010	<0.010	0.011	0.019	0.044	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	2	10	10.000	8.060	0.468	5.550	0.369	7.000	21.000	17.000	2.860	3.500	<0.009	<0.009	0.468	34.063	<0.009	0.281
Lead	0.01	0.1	0.072	0.023	0.001	0.116	0.009	0.030	0.153	0.058	1.130	0.042	0.107	0.069	<0.009	0.181	<0.009	<0.009
Manganese	0.4	10	0.526	1.430	0.027	0.760	1.160	0.926	1.740	6.480	0.838	0.379	2.592	<0.001	<0.001	1.283	0.001	0.014
Mercury	0.006	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	-	-	-	-	-	-
Nickel	0.07	1	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.047	<0.025	<0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	0.04	0.05	0.001	0.001	<0.001	0.002	0.001	0.001	0.001	0.001	0.003	0.005	-	-	-	-	-	-
Strontium	NG	NG	5.130	6.260	8.840	3.150	4.790	2.670	8.030	6.240	5.210	3.150	-	-	-	-	-	-
Uranium	0.03	NG	0.009	0.051	0.023	0.022	0.018	0.012	0.030	0.027	0.026	0.030	-	-	-	-	-	-

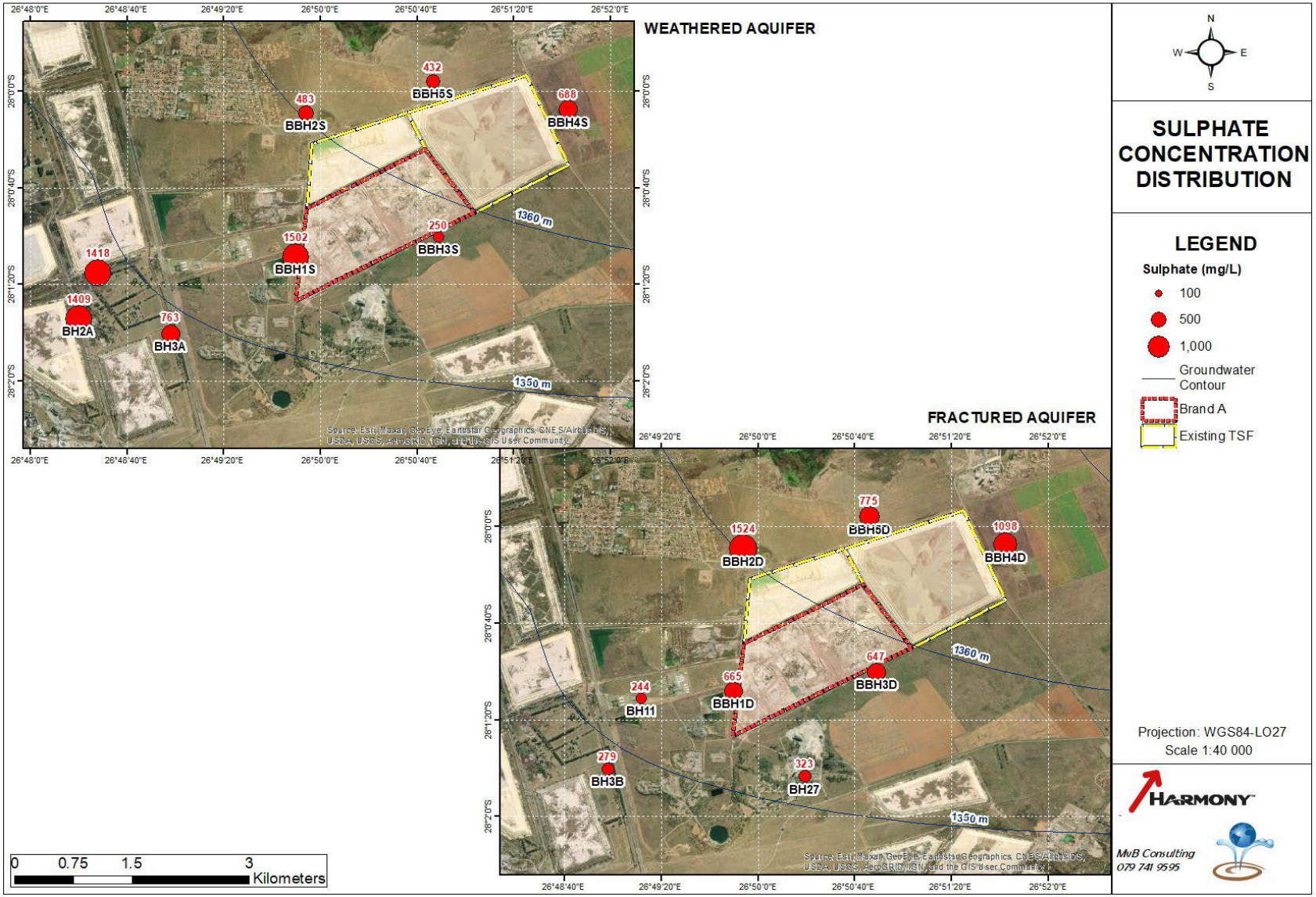

Figure 33: Sulphate concentration distribution in the groundwater monitoring boreholes (MvB Consulting, 2023)

The Piper diagram is one of the most commonly used techniques to interpret groundwater chemistry data. This method proposed the plotting of cations and anions on adjacent trilinear fields with these points then being extrapolated to a central diamond field. Here the chemical character of water, in relation to its environment, could be observed and changes in the quality interpreted. The cation and anion plotting points are derived by computing the percentage equivalents for the main diagnostic cations of Ca, Mg and Na, and anions Cl, SO_4 and HCO_3.

Different waters from different environments always plot in diagnostic areas. The upper half of the diamond normally contains water of static and disordinate regimes, while the middle area normally indicates an area of dissolution and mixing. The lower triangle of this diamond shape indicates an area of dynamic and co-ordinated regimes. Sodium chloride brines normally plot on the right hand corner of the diamond shape while recently recharge water plots on the left-hand corner of the diamond plot. The top corner normally indicates water contaminated with gypsum (mine impact). In general the top half of the diamond contains static waters and other unusual waters high in Mg/Ca Cl2 and Ca/Mg SO_4. The lower half contains those waters normally found in a dynamic basin environment. The values for mixtures of any two waters in any proportion plot along a line joining their respective points in each of these diagrams. Water therefore being invaded by an industrial effluent will plot a vector towards the analysis of the invading fluid. The Piper diagram for the Brand A TSF region is shown as **Figure 34**. Most of the samples plot between the Ca-SO_4 and Na-Cl type water. This is a mixture between the typical saline water in the Karoo aquifer and mining impact.

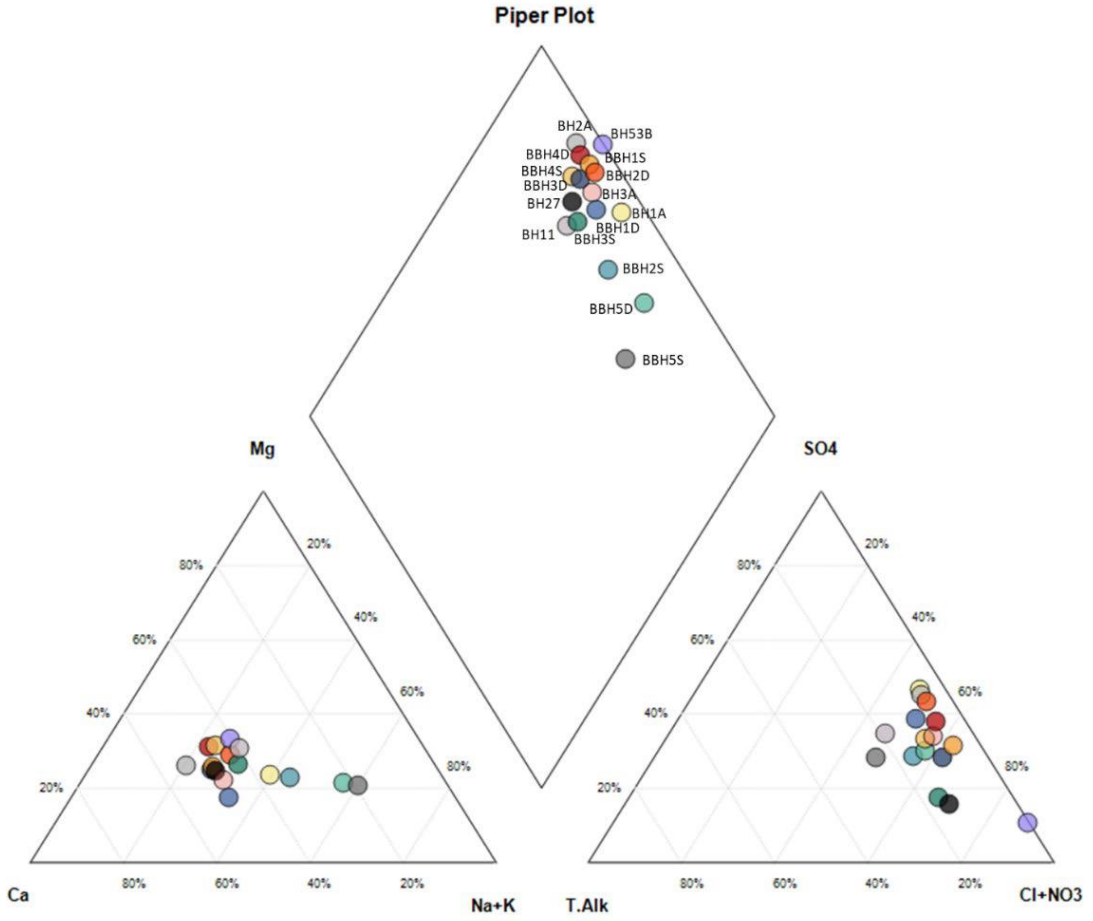

Figure 34: Piper diagram for the Brand A TSF region (MvB Consulting, 2023)

6.12.8 AQUIFER CLASSIFICATION

An aquifer classification system provides a framework and objective basis for identifying and setting appropriate levels of groundwater resource protection. This would facilitate the adoption of a policy of differentiated groundwater protection.

The aquifer classification system used to classify the aquifers is the proposed National Aquifer Classification System of Parsons (1995). This system has a certain amount of flexibility and can be linked to second classifications such as a vulnerability or usage classification. Parsons suggests that aquifer classification forms a very useful planning tool that can be used to guide the management of groundwater issues. He also suggests that some level of flexibility should be incorporated when using such a classification system.

The South African Aquifer System Management Classification is presented by five major classes:

- Sole Source Aquifer System;
- Major Aquifer System;
- Minor Aquifer System;
- Non-Aquifer System; and
- Special Aquifer System.

The following definitions apply to the aquifer classification system:

- Sole source aquifer system: “An aquifer that is used to supply 50 % or more of domestic water for a given area, and for which there are no reasonable alternative sources should the aquifer become depleted or impacted upon. Aquifer yields and natural water quality are immaterial”.
- Major aquifer system: “Highly permeable formations, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good”.
- Minor aquifer system: “These can be fractured or potentially fractured rocks that do not have a high primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although this aquifer seldom produces large quantities of water, they are both important for local supplies and in supplying base flow for rivers”.
- Non-aquifer system: “These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks does occur, although imperceptible, and needs to be considered when assessing risk associated with persistent pollutants”.
- Special aquifer system: “An aquifer designated as such by the Minister of Water Affairs, after due process”.

After rating the aquifer system management and the aquifer vulnerability, the points are multiplied to obtain a Groundwater Quality Management (GQM) index. The aquifers in the study area are classified as follows:

Table 27: Aquifer Classification (MvB Consulting, 2023)

Description	Aquifer	Vulnerability	Rating	Protection
Weathered Aquifer	Minor (2)	2	4	Medium
Fractured Aquifer	Minor (2)	1	2	Low

6.13 AIR QUALITY

Air quality sensitive receptors (AQSRs) refer to places where humans reside. Ambient air quality guidelines and standards, as discussed under **Section 3.1.10**, have been developed to protect human health. Ambient air quality, in contrast to occupation exposure, pertains to areas outside of an industrial site or boundary where the public has access to and according to the Air Quality Act, excludes air regulated by the Occupational Health and Safety Act (Act No 85 of 1993). Air quality sensitive receptors within the Project boundary include residential areas, farmsteads, schools and hospitals. The closest towns in the immediate region of the project include Virginia, Saaiplaas, Bronville and Welkom.

The wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds in between 4 and 5 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e., periods during which the wind speed was below 1 m/s are also indicated. The period wind field and diurnal variability in the wind field are shown in **Figure 35**, while the seasonal variations are shown in **Figure 36**.

During the 2019 to 2021 period, the wind field was dominated by winds from the north-northeast and northeast, followed by northerly and easterly winds. During the day (6AM – 6PM), the prevailing wind field is from the north to northeast and the west, with less frequent winds from the north-westerly sector, the easterly sector and the south-west. During the night, the wind field shifts to the easterly sector (north-northeast to east-southeast), with very little flow from the westerly sector. Long-term air quality impacts are therefore expected to be the most significant to the south and southwest of the project area. The strongest winds (more than 6 m/s) were also from the north and northeast and occurred mostly during the day, with 15 m/s the highest wind speed recorded. The average wind speed over the three years is 3.7 m/s, with calm conditions occurring for 3.5% of the time (**Figure 35**).

Seasonally, the wind flow pattern conforms to the period average wind flow pattern. The seasonal wind field shows little seasonal differences in the wind fields. During summer and spring, the dominant winds are from the north-northeast to east, with more frequent westerly winds during spring. Autumn reflects dominant north-easterly and easterly winds, with a similar wind field during winter, but with more frequent north-northeasterly and east-southeasterly winds.

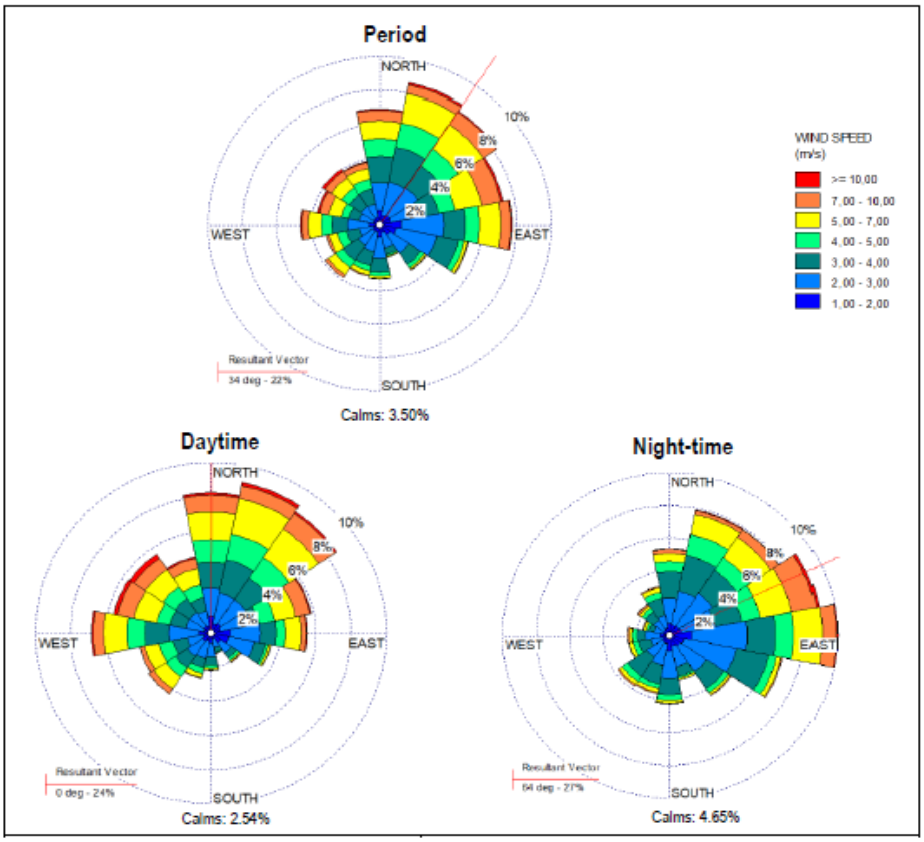

Figure 35: Period, day- and night-time wind roses (SAWS Welkom Data, 2019 to 2021)

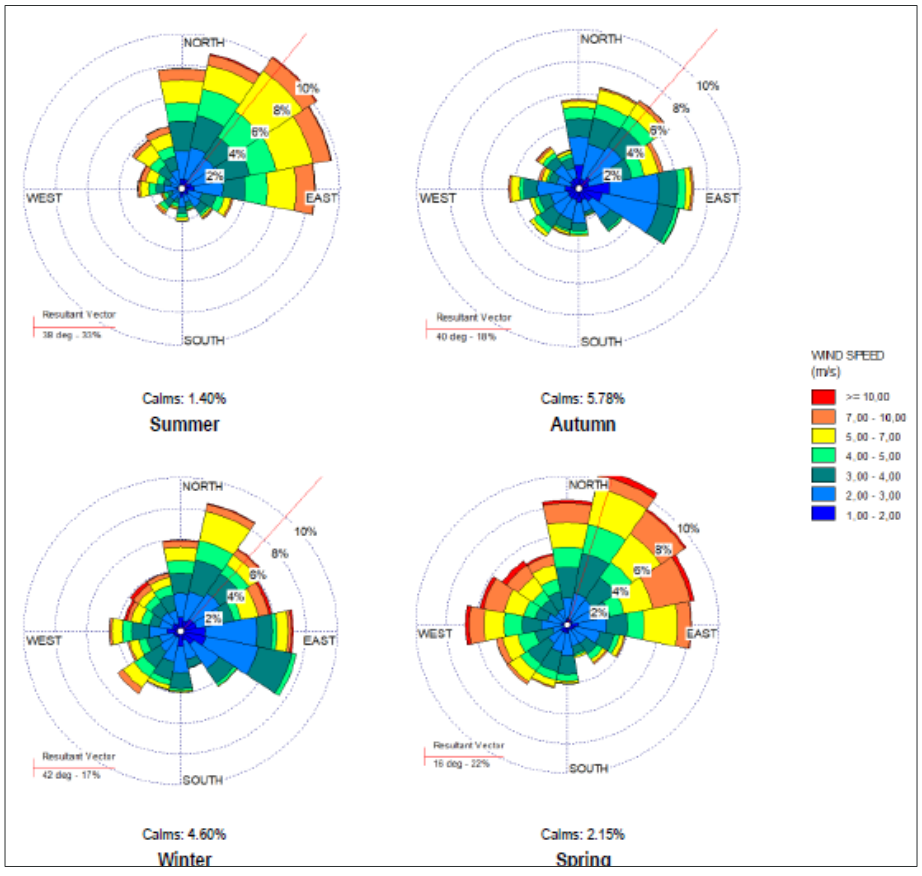

Figure 36: Seasonal wind roses (SAWS Welkom Data, 2019 to 2021)

According to the Beaufort wind force scale (https://www.metoffice.gov.uk/guide/weather/marine/beaufort-scale), wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 9-11 m/s referred to as a fresh breeze. Wind speeds between 11-14 m/s are described as a strong breeze with winds between 14-17 m/s near gale force winds and 17-21 m/s as gale force winds. Over the 3-year period, wind speeds within 14-17 m/s occurred for 0.03% of the time, and winds between 11-14 m/s for 0.46%. The likelihood for wind erosion to occur from open and exposed surfaces, with loose fine material, but taking into account that the TSF surfaces are typically crusted, was estimated when the wind speed exceeds 9 m/s (Mian & Yanful, 2003). Wind speeds exceeding 9 m/s occurred for 2.27% over the 3-year period.

6.14 VISUAL RECEPTORS

The visual receptors identifies receptor locations where people would most likely be susceptible to negative changes in the landscape caused by the physical presence of the Project. The main areas of concern might be:

- Farmsteads associated with rural development to the east and southeast of the Project site;
- Residential areas north and south of the development site (Saaiplaas and Bronville); and
- Travellers along the R730 arterial route.

Most of the study area's scenic quality can be considered moderate to low within the context of the sub-region, and sensitive viewing areas and landscape types identified and mapped indicating potential sensitivity to the project, specifically from farmsteads and people travelling along arterial roads west of the site. The site is in a landscape type rated as moderate to low. People living and passing through these locations will experience some negative change and loss of the baseline landscape aesthetic due to the scale and extent of the TSF. Also, due to the low Visual Absorption Capacity (VAC) of the western and southern sections of the study area, sensitive views to the development would often be open and unobstructed (i.e. the TSF would dominate the view). These negative changes would occur over an extended time frame i.e., over the life of the mine and beyond as the TSF would remain as a residual structure in the landscape and represent the worst case scenario. A visual impact assessment will be undertaken during the EIA Phase and will be discussed in the EIR.

7 ENVIRONMENTAL IMPACT ASSESSMENT

This section aims to identify and do a preliminary assessment on the potential environmental impacts associated with the proposed Brand A TSF. This impact assessment will be used to guide the identification and selection of preferred alternatives, and management and mitigation measures, applicable to the proposed activities. The preliminary assessment will also serve to focus the subsequent EIA phase on the key issues and impacts.

7.1 IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

7.1.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$\boldsymbol{C = \frac{(E + D + M + R) * N}{4}}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 28** below.

Table 28: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),

Aspect	Score	Definition
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per **Table 29**.

Table 29: Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 30: Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Probability				

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 31**.

Table 31: Significance Classes

Environmental Risk Score	
Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk).
≥9 - <17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

7.1.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 32: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.

	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 32. The impact priority is therefore determined as follows:

Priority = CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 1.5 (Refer to **Table 33**).

Table 33: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
2	Low	**1**
3	Medium	**1.125**
4	Medium	**1.25**
5	Medium	**1.375**
6	High	**1.5**

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 34: Final Environmental Significance Rating

Significance Rating	Description
<-17	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
≥-17, ≤-9	Medium negative (i.e. where the impact could influence the decision to develop in the area).
>-9, < 0	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact

Significance Rating	Description
>0, <9	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥9, ≤17	Medium positive (i.e. where the impact could influence the decision to develop in the area).
>17	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

7.2 IMPACTS IDENTIFIED

This Section presents the potential impacts that have been identified during the scoping phase assessment. It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final Scoping report submitted to the CA for adjudication. The results of the public consultation will be used to update the identified potential impacts which will be further refined during the course of the EIA assessment and consultation process.

Potential environmental impacts were identified during the scoping process. These impacts were identified by the EAP, the appointed specialists, as well as the public. **Table 35** provides the list of potential impacts identified.

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested which will be updated during the detailed EIA level investigation.

When considering cumulative impacts, it is important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, such as regional deterioration of air quality, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on a regional scale are related to the transportation vectors that they act upon. For example, air movement patterns result in localised air quality impacts having a cumulative effect on air quality in the region. Similarly, water acts as a vector for distribution of impacts such as contamination across a much wider area than the localised extent of the impacts source. At a finer scale, there are also impacts that have the potential to result in a cumulative effect, although due to the smaller scale at which these operate, the significance of the cumulative impact is lower in the broader context.

Table 35: Identified environmental impacts

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
Site preparation (Planning)	Vegetation clearance for pipelines and access roads Planned placement of infrastructure Topsoil stripping for pipelines and access roads		○ Temporary disturbance of wildlife		○ Disturbance/ destruction of archaeological sites or historic structures (if any)
Human resources management (Planning)	Employment/recruitment I&AP consultations Environmental awareness training HIV/AIDS Awareness programmes Integration with Municipalities' strategic long-term planning			○ Employment opportunities.	
Earthworks (Construction)	Stripping and stockpiling of soils Levelling, grubbing and bulldozing Removal of waste and cleared vegetation Preparing trenches and foundations Establishing storm water management measures Establishment of firebreak	○ Erosion due to storm water runoff ○ Impact due to topsoil stripping ○ Surface water contamination ○ Loss of fertility ○ Loss of flow paths ○ Emissions and dust ○ Impacts on wetlands	○ Loss/ destruction of natural habitat ○ Introduction/ Invasion by Alien Species ○ Displacement of faunal species	○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.). ○ Safety and security (i.e., access to properties, theft, fire hazards, etc.). ○ Impact on existing infrastructure (i.e., roads, fences, etc.) ○ Perceptions and expectations ○ Employment opportunities	○ Disturbance/ destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils
Civil Works (Construction)	Establishment of infrastructure and services Mixing of concrete and concrete works Establishment of dewatering pipelines Sewage and sanitation Establishment of waste area Access control and security General site management	○ Erosion due to storm water runoff ○ Impact due to topsoil stripping ○ Surface water contamination ○ Loss of fertility ○ Loss of flow paths ○ Emissions and dust ○ Impacts on wetlands	○ Loss/ destruction of natural habitat ○ Introduction/ Invasion by Alien Species ○ Displacement of faunal species	○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.). ○ Safety and security (i.e., access to properties, theft, fire hazards, etc.).	○ Disturbance/ destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils

Main Activity / Action / Process	Ancillary Activity	Geo-physical (geology, topography, air, water)	Biological	Socio-economic	Heritage and cultural
				○ Impact on existing infrastructure (i.e., roads, fences, etc.) ○ Perceptions and expectations ○ Employment opportunities	
Deposition at TSF (Operation)	Deposition of tailings Maintenance and management of stormwater system Water management	○ Subsidence effects ○ Impacts on surface and/or groundwater quality due to leachate ○ Loss of fertility ○ Loss of flow paths ○ Emissions and dust		○ Visual impact and impact on sense of place ○ Nuisance and impact on sense of place (i.e., noise, dust, etc.). ○ Safety aspects related to radiation and health as well as stability.	
Closure and Rehabilitation of TSF (Decommissioning and Closure)	Revegetation Slope stabilisation Erosion control	○ Emissions and dust	○ Alien and invasive species	○ Safety and security (i.e., access to properties, theft, fire hazards, etc.). ○ Perceptions and expectations ○ Visual and dust	
Maintenance (Post closure)	Initiate maintenance and aftercare program Environmental aspect monitoring	○ Surface and groundwater quality	○ Alien and invasive species	○ Visual ○ Site security and access control	

7.3 DESCRIPTION AND PRELIMINARY ASSESSMENT OF IMPACTS

The following potential impacts were identified during the scoping phase assessment and were assessed in terms of nature, significance, consequence, extent, duration and probability. These preliminary impact calculations will be subject to amendment based on the EIA phase assessment and the results of public consultation undertaken during the Scoping as well as EIA phases. **Table 36** provides a description of each impact with preliminary mitigation measures and an indication of which impacts are to be assessed in greater detail in the EIA phase assessment. Preliminary mitigation / management measures to minimise potential negative impacts or enhance potential benefits are put forward in this Scoping Report and will be adjusted where relevant during the EIA phase once detailed specialist assessments are concluded and input from the public has been considered.

Table 36: Preliminary impact assessment

#	Impact	Phase	Pre-mitigation Environmental Risk	Post-mitigation Environmental Risk	Description and Preliminary Mitigation	Further Assessment
1	Disturbance / destruction of sites of heritage significance	Construction	-7,5	-2,25	The site is currently rated as having medium-low cultural heritage and palaeontology significance. Known heritage features must be marked as no-go areas as far as possible. Known features to be impacted upon must first be authorized through a permit. If unearthed, under no circumstances shall any heritage, archaeological or paleontological artefact/ feature be removed, destroyed or interfered with by anyone on the site, unless such removal has been authorised by the heritage authorities. Chance Find Protocol shall be implemented for the project. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts as set out in the NHRA (Act No 25 of 1999) Section 51 (1)	Detailed Heritage Impact Assessment and Detailed Palaeontology Impact Assessment & EIA Phase impact assessment
2	Disturbance / destruction of palaeontological resources	Construction	-7,5	-2,5		
3	Destruction, loss and fragmentation of the vegetation community	Construction	-10	-6	Existing vegetation within the proposed development footprint will need to be cleared. Since the proposed development site is situated directly adjacent to existing mining infrastructure, no fragmentation of vegetation communities is likely to occur. Mitigation could include avoidance of sensitive areas, preconstruction survey for SCC and to limit disturbance as far as possible. A detailed biodiversity assessment will be undertaken for the EIA phase.	Terrestrial Biodiversity Impact Assessment & EIA Phase impact assessment
4	Introduction or spread of alien plant species	Construction	-7	-4,5	The proposed development footprint currently contains significant alien species. These will need to be controlled to ensure that they do not spread into the surrounding areas. Care must be taken to prevent alien and invasive species from establishing. A detailed biodiversity assessment will be undertaken for the EIA phase. An Alien Invasive Species Management Plan should be complied for the project.	Terrestrial Biodiversity Impact Assessment & EIA Phase impact assessment
		Operation	-5,25	-3		
		Rehab and closure	-3,25	-3		
5	Erosion due to stormwater runoff	Operation	-4,5	-4	Erosion of the side slopes is likely unless specific measures are implemented to reduce erosion. Furthermore, the rainfall runoff from the TSF must be contained in a dirty water system to prevent any contaminants from entering the natural environment. A soils assessment is being undertaken as part of the EIA phase. Stormwater Management Plan should be a suitable control measure for stormwater.	EIA Phase impact assessment
6	Mortality / disturbance of wildlife due to increased human presence and use of machinery and vehicles.	Construction	-14	-11	Even though the development footprint is surrounded by existing mine infrastructure fauna is still likely to occur. The area must be walked though prior to construction to ensure no faunal species remain in the habitat and	EIA Phase impact assessment

#	Impact	Phase	Pre-mitigation Environmental Risk	Post-mitigation Environmental Risk	Description and Preliminary Mitigation	Further Assessment
					get killed. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated. Clearing of the area must be done in a systematic manner, moving from one end to the other to allowing resident fauna to move off. A detailed biodiversity assessment will be undertaken for the EIA phase.	
7	Soils and Agricultural Potential Impacts	Construction	-8,25	-5,5	Loss of land capability will occur during construction however the area is already surrounded by existing mine infrastructure. Avoidance of spills and leaks will be an important part of mitigation. Avoidance of spills and leaks will be an important part of mitigation in this regard. Appropriate noise control measures will be included in the EMPr to reduce soils and agricultural impacts from activities at the TSF.	Environmental Management Programme
		Operation	-6	-5		
8	Wetlands Impacts	Construction	-17,5	-9	There are several wetlands on the TSF site and in close proximity to the TSF site. The most notable impact is the potential loss or damage to some water resources, the delineated wetlands in particular. A detailed wetland assessment will be undertaken for the EIA phase. There is limited mitigation available for the loss of wetlands.	EIA Phase impact assessment
9	Aquatic Biodiversity Impacts	Construction	-13	-6,75	There are several wetlands in close proximity to the TSF site. Damage to aquatic ecosystems and wetland habitats is a potential impact. A detailed aquatic assessment will be undertaken for the EIA phase.	EIA Phase impact assessment
10	Health impacts	Operation	-11,25	-6,75	Potential health and safety impacts include radiation from the TSF on potential receptors of radiation exposure. A detailed health and radiological assessment will be undertaken for the EIA phase.	EIA Phase impact assessment
		Rehab and closure	-11,25	-6,5		
11	Noise	Construction	-2,25	-2,25	Noise generation from construction and operation of the TSF will be confined to the development footprint. The construction and operation of the new TSF is not likely to significantly increase noise levels on any receptors as there are no sensitive receptors in close proximity to the site. Appropriate noise control measures will be included in the EMPr to reduce noise generated from activities at the TSF.	Environmental Management Programme
		Operation	-2,5	-2,5		
12	Surface water quality	Construction	-9,75	-6,75	Stormwater runoff from the TSF has the potential to contaminate surrounding surface water features if not adequately contained.	Stormwater management plan will form part of EMPr
		Operation	-11,25	-7,5		
		Rehab and closure	-11,25	-7,5		
13	Groundwater quality	Operation	-11,25	-10,5	The proposed TSF has the potential to contaminate groundwater unless suitable measures are implemented to prevent and/or contain runoff and infiltration. The TSF barrier system will be determined in consultation with the authorities and will be in compliance with relevant norms and standards	EIA Phase impact assessment
		Rehab and closure	-11,25	-10,5		

#	Impact	Phase	Pre-mitigation Environmental Risk	Post-mitigation Environmental Risk	Description and Preliminary Mitigation	Further Assessment
					for determination of liner requirements in terms of the NEM:WA (GN R. 636).	
14	Air quality	Construction	-12	-8	The proposed TSF could have a significant incremental impact on the surrounding environment and human health during the operational phase. A detailed air quality impact assessment will be undertaken during the EIA phase to quantify the incremental and cumulative impacts of the proposed TSF. Air quality management and monitoring will be important.	EIA Phase impact assessment
		Operation	-16,25	-14		
		Decommissioning	-12	-8		
		Rehab and closure	-12	-8		
15	Visual - Change of Landscape Character	Construction	-6,5	-5,5	In a relatively flat landscape, the scale and nature of the TSF will be impossible to screen however the site is already surrounded by other TSFs. The desktop visual assessment will be re-evaluated during the EIA phase to confirm the initial assessment and suggest appropriate mitigation measures. Preliminary mitigation includes landscaping, good housekeeping, management of lighting impact and planning to reduce visual impacts as far as possible.	EIA Phase impact assessment
		Operation	-11,5	-7.5		
		Decommissioning	-6,5	-5,5		
16	Visual - Impact on Urban Edge, Adjacent Roads and towns	Construction	-6,5	-5,5		
		Operation	-11,25	-7.75		
		Decommissioning	-6,5	-5,5		
17	Employment opportunities	Planning	5,25	6	As the proposed TSF forms part of an existing mining operation, the potential for new job creation is limited. Some jobs will be created during construction. The majority of the employment opportunities are related to the future ongoing operation of the Harmony One Plant which requires additional deposition space in order to continue operations.	EIA Phase impact assessment.
		Construction	6	6,75		
		Operation	9	9,75		
		Decommissioning	6	6,75		
		Rehab and closure	6	6,75		
18	Expectations regarding creation of opportunities	Planning	-6	-5,25	Harmony must put a communication strategy in place that will communicate in an open and honest way on the kind of jobs that will be created, who will qualify and how the recruitment process will work. Heavy vehicles should travel during off peak times and should be clearly marked. Relevant mitigation proposed in the biophysical studies should be adhered to. Surrounding communities should be educated regarding the risk of TSF failure. A community safety strategy with regard to TSF failure should be developed and shared with the community. Develop & implement an Influx Management Strategy as per IFC Guidelines. Contractors should be required to make use of a certain proportion of local labour as far as possible. Jobs should be advertised in a way that is accessible to all members of society. Preference should be given to local labour that is within easy travelling distance from the site of work. If necessary, skills development programmes should be put in place to develop local skills.	
19	Impacts of traffic on people – dust, noise, safety – from a social and nuisance perspective	Operation	-6	-5,25		
20	Negative perceptions relating to the risk of TSF failure.	Operation	-6	-5,25		
21	Impacts on livelihoods of landowners.	Operation	-6	-5,25		
22	Influx of people	Construction	-6	-5,25		

8 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. The sensitivity mapping technique integrates numerous datasets (basemaps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software and analysis tools. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialists input within each respective field based on aerial or ground-surveys. Therefore, the sensitivity mapping exercise assists in the identification of low, medium and highly sensitive areas within the study area, towards selecting the preferred location, design and layout, and process or technology alternatives for the proposed activities and infrastructure.

This sensitivity mapping approach allows for the proposed activities to be undertaken whilst protecting identified sensitive environmental areas / features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. **Table 37** below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect. **Figure 37** presents the preliminary combined sensitivity map for the project. These areas and sensitivities will be further refined in the EIA phase once further detailed assessments are completed. This map will be updated for the EIA phase of the project once detailed specialist studies are completed.

Table 37: Sensitivity rating and weighting

Sensitivity Rating	Description	Weighting
Least concern	The inherent feature status and sensitivity is already degraded or contain no inherent sensitivities. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement.	-1
Low/Poor	The proposed development will not have a significant effect on the inherent feature status and sensitivity.	0
Medium	The proposed development will moderately negatively influence the current status of the feature.	1
High	The proposed development will have a significantly negative influence on the current status of the feature.	2
Very High	The proposed development will have a very high significant negative influence on the current status of the feature.	3

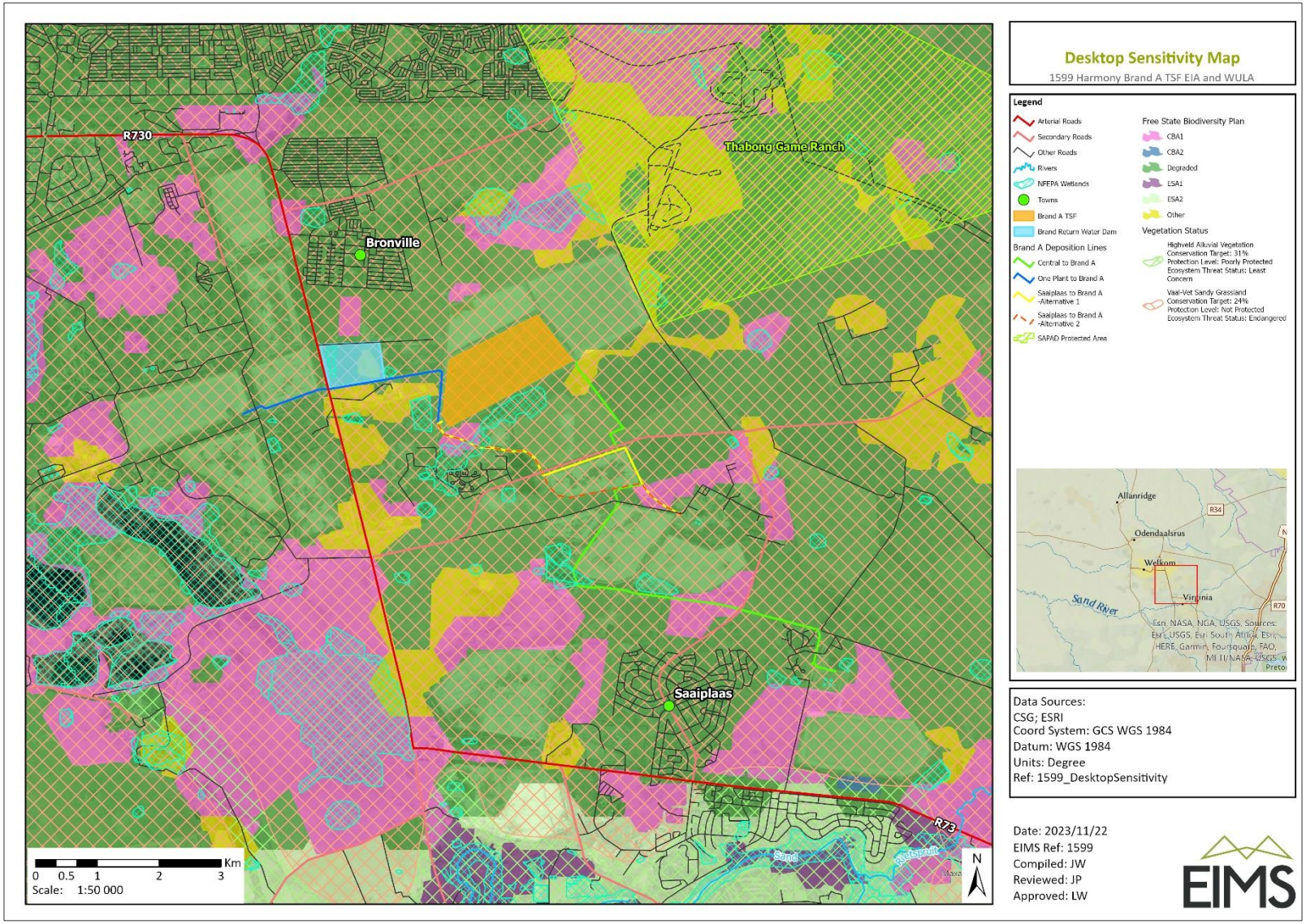

Figure 37: Combined scoping sensitivity map

9 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

The section below outlines the proposed plan of study which will be conducted for the various environmental aspects during the EIA Phase. It is also important to note that the plan of study will also be guided by comment obtained from I&AP's and other stakeholders during the PPP.

9.1 DESCRIPTION OF ALTERNATIVES TO BE CONSIDERED IN EIA PHASE

Owing to the nature of the proposed TSF there are limited reasonable or feasible alternatives that can be considered as per the motivation provided in **Section 4**. The EIA process being undertaken includes the assessment of potential impacts and the identification of environmental sensitivities within and in the vicinity of the proposed project area thereby allowing for the recommendation of mitigation measures towards the avoidance, minimisation and / or management of the anticipated impacts. The layout and design will be planned to avoid any no-go areas identified from the various specialist studies, if required, and the design, including the height and slope of the TSF, will cater for the volume of tailings required; otherwise apart from the design requirements no additional alternatives are considered applicable to this application.

9.2 DESCRIPTION OF THE ASPECTS TO BE ASSESSED AS PART OF THE EIA PROCESS

The following aspects will be assessed further during the EIA phase investigation to be undertaken:

- Soils and Agricultural Impact Assessment;
- Visual Impact Assessment;
- Air Quality Assessment;
- Groundwater Assessment;
- Terrestrial Biodiversity Assessment;
- Health Risk and Radiological Impact Assessment;
- Aquatics and Wetland Assessment;
- Socio-economic Impact Assessment;
- Climate Change Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment; and
- Closure and Rehabilitation Plan.

No aspect will be disregarded at scoping:

9.3 ASPECTS TO BE ASSESSED BY SPECIALISTS

Table 38 below details the various aspects of the project to be addressed in the EIA phase through detailed specialist studies.

Table 38: Details of specialist input during the EIA phase

Aspect	Component	Scope of Work / Terms of Reference
Soils and Agriculture	Soils and Agriculture	The following will be undertaken as part of the EIA phase study: • Land use identification using aerial imagery and ground-truthing; • Confirmation of "Low" and "High" sensitivities • Identifying the effects that the proposed activities will have on agricultural production in the area; • Outline potential mitigation measures to be included in the EMPr.; and • Compilation of a comprehensive report.
Air quality	Air Quality Impact Assessment	The following will be undertaken as part of the EIA phase study: • Emissions Inventory (tailings wind erosion only); • Dispersion Modelling; • Inhalation Health Risk Screening, Compliance Assessment and information for radiological study; • Mitigation and management measures; and • Compilation of a comprehensive report
Visual	Visual Impact Assessment	The following will be undertaken as part of the EIA phase study: • Site visit; • Baseline Mapping; • Viewshed and Building of Computer Model; and • Compilating of an impact assessment report.
Biodiversity (Terrestrial)	Terrestrial Biodiversity Assessment	The surveys will include the following: • A survey for Red and Orange Data plant species; • Vegetation units will be identified, classified and delineated; and

Aspect	Component	Scope of Work / Terms of Reference
		• Habitat types will be classified and delineated. The floristic survey should be conducted during the growing season (the rainy season when most plants are in flower or seeding), over the project areas. These will give an indication of the actual species present on site and will be discussed in context of plant communities (should the area support distinct communities) within the ecosystem of the area. Protected, endemic, exotic, alien invasive and culturally significant species will also be discussed as separate issues and related back to relevant legal requirements. Furthermore, the identification of red data and protected species as listed according to the IUCN List, NEMBA and other Provincial and National legislation will be completed. Depending on the vegetation and terrain, the timed meander sampling could be used during vegetation assessments, however, should dominant vegetation types require other methods be used, then these shall be motivated. The surveys will include the following: • The identification of these features and delineation thereof; and • The location of any unique or protected habitat features. All sensitive areas, as described by the provincial and national legislation, will be identified. The locality and extent, as well as species composition of sensitive areas such as the wetlands or pans, streams, rivers and rocky outcrops will be conducted to identify and map all such sensitive areas present. Sensitive areas will be identified and delineated. An additional survey for potential SCC is to be undertaken in summer season to determine if additional sites are present.. Based on the findings from this survey mitigation measures will be proposed to address this concern. This will include members from The Biodiversity Company and the Endangered Wildlife Trust. A terrestrial ecology assessment report will be written. This report will be compiled according to the necessary requirements and standards.
Biodiversity (Aquatic) and wetlands	Aquatic and Wetland Biodiversity Assessment	The areas will be traversed on foot to identify local freshwater resources. The following will be achieved to supplement the approach: • A desktop assessment of all available datasets; • GIS processing to preliminary identify water accumulation areas; and • The delineation of water resources in accordance with the DWAF (2005) guidelines, whereby the outer edges will be identified. • A functional and integrity assessment of the water resources.

Aspect	Component	Scope of Work / Terms of Reference
		The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, *et al*., 2014) will be used to determine the appropriate buffer zone for the proposed activity. The risk assessment will be completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016). An aquatics and wetlands assessment report will be written. This report will be compiled according to the necessary requirements and standards.
Heritage	Heritage Impact Assessment	The following is included in the HIA for the EIA phase of the project: • Desktop Study An archaeological and historical desktop study will be undertaken by utilising the previous studies conducted. This will be augmented by an assessment of old topomaps and previous archaeological and heritage impact assessments undertaken for the study area and surroundings. • Fieldwork: An experienced fieldwork team from will undertake an archaeological and heritage site survey to identify the heritage resources within the study area. Tracklogs will be recorded and the locations of all heritage resources identified during the fieldwork will be documented using a hand-held GPS. Furthermore, the documentation will reflect a brief qualitative description and statement of significance for each site and includes a photographic record of all the sites. • Report: A Heritage Impact Assessment will be written. This report will be compiled according to the necessary requirements and standards.
Palaeontology	Palaeontology Impact Assessment	The following is included in the PIA for the EIA phase of the project: • A PIA desktop study will be undertaken by utilising available data. • A site survey will be undertaken. • A Palaeontological Impact Assessment will be compiled according to the necessary requirements and standards.
Geohydrology	Geohydrological Assessment	The aim of the geohydrological study is to assess the following: • Assessment of the geohydrological environment in terms of aquifer development, aquifer hydraulics, groundwater flow and groundwater chemistry. • Assessment of the potential short and long-term impact from the TSF on the groundwater environment. • Recommended management measures to mitigate potential impacts.

Aspect	Component	Scope of Work / Terms of Reference
		The study will include the following: • Desktop study of existing information. Conceptual model of the groundwater system. • Numerical groundwater flow and mass transport model. • Risk assessment and reporting.
Hydrology	Hydrological Assessment	• A 2D approach to hydraulic modelling will be utilised to maximise the benefit to flood modelling, with regards to the available terrain data. • The relevant floods event will be modelled to produce respective flood-lines for the current (baseline) scenario only. • A potential deliverable of a rain-on-grid model which considers the accumulation of surface water (and thereby demonstrates surface water flooding and not only river (fluvial) flooding is included as an optional extra. This result would assist in planning the design of berms to divert clean water around the facility. It will also identify preferential flow paths that are not defined by the 1:50,000 topographical river. This deliverable is recommended given the environmental significance of the proposed TSF. HEC-RAS 6.3.1 is expected to be used for this study. A specialist surface water reports to inform and contribute towards the application in terms of NEMA will be produced. This report will meet the requirements of Appendix 6 of GN.R982 (as amended) of NEMA. A detailed evaluation of the predicted impacts of the project on the receiving environment, or of the receiving environment on the project as per the methodology that uses the criteria of extent, duration and intensity to quantify the significance of the potential impact. The evaluation of impacts will include: • An assessment of impacts during the construction, operation phases and decommissioning phases; • An assessment of the probability of each impact occurring, the reversibility of each impact and the level of confidence in each potential impact; • An assessment of the significance of each impact before and after mitigation; • The identification of any residual risks that will remain after implementation of any mitigation of an impact; and • The cumulative impact in terms of the current and proposed activities in the area. Recommendations to avoid negative impacts or where this will not be possible, then practical mitigation, management and/or monitoring options to reduce negative impacts and enhance positive impacts. Recommendations on the preferred placement of infrastructure will be provided if any watercourses intersect sensitive infrastructure (as determined by river buffers or flood-lines if

Aspect	Component	Scope of Work / Terms of Reference
		available). An outline of recommended measures to manage residual impacts will be provided where necessary (i.e. impacts that remain after optimisation of design and planning) for the construction, operation and decommissioning phases. Where required, a surface water monitoring plan will be included with an indication of the following: • Aspects to be measured; • Responsible person/body; • Frequency of monitoring actions; • Standards to be met; and • Reporting requirements. • The conditions, in respect of the surface water environment, for inclusion in the Environmental Authorisation. A sensitivity map will be produced outlining area of increased surface water sensitivity (low, medium and high).
Health Risk and Radiological	Health Risk and Radiological Assessment	The overall framework within which the radiological public safety and impact assessment will be consistent with international practice (e.g., IAEA ISAM Safety Assessment Methodology), the following logical elements will be included in the scope of the assessment: • Definition of the assessment context: High-level definition of what will be included and excluded in the assessment, and justification for the choices made. This will include a definition of the regulatory framework within which the assessment will be performed based on international guidelines and requirements. • High-level description of the system: The system as used here refers to the mining operation and associated activities, the potentially affected environment, as well as the public habits and behavioural conditions that might determine their potential levels of radiological exposure. • Definition of exposure conditions: During this step, assessment context and system description information will be used to define a limited number of credible public exposure conditions associated with the mining operations. • Development of conceptual and mathematical models: The development of conceptual and mathematical models for each exposure condition will be done systematically and transparently to increase general confidence in the assessment results. Parameter values will be assigned using site-specific conditions, or if not available, will be justified using literature values. • Consequence analysis: During this step, the mathematical models will be used to evaluate the radiological consequences of each exposure condition defined for the workers and public, both for the operational and post-operational periods.

Aspect	Component	Scope of Work / Terms of Reference
		• Interpretation of the results: During this step, the results will be interpreted in terms of the assessment context defined in the first step.
Closure and Rehabilitation	Engineering Designs and Financial	A closure plan and closure cost estimate in support of the TSF application will be undertaken. This report will address the closure measures that will be implemented and provides the cost of environmental rehabilitation at closure. The closure costing will be calculated according to the escalated DMRE rates since the NEMA Financial Provision regulations have not yet come into effect.

Social Assessment	Socio-Economic Impact Assessment	The following activities will form part of the process forward:
		• Fieldwork will be conducted to obtain additional information and communicate with key stakeholders. Key stakeholders are likely to include:
		  ○ Authorities: local municipalities that fall in the project area.
		  ○ Affected parties: communities and individuals that will be affected by the project.
		  ○ Interested parties: local business in the area, community-based organisations and non-governmental organisations within the affected communities, trade unions, and political groups.
		• Methodologies will include in-depth interviews, participatory rural appraisal, in-the-moment discussion groups, focus groups and immersions. Field notes will be kept of all interviews and focus groups. Initial meetings have been conducted.
		• An interview schedule might be utilised instead of formal questionnaires. An interview schedule consists of a list of topics to be covered, but it is not as structured as an interview. It provides respondents with more freedom to elaborate on their views.
		• The final report will focus on current conditions, providing baseline data. Each category will discuss the current state of affairs, but also investigate the possible impacts that might occur in future. The impacts identified in the scoping report will be revisited and rated accordingly. New impacts that have not been identified will be added to the report. Recommendations for mitigation will be made at the end of the report.
		• The SIA process will have a participatory focus. This implies that the SIA process will focus strongly on including the local community and key stakeholders. The public consultation process will feed into the SIA.
		• Impacts will be rated according to significance (severity), probability, duration, spatial extent, and stakeholder sensitivity.
		• Information obtained through the public processes will inform the writing of the final SIA and associated documents.

Climate Change	Climate Change Assessment	The following is included in the Climate Change Assessment for the EIA phase of the project:

Aspect	Component	Scope of Work / Terms of Reference
		• A study of legal requirements pertaining to GHG emissions – applicable national and international legal guidelines such as the International Finance Corporation; • Identification of the Transitional and Physical Risks associated with the project (as per the Task Force on Climate-related Financial Disclosures); • The GHG emissions during the construction, operation and decommissioning of the project covering scope1, scope 2 and scope 3 emissions. These emissions will be compared to the global and national (if available) emission inventory; and compared to international benchmarks for the project. Calculated emissions will be compared to any guidelines provided by the International Finance Corporation; • The robustness of the project in terms of forecasted climate change impacts to the area over the lifetime of the project; • The vulnerability of communities in the immediate vicinity of the project to climate change; • Proposed management and mitigation strategies; and • Producing a report that complies with the requirements of Appendix 6 of the EIA Regulations, 2014 (Government Notice (GN) R 982 of 2014, as amended) and/or the Department of Forestry, Fisheries and Environment (DFFE) "Protocols for the assessment and minimum report content requirements of environmental impacts" (GN 320 of 2020 and GN 1150 of 2020).

9.4 PROPOSED METHOD OF ASSESSING ENVIRONMENTAL ASPECTS

The same method of assessing impact significance as was used during the Scoping phase will be applied during the EIA phase. This methodology is described in detail in **Section 7.1** of this report.

9.5 PROPOSED METHOD FOR ASSESSING DURATION AND SIGNIFICANCE

The significance of environmental impacts will be rated before and after the implementation of mitigation measures. These mitigation measures may be existing measures or additional measures that may arise from the impact assessment and specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of the mitigation. The proposed method for the assessment of environmental issues is set out in the **Section 7.1**. This assessment methodology enables the assessment of environmental issues including: the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

The specialist studies will recommend practicable mitigation measures or management actions that effectively minimise or eliminate negative impacts, enhance beneficial impacts, and assist project design. If appropriate, the studies will differentiate between essential mitigation measures, which must be implemented and optional mitigation measures, which are recommended.

9.6 STAGES AT WHICH COMPETENT AUTHORITIES WILL BE CONSULTED

Competent authorities have been and will be consulted during the initial notification period, the scoping phase as well as during the EIA phase.

9.7 PROPOSED METHOD OF EIA PHASE PUBLIC PARTICIPATION

The proposed public participation process to be followed for the EIA phase is provided below.

- The commenting periods that will be provided to the I&AP's (and the competent authorities) will be 30 days as per the relevant legislative requirements.
- The dates of the review and commenting period for the draft EIA/EMPr will be determined at a later date and communicated to all registered I&AP's through faxes, emails, SMS's and/or registered letters.
- The location at which the hard copy of the EIA report will be made available is at the same public places in the project area that the Scoping Report was made available (refer to **Section 5.2.3**), sent electronically to stakeholders who request a copy, and placed on the EIMS website: www.eims.co.za.
- The public participation will be undertaken in compliance with NEMA GNR 982 (Chapter 6).
- A public meeting will be held during the review period for the EIA report. Focus group meetings will also be held with key stakeholders as and where necessary.
- All comments and issues raised during the comment periods will be incorporated into the final EIA Report.

9.8 DESCRIPTION OF TASKS THAT WILL BE UNDERTAKEN DURING THE EIA PROCESS

The plan of study detailed in the above sections and is summarised below. The following tasks will be undertaken as part of the EIA phase of the project:

- EIA-phase specialist studies.
- Public consultation:
    - Notification of the availability of the EIA Report for review and comment to all registered I&AP's;

- Public and focus group meetings.

- Authority consultation:
  - Consultation with DMRE, DESTEA and the commenting authorities; and
  - Authority consultation (including meetings where necessary) to provide authorities with project related information and obtain their feedback.

- Document compilation:
  - The EIA and EMPr will be compiled in line with the requirements of Appendix 3 and 4 of the NEMA EIA Regulations.
  - The EIA and EMPr will be made available for public comment for a period of 30 days.
  - The EIA and EMPr will be finalised and submitted to the DESTEA and DMRE for adjudication and decision making.

9.9 MEASURES TO AVOID, REVERSE, MITIGATE, OR MANAGE IMPACTS

All comments received from I&APs during the Scoping Report review will be taken into consideration and where applicable inform the high-level mitigation measures. Detailed mitigation measures will be further developed as part of the EIA phase. The potential impacts will further be assessed in terms of the mitigation potential, taking into consideration the following:

- Reversibility of impact:
  - Reversible;
  - Partially reversible.; and
  - Irreversible.

- Irreplaceable loss of resources:
  - Replaceable;'
  - Partially replaceable; and
  - Irreplaceable.

- Potential of impacts to be mitigated:
  - High;
  - Medium; and
  - Low.

More detailed assessment findings for each identified impact taking the above into consideration will be provided in the EIA Report and associated EMPr.

10 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I **Vukosi Mabunda** herewith undertake that the information provided in the foregoing report is correct to the best of my knowledge, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report where applicable.

…….

Signature of the EAP

Date: 2024/03/26

11 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I **Vukosi Mabunda** herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

…….

Signature of the EAP

Date: 2024/03/26

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