EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

T 011 789 7170 E info@eims.co.za W www.eims.co.za

INTEGRATED WATER AND WASTE MANAGEMENT PLAN REPORT

HARMONY GOLD:
MPONENG LOWER COMPARTMENT TAILING STORAGE FACILITY (REDEPOSITION)

WU45483

FEBRUARY 2026

DOCUMENT DETAILS

EIMS REFERENCE: 1658

DOCUMENT TITLE: INTEGRATED WATER AND WASTE MANAGEMENT PLAN REPORT: HARMONY GOLD: MPONENG LOWER COMPARTMENT TAILING STORAGE FACILITY (REDEPOSITION) - WU45483

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Vukosi Mabunda		2026/01/19
CHECKED:	John von Mayer		2026/01/29
AUTHORIZED:	Liam Whitlow		2026/02/24

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2026/01/19	ORIGINAL DOCUMENT	IWWMP Report for Quality Review
2026/02/24	REVISION 1	IWWMP Report for Public Review

Table of Contents

List of Figures

List of Tables

Appendices

Acronyms and Abbreviations

APPA:	Air Pollution Prevention Act
AQSR:	Air Quality Sensitive Receptors
ASTM:	American Standard Testing Methodology
CA:	Competent Authority
CARA:	Conservation of Agricultural Resources Act, 1983
CBA:	Critical Biodiversity Area
CCAM:	Conformal-Cubic Atmospheric Model
CIP:	Carbon-In-Pulp
CLR:	Carbon Leader Reef
CMA:	Catchment Management Agency
CMS:	Catchment Management Strategy
CO_2:	Carbon Dioxide
C-Plan:	Conservation Plan
DAFF:	Department of Agriculture, Forestry and Fisheries (now DFFE)
DEA:	Department of Environmental Affairs (now DFFE)
DFFE:	Department of Forestry, Fisheries and the Environment
DMPR:	Department of Mineral and Petroleum Resources
DMRE:	Department of Mineral Resources and Energy (now DMPR)
DSO:	Dam Safety Office
DWS:	Department of Water and Sanitation
EA:	Environmental Authorisation
EAP:	Environmental Assessment Practitioner
EC:	Electrical Conductivity
ECA:	Environmental Conservation Act
EIA:	Environmental Impact Assessment
EIMS:	Environmental Impact Management Services (Pty) Ltd

ELWU:	Existing Lawful Water Use
EMPr:	Environmental Management Programme
EN:	Endangered
ESA:	Ecological Support Areas
GA:	General Authorisation
GCM:	Conformal-Cubic Atmospheric Model
GDARD	Gauteng Department of Agriculture and Rural Development
GHG:	Greenhouse Gasses
GN:	Government Notice
GNR:	Government Notice Regulation
GQM:	Groundwater Quality Management
Ha:	hectare
HIA:	Heritage Impact Assessment
I&AP:	Interested and Affected Party
IDP:	Integrated Development Plan
IEM:	Integrated Environmental Management
IPCC:	Intergovernmental Panel on Climate Change
IWML:	Integrated Waste Management Licence
IWRM:	Integrated Water Resource Management
IWWMP:	Integrated Water and Waste Management Plan
km:	kilometre
ktpm:	kilotonnes per month
LC:	Leachable Concentration
LED:	Local Economic Development
LOM:	Life of Mine
m:	meters
MAE:	Mean Annual Evaporation
mamsl:	meters above mean sea level
MAP:	Mean Annual Precipitation
MAR:	Mean Annual Runoff
MCLC:	Merafong City Local Municipality
mm:	millimetres
MPRDA:	Minerals and Petroleum Resources Development Act, 2002

MR: Mining Right

µm: micrometres

NAAQS: National Ambient Air Quality Standards

NAEIS: National Atmospheric Emissions Inventory System

NWRS: National Water Resource Strategy

NB: Nominal Bore

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

NNR: National Nuclear Regulator

NORM: Naturally Occurring Radioactive Material

NT: Near Threatened

NWA: National Water Act, 1998

ONAs: Other Natural Areas

PCD: Pollution Control Dam

PHRAG: Provincial Heritage Resources Authority Gauteng

PSDF: Provincial Spatial Development Framework

PIA: Palaeontological Impact Assessment

PM: Particulate Matter

PM_{10}: Particulate Matter with an aerodynamic diameter of 10 micrometers or smaller

$PM_{2.5}$: Particulate Matter with an aerodynamic of 2.5 micrometers or less

PPP: Public Participation Process

PPR: Public Participation Report

RCP: Representative Concentration Pathways

RE: Remaining Extent / Remainder

RQOs: Resource Quality Objectives

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

TSP: Total Suspended Particulates

VCR: Ventersdorp Contact Reef

WMA: Water Management Area

WML: Waste Management License

WRD: Waste Rock Dump

WRDM: West Rand District Municipality

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.
Applicant	A person who has submitted an application for an environmental authorisation to the competent authority and has paid the prescribed fee.
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

Term	Definition
	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.
Development Footprint (also referred to as study area)	Any evidence of physical alteration as a result of the undertaking of any activity. For purposes of this report, it refers to actually area being assessed and will likely be altered / developed should the project proceed.
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.

Term	Definition
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.
Listed Activity	The activities listed in Appendix 1, identified in terms of section 24(2) (a) of the Act as activities that may not commence without an environmental authorisation from the competent authority
Particulate Matter	Refers to a complex mixture of microscopic solid particles and liquid droplets suspended in the air, including dust, smoke, and soot. It is categorized by size, with the most hazardous being fine particles ($PM_{2.5}$) that are 2.5 micrometers or smaller in diameter, and inhalable particles (PM_{10}) that are 10 micrometers or smaller.
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:	Refers to: • 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.
Return Water Dam	A return water dam is a purpose-built facility, often on a mine, that stores and controls process water, which is then pumped back to the plant or to a reclamation site.
Ridge	A ridge is a long, narrow, elevated geomorphologic landform, structural feature, or a combination of both separated from the surrounding terrain by steep sides.
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.
Slurry	In mining, a slurry is a thick, fluid mixture of solids and liquid, usually water, that is used to transport extracted ore and waste materials like tailings from one place to another.

Term	Definition
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.
Tailings	Tailings are the leftover, finely-ground rock, minerals, and water that remain after the valuable components have been extracted from mined ore. These waste materials are typically processed into a slurry and pumped into surface storage facilities, called tailings dams or Tailings Storage Facilities where they are stored as fine-grained residue.
Tailings Storage Facility	Tailings Storage Facility are specially engineered structures, often large dams, designed to contain the liquid or slurry waste (tailings) from mining operations, which consist of crushed rock, water, and trace chemicals.
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	Refers to: (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

Golden Core Trade and Invest (Pty) Ltd - Mponeng Operations (a subsidiary of Harmony Gold Mining Company Limited), hereafter referred to as Golden Core Trade and Invest / “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 redeposition on Mponeng Lower Compartment Tailings Storage Facility (TSF) and associated infrastructure located at 26°27'10.53"S; 27°24'39.93"E (central TSF point), near Carletonville in the Merafong City Local Municipality (West Rand District Municipality) in Gauteng Province. The Mponeng Lower Compartment Tailings Storage Facility (hereafter referred to as Mponeng Lower Compartment TSF) is an existing TSF with a footprint of approximately 102ha, however, the Mponeng Lower Compartment TSF is no longer in operation and is currently utilised as a Holding Dam and an approximately 200m^2 portion of the TSF has been converted and is currently used as an authorized General Waste Landfill Facility (Gaut 002-09-10-W0011). Further thereto, the approved 2012 EMPr states that the Mponeng Lower Compartment TSF will no longer be used for tailings storage but rather be used as a Holding Dam. The facility is further included in the Water Use Licence as a Holding Dam.

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 West Wits Region in the Gauteng Province. The Savuka Plant currently deposits tailings onto the Savuka 5a, 5b, 7a & 7b TSFs. However, these facilities are approaching their final and approved height, and the current planned Life of Mine (LOM) for the West Wits Region exceed the available deposition capacity of these TSFs. The Savuka tailings facility has reached the end of its lifecycle and is undergoing a short-term extension of two years. Following this period, tailings from Savuka will need to be diverted to an alternative facility. The Mponeng Lower Compartment has been identified as a viable solution to accommodate tailings until the end of life of the Savuka plant and thereafter accommodate tailings from the Mponeng plant. Tailings were deposited up to 25m on the southern half of the footprint, but deposition was ceased after a natural spring was identified within the footprint. Harmony plans to re-commission the Lower Compartment after the spring is diverted to reduce groundwater contamination as well as possible stability issues to the TSF.

It should be noted that the site operates under Water Use Licence No. 08/C23E/AFGJCEI/12157 obtained in September 2022, which authorises multiple uses under Section 21 of the National Water Act, including:

- (a) Taking water from a resource:
- (b) Storage of water:
- (c & i) Activities impacting watercourses or altering flow:
- (e) Discharge of water containing waste:
- (f & g) Disposal of waste on land:
- (h) Disposing waste likely to impact a water resource: and
- (j) Removal and use of underground water.

The water uses on-site support various operational needs including underground mining, mineral processing, refrigeration and cooling, dust suppression, potable supply, and irrigation of treated effluent (PSE). Effluent quality and compliance are monitored against the water quality objectives defined in the WUL, with discharge regulated into the Wonderfonteinspruit and Elandsfonteinspruit, as outlined in the 2024/2025 Annual Water Monitoring Report. However, a new application is required as the proposed activities overlap several new properties not covered in the existing license.

The Mponeng Lower Compartment TSF will store approximately 43 Million Tonnes of tailings material. It is anticipated to accommodate tailings deposition for a period of 10 years at a rate of 350 kilotonnes per month

(ktpm). The end-of-life limiting factors considered were a rate of rise below 4 meters per annum and a final facility height of 60 meters, ensuring safe and sustainable deposition over the operational life of the facility. In order to redeposit on the Mponeng Lower Compartment TSF from the Savuka Plant, slurry pipelines will need to be constructed, either from the Savuka Plant to the TSF, or from the Kuasasalethu Plant to the TSF. The residue deposition pipelines will have a Nominal Bore (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.

The proposed main activities are as follows:

- Recommencement of deposition on Mponeng Lower Compartment TSF;
- Construction of slurry and return water pipelines;
- Construction of pipeline bridge;
- Construction of pipe culvert;
- Upgrade of Return Water Dam (RWD);
- Installation of Clean Water Diversion System (Spring Diversion);
- Installation of Dirty Water Systems;
- Installation of sub-surface drainage system; and
- Undertaking of ground improvement.

EIMS has been appointed to compile and submit the required documentation in support of applications for:

- Water Use Licence (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses:
    - Section 21(a); Taking water from a water resource;
    - Section 21(c): Impeding or diverting the flow of water in a watercourse;
    - Section 21(i): Altering the bed, banks, course or characteristics of a watercourse ; and
    - Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

  An application for a Water Use Licence (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers.
- 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, 12, 19, 21D, 21F;* **Listing Notice 2**, *Activity 6*, and 15; and **Listing Notice 3**, *Activities 12, 14, and 23* as well as the National Environmental Management: Waste Act – NEMWA (Act 59 of 2008) – *Activities B7, B10 and B11.* A separate application for an Integrated EA has been lodged with the Department of Mineral and Petroleum Resources (DMPR) for the EA Activities.

PURPOSE OF THE REPORT

The Department (DWS) requires an Integrated Water and Waste Management Plan (IWWMP) as a simple, feasible and implementable plan for water users based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), Catchment Management Strategy (CMS), Resource Quality Objectives (RQOs) and sensitivity of the receiving water resource, upstream and downstream cumulative impacts of water use activities, external water use authorisation guidelines, as well as water use specific supplementary information requirements. The most important component of the IWWMP development process

is the formulation of various strategies, goals and objectives for the water use or waste management of an activity, in accordance with the set philosophies and policies. The policies must address the four key areas related to IWWMP development, namely process water, storm water, groundwater and waste. The purpose of this IWWMP is follows:

- Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects (e.g., process water balances, storm water management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimization and recycling) of the specific activity, in order to meet set goals and objectives, in accordance with Integrated Water Resources Management principles;
- Provision of a management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
- Documentation of all the relevant information, as specified in this guideline, to enable the Department to make the decision regarding the authorisation of a water use;
- Clarification of the content of the IWWMP from the DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the content of an IWWMP;
- Standardisation of the format of the supporting documentation which the Department requires during submission of a WULA;
- Provision of guidance on the content of information required in an IWWMP as part of the water use authorisation process and level of detail that the Department requires to enable them to evaluate the supporting documentation to make a decision on authorisation water use; and
- Ensuring that a consistent approach is adopted by the Department and the various Regional Offices and CMA's with regards to IWWMPs.

It is the responsibility of the water user to demonstrate to the Department that the selected management measures in the IWWMP action plan adhere to the "SMART" concept i.e.

PROJECT ALTERNATIVES AND 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; Location Alternative, Route Alternative, Layout or Design Alternatives, and Process Alternatives. The preferred option under each category of alternatives is discussed in detail in **Section 6.4** 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 during construction, operation and closure phases;
- Negative impact on identified hydrology, wetlands and aquatic species during construction and operation and closure phases;
- Negative visual impact during operation;
- Negative impact on air quality and climate change during the operation phase;
- Negative impact on the health and safety during the operation phase;
- Negative impact on natural habitats, flora and fauna during the planning and construction phases;
- Mortality / disturbance of potential Species of Conservation Concern (SCC);
- Negative impact on archaeological and cultural heritage during the construction phase; and
- Positive socio-economic impact through employment opportunities.

PUBLIC PARTICIPATION PROCESS

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 has been undertaken in accordance with the requirements of the MPRDA, NWA 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.

The PPP commenced on the 15th of August 2025 with an initial notification and call to register as interested and affected parties (I&APs). This IWWMP Report has been made available for public review and comment for a period of 60 days from the **24 of February 2026 to 29 April 2026**. Contact details or submission method methods of comments was as follows:

- Environmental Impact Management Services (Pty) Ltd (EIMS)
- P.O. Box 2083 Pinegowrie 2123
- Phone: 011 789 7170 / Fax: 011 787 3059
- Contact: Mbali Tshabalala
- EIMS Reference No: 1658
- Email: mponengtsf@eims.co.za

1 INTRODUCTION

Golden Core Trade and Invest (Pty) Ltd - Mponeng Operations (a subsidiary of Harmony Gold Mining Company Limited), hereafter referred to as Golden Core Trade and Invest / "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 redeposition on Mponeng Lower Compartment Tailings Storage Facility (TSF) and associated infrastructure located at 26°27'10.53"S; 27°24'39.93"E (central TSF point), near Carletonville in the Merafong City Local Municipality (West Rand District Municipality) in Gauteng Province. The Mponeng Lower Compartment Tailings Storage Facility (hereafter referred to as Mponeng Lower Compartment TSF) was an existing TSF with a footprint of approximately 102ha, however, the Mponeng Lower Compartment TSF is no longer in operation and is currently utilised as a Holding Dam and an approximately 200m^2 portion of the TSF has been converted and is currently used as an authorized General Waste Landfill Facility (Gaut 002-09-10-W0011). Further thereto, the approved 2012 EMPr states that the Mponeng Lower Compartment TSF will no longer be used for tailings storage but rather be used as a Holding Dam. The facility is further included in the Water Use Licence as a Holding Dam.

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 West Wits Region in the Gauteng Province. The Savuka Plant currently deposits tailings onto the Savuka 5a, 5b, 7a & 7b TSFs. However, these facilities are approaching their final and approved height, and the current planned Life of Mine (LOM) for the West Wits Region exceed the available deposition capacity of these TSFs. The Savuka tailings facility has reached the end of its lifecycle and is undergoing a short-term extension of two years. Following this period, tailings from Savuka will need to be diverted to an alternative facility. The Mponeng Lower Compartment has been identified as a viable solution to accommodate tailings until the end of life of the Savuka plant and thereafter accommodate tailings from the Mponeng plant. Tailings were deposited up to 25m on the southern half of the footprint, but deposition was ceased after a natural spring was identified within the footprint. Harmony plans to re-commission the Lower Compartment after the spring is diverted to reduce groundwater contamination

It should be noted that the site operates under Water Use Licence No. 08/C23E/AFGJCEI/12157 obtained in September 2022, which authorises multiple uses under Section 21 of the National Water Act, including:

- (a) Taking water from a resource:
- (b) Storage of water:
- (c & i) Activities impacting watercourses or altering flow:
- (e) Discharge of water containing waste:
- (f & g) Disposal of waste on land:
- (h) Disposing waste likely to impact a water resource: and
- (j) Removal and use of underground water.

The water uses on-site support various operational needs including underground mining, mineral processing, refrigeration and cooling, dust suppression, potable supply, and irrigation of treated effluent (PSE). Effluent quality and compliance are monitored against the water quality objectives defined in the WUL, with discharge regulated into the Wonderfonteinspruit and Elandsfonteinspruit, as outlined in the 2024/2025 Annual Water Monitoring Report. However, a new application is required as the proposed activities overlap several new properties not covered in the existing license. Subsequently, EIMS has been appointed to compile and submit the required documentation in support of applications for:

- Water Use Licence (WUL) in accordance with the National Water Act – NWA (Act 36 of 1998). Water uses:
    - Section 21(a); Taking water from a water resource;

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse ; and
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

- Environmental Authorisation (EA) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998) - Listed activities:
  - Listing Notice 1, Activities 10, 12, 19, 21D, 21F;
  - Listing Notice 2, Activity 6, and 15; and
  - Listing Notice 3, Activities 12, 14, and 23; and
- Waste Management License (WML) in accordance with the National Environmental Management Act – NEMA (Act 107 of 1998) - Listed activities:
  - Category B - Activities B7, B10 and B11.

An application for a Water Use Licence (WUL) has been lodged with the Department of Water and Sanitation (DWS) for the water use triggers. A separate application for an Integrated EA has been lodged with the Department of Mineral and Petroleum Resources (DMPR) for the EA Activities.

1.1 ACTIVITY BACKGROUND

Golden Core Trade and Invest (Pty) Ltd is the holder and operator of the Mponeng Operations, situated near Carletonville in the Merafong City Local Municipality, Gauteng Province. The Mponeng Shaft is currently operational, while the Savuka shaft is at demolition stage and The TauTona shaft in closure and care and maintenance. The operations form part of the historic West Wits Mining Complex, previously managed by AngloGold Ashanti and acquired by Harmony Gold in 2020. Since the transition, Golden Core Trade and Invest has continued managing the operational, environmental, and compliance functions of the site, including its water and waste obligations as per the Water Use Licence issued by the Department of Water and Sanitation.

The primary economic reef horizons exploited at Mponeng include the Ventersdorp Contact Reef (VCR) and the Carbon Leader Reef (CLR), mined at ultra-deep levels exceeding 3 800 m below surface. Ore is processed at the Mponeng Gold Plant using conventional carbon-in-pulp technology (Gomelelo Environmental and Management Consulting (Pty) Ltd, 2025). The operations are authorised through 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 Carletonville area (Mining Right Ref: ((GP) 30/5/1/2/2 (01) MR). Subsequently the Applicant also holds a Water Use License (WUL). The current WUL (08/C23E/AFGJCEI/12157) was issued in 2022 which superseded the initial WUL issued for the operations in 2013.

Table 2: Applicant Details.

Applicant Details	
Applicant Name:	Golden Core Trade and Invest (Pty) Ltd. - Mponeng Operations
Contact Person:	Hlayiseko Mashaba
Postal Address:	Randfontein Office Park
	Corner Main Reef Rd and Ward Ave
	Randfontein

Applicant Details	
	Gauteng
	1759
Tel:	+27 (0)11 411 2252
Email:	Hlayiseko.Mashaba@Harmony.co.za

1.2 REGIONAL SETTING AND LOCATION OF ACTIVITY

The Mponeng Operations are situated within the West Wits Goldfield, part of the greater Witwatersrand Basin, which is one of the world's most renowned gold producing geological formations. The area is located approximately 90 km southwest of Johannesburg and falls within the administrative boundaries of the Merafong City Local Municipality, under the jurisdiction of the West Rand District Municipality, in the Gauteng Province. The project area falls within the West Rand District Municipality in Gauteng Province. Development area falls within Wards 11, 14 and 27 of Merafong City Local Municipality administrative area. The Mponeng Lower Compartment TSF is located at 26°27'10.53"S; 27°24'39.93"E in Wadela, immediately north of the N12. The site is approximately 7km northwest of Fochville, 10km south of Carletonville central and 20km west of Westonaria

The area north of the Mponeng TSF is characterized by a series of parallel hills that form the Gatsrand and have an elevation of approximately 1 770 metres above mean sea level (mamsl) (**Figure 1**). The Mponeng Lower Compartment TSF is located at approximately 1 538 mamsl. The difference in elevation of approximately 230mamsl symbolizes the ridge between the TSF and the Savuka Plant. The study area features a varied aesthetic and visual landscape, with mining activities predominating the western and northern sections of the study area and savannah-covered grassland and agriculture in the southern regions. The northwestern and western sections consist of gently undulating land that slopes westward and southward towards drainage lines that generally flow west and northwest. The topography rises in the central parts of the study area immediately north of the Project site, which is mostly undeveloped and composed of gentle rolling grassland. Residential areas, linked to the mines, are situated immediately west (Wedela), northwest (Harmony housing), and north of the Project site (Western Deep Levels housing). South of Wedela and the Project site is a grassland area with savannah-covered slopes. These areas are primarily used for grazing. The far southern sections of the study area comprise agricultural lands.

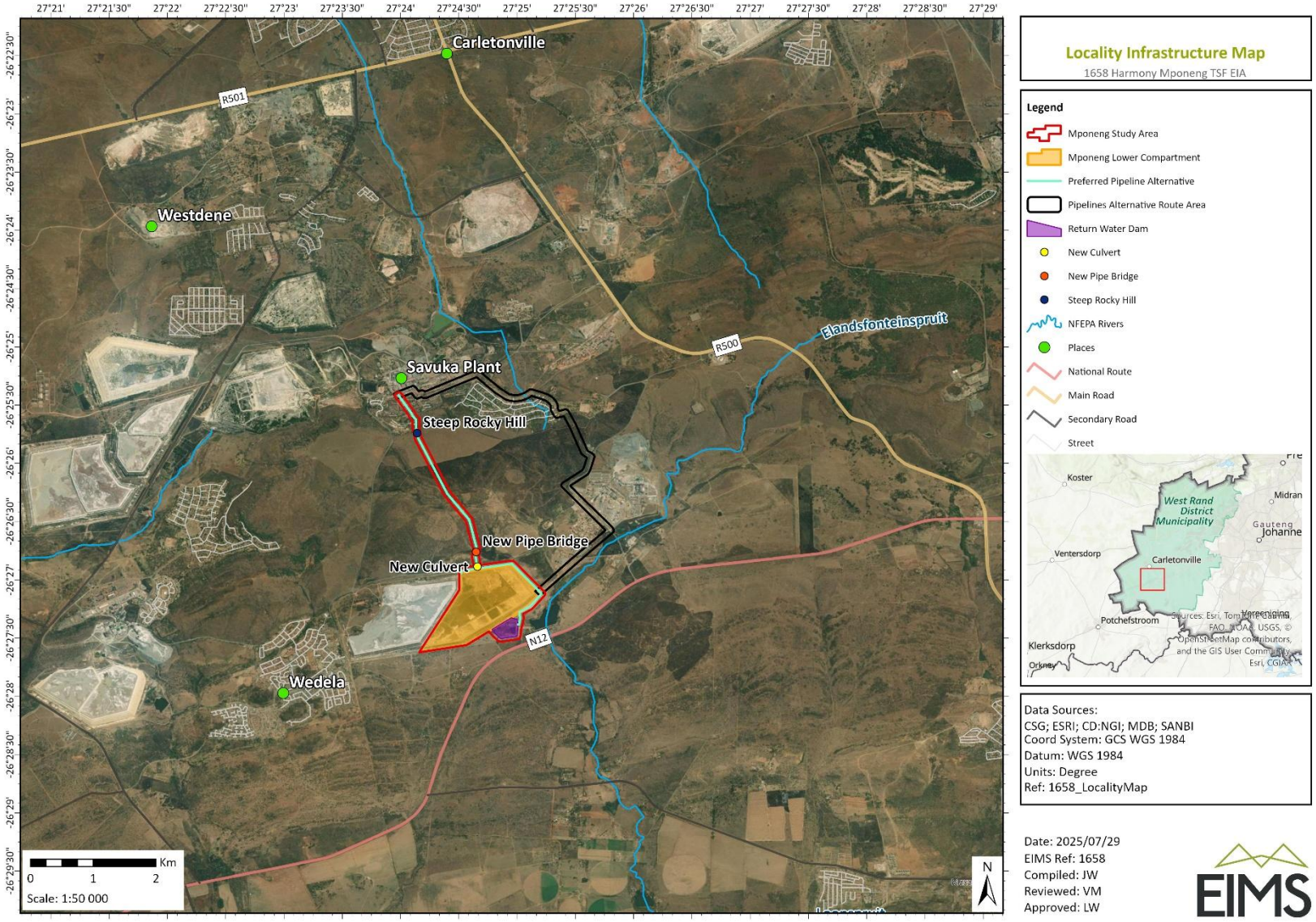


Figure 1: Locality of Mponeng Lower Compartment TSF.

1.3 PROPERTY DESCRIPTION

Table 3 indicates the farm portions that the project is located on including details on the project location as well as the distance from the proposed project area to the nearest towns. The locality and extent of the Mponeng Lower Compartment TSF is shown in **Figure 2**.

Table 3: Locality details

<table>
<tr><td>Property</td><td colspan="4">Mponeng Lower Compartment TSF (existing TSF) is located on Remainder of Portion 23 of the Farm Elandsfontein 115IQ. The pipelines traverses through Remainder (RE) of Portion 5 Farm Elandsfontein 115IQ, Portions 3, 4 and 5 of Farm Blyvooruitzicht 116 IQ, and the Remainder of Portion 27 of Farm Elandsfontein 144IQ.</td></tr>
<tr><td rowspan="7">Property Name, 21-digit Surveyor General Code and Ownership</td><td>Farm Name</td><td>Portion</td><td>LPI Code</td><td>Ownership Type</td></tr>
<tr><td>Farm Elandsfontein 115IQ</td><td>RE/23/115</td><td>T0IQ00000000011500023</td><td>Applicant</td></tr>
<tr><td>Elandsfontein 115IQ</td><td>RE/5/115</td><td>T0IQ00000000011500005</td><td>Applicant</td></tr>
<tr><td>Blyvooruitzicht 116 IQ</td><td>3</td><td>T0IQ00000000011600003</td><td>Applicant</td></tr>
<tr><td>Blyvooruitzicht 116 IQ</td><td>4</td><td>T0IQ00000000011600004</td><td>Applicant</td></tr>
<tr><td>Blyvooruitzicht 116 IQ</td><td>5</td><td>T0IQ00000000011600005</td><td>Applicant</td></tr>
<tr><td>Elandsfontein 144IQ</td><td>RE/27</td><td>T0IQ00000000014400027</td><td>Private</td></tr>
<tr><td>Application Area (Ha)</td><td colspan="4">The approximate size of the infrastructure is as follows:
Mponeng Lower Compartment TSF footprint is approximately 102ha;
Proposed residue pipeline route is approximately 3.36km long;
Proposed return water pipeline route is approximately 4.85km long;
Alternative residue and return water pipeline route is approximately 13.6km long;
Upgrading of return water dam to approximately 8.20ha
New pipe culvert approximately 20m long within an area of approximately 0.23ha; and
New pipe bridge approximately 100m long within an area of approximately 0.81ha.</td></tr>
<tr><td>Magisterial District</td><td colspan="4">The project area falls within the West Rand District Municipality in Gauteng Province. Development area falls within Wards 11, 14 and 27 of Merafong City Local Municipality administrative area.</td></tr>
<tr><td>Distance and direction from nearest towns</td><td colspan="4">Mponeng Lower Compartment TSF is located at 26°27'10.53"S; 27°24'39.93"E (central coordinates) in Wadela, immediately north of the N12. The site is approximately 7km northwest of Fochville, 10km south of Carletonville central and 20km west of Westonaria (refer to Figure 1).</td></tr>
<tr><td>Surrounding land uses</td><td colspan="4">The study area (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 west of the Mponeng Lower Compartment TSF (Mponeng Upper Compartment) and northwest of the</td></tr>
</table>

	pipelines start point (Savuka TFS). There is vacant land immediately north of the site characterised by a ridge elevating from 1546m above mean sea level (mamsl) at the Mponeng Lower Compartment TSF to 1706 mamsl at the highest level before sloping down to around 1600 mamsl at Western Deep Levels community, a change in elevation of 160m within a distance of 2.5km. There are several watercourses around the Mponeng Lower Compartment TSF site consisting of dams and drainage channels. Mponeng Water Treatment Works is located 400m east of the site. The Mponeng Hostel is the closest community to the site, located 800m east of Mponeng Lower Compartment TSF. The Wadela residential community is located 1.2km west of the site. It must be noted that the Mponeng Lower Compartment and Wadela community is separated by the Mponeng Upper Compartment. Western Deep Levels and Elandsrand residential communities are located further away from Mponeng Lower Compartment TSF, 2.6km north and 2.7km northwest of Mponeng Lower Compartment TSF respectively. There are established large-scale agricultural activities south of the site (approximately 3km) with a combination of pivot and horizontal farming techniques.

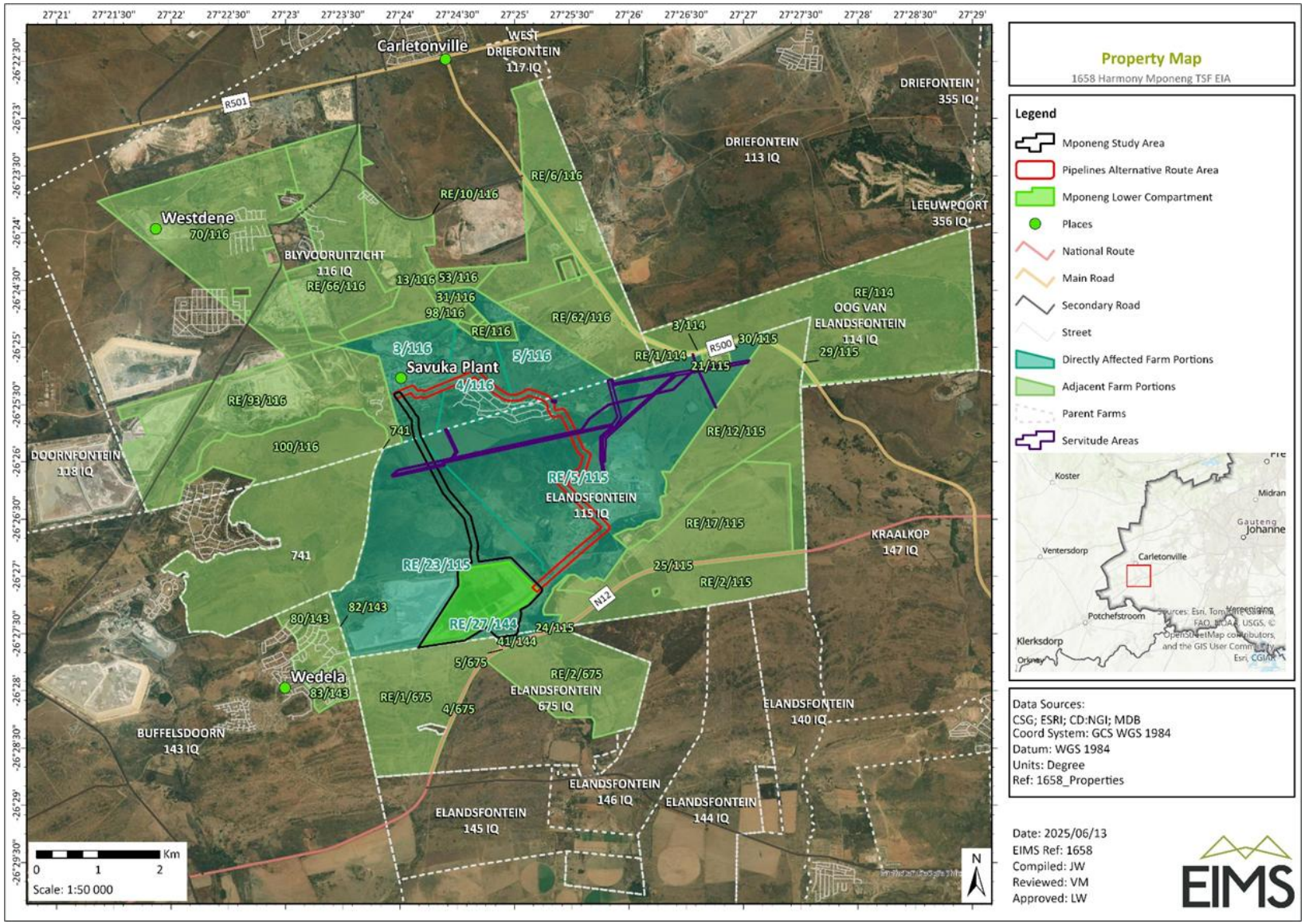


Figure 2: Locality map indicating the location of the proposed Mponeng Lower Compartment TSF and cadastral information.

1.4 PURPOSE OF THE IWWMP

Although the requirement for the compilation of an Integrated Water and Waste Management Plan (IWWMP) was originally aimed at collating and rationalising the information submitted for Water Use Licence Applications (WULA) to the DWS, it has progressed beyond this purpose to:

- Provide the regulatory authorities with focused and structured information not only to meet their general information needs, but also to articulate the required management measures and actions to achieve the water and waste related performance on an on-going basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.

The IWWMP should be used in conjunction with other guidelines developed by DWS, such as the External Guideline on the Water Use Authorisation Process and the series of Best Practical Guidelines for water resource protection in the Industries and Mines. The Department and/or relevant Catchment Management Agencies (CMA) implement the Integrated Water Resource Management (IWRM) at source, by means of an IWWMP.

The Department requires an IWWMP as a simple, feasible and implementable plan for water users based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), Catchment Management Strategy (CMS), Resource Quality Objectives (RQOs) and sensitivity of the receiving water resource, upstream and downstream cumulative impacts of water use activities, external water use authorisation guidelines, as well as water use specific supplementary information requirements. The most important component of the IWWMP development process is the formulation of various strategies, goals and objectives for the water use or waste management of an activity, in accordance with the set philosophies and policies. The policies must address the four key areas related to IWWMP development, namely process water, storm water, groundwater and waste.

The purpose of this IWWMP is, therefore, as follows:

- Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects (e.g., process water balances, storm water management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimization and recycling) of the specific activity, in order to meet set goals and objectives, in accordance with Integrated Water Resources Management principles;
- Provision of a management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
- Documentation of all the relevant information, as specified in this guideline, to enable the Department to make the decision regarding the authorisation of a water use;
- Clarification of the content of the IWWMP from the DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the content of an IWWMP;
- Standardisation of the format of the supporting documentation which the Department requires during submission of a WULA;
- Provision of guidance on the content of information required in an IWWMP as part of the water use authorisation process and level of detail that the Department requires to enable them to evaluate the supporting documentation to make a decision on authorisation water use; and
- Ensuring that a consistent approach is adopted by the Department and the various Regional Offices and CMA's with regards to IWWMPs.

It is the responsibility of the water user to demonstrate to the Department that the selected management measures in the IWWMP action plan adhere to the "SMART" concept as defined in **Figure 3**.

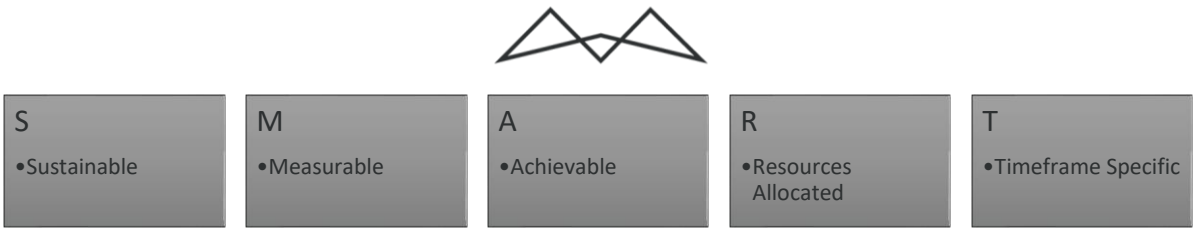


Figure 3: Diagram of the "SMART" Concept.

It is a Departmental requirement that a water user needs to compile an IWWMP for any one of the following purposes:

- As the supporting technical documentation for any WULA (the main purpose of this document);
- When converting Existing Lawful Use (ELU) to licensed water use; and
- In order to comply with the conditions of an existing water use license.

The implementation of the IWWMP is an interactive process whereas its performance is monitored on an annual basis. The assessment of the IWWMP document itself, as well as the submission of information relating to monitoring and auditing conducted in terms of it could lead to its shortcomings, which must be addressed in the annual update of the action plan of the IWWMP. This will ensure that the concept of continual improvement is applied throughout the life cycle of the activity (Operational Guideline: IWWMP dated February 2010 and GNR 267, the Water Use Licence Application and Appeals Regulations, dated March 2017).

In line with the guidelines of the DWS Operational Guideline: Integrated Waste and Water Management Plan (2010) and GNR 267, Water Use Licence Application and Appeals Regulations (2017), **Figure** 4 provides a guide to the structure of the IWWMP.

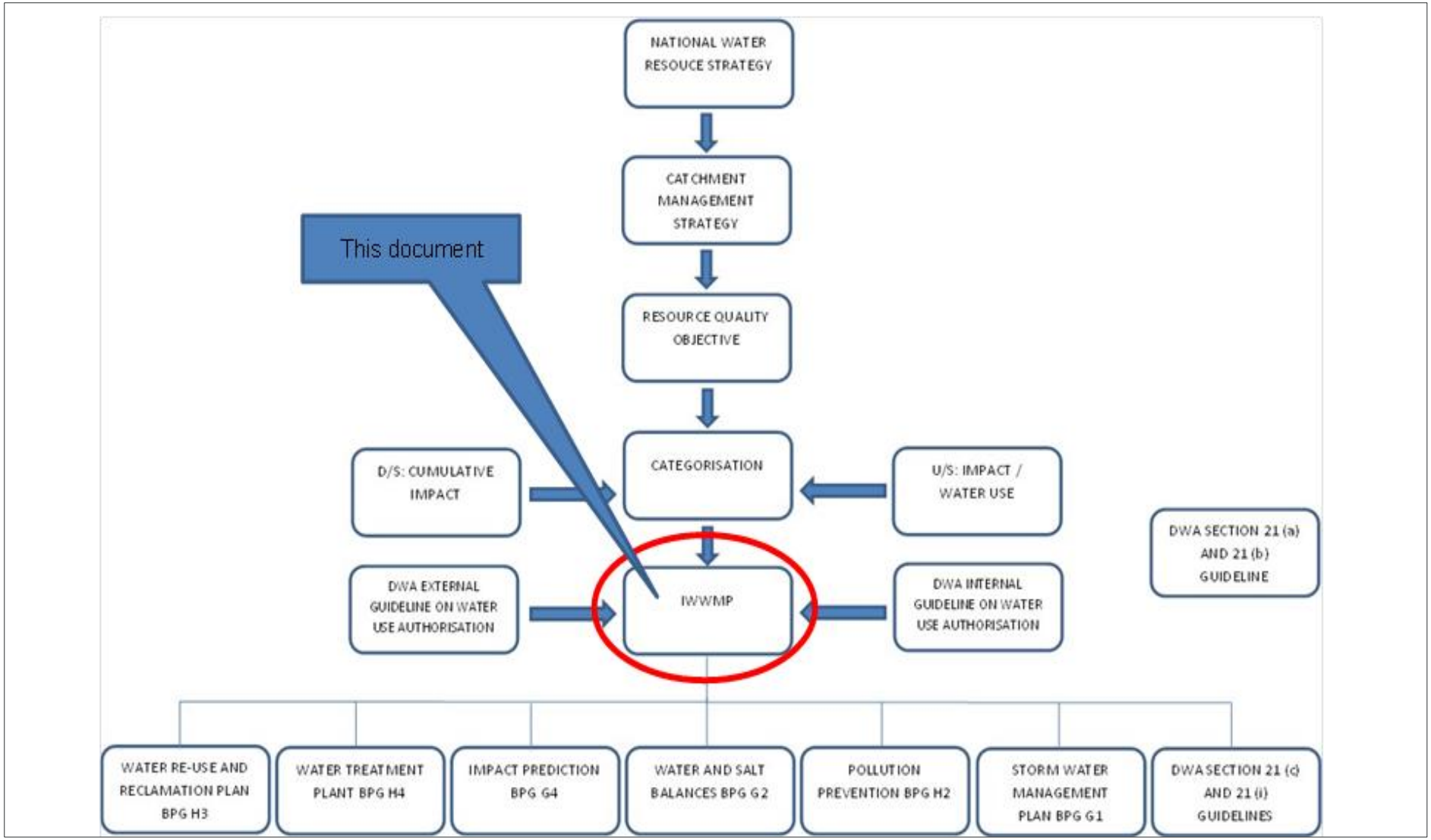


Figure 4: Schematic Layout of the IWWMP Approach

2 CONTEXTUALISATION OF THE ACTIVITY

The section below provides a detailed project description. The aim of the description is to indicate the activities that are performed at the TSF. Furthermore, the detailed project description facilitates the understanding of the activities taking place that will result in impacts on the environment and for which mitigation measures are in place or plans are in place to implement these mitigation measures.

2.1 DESCRIPTION OF ACTIVITY

The Mponeng Operations, currently under the management of Golden Core Trade and Invest (Pty) Ltd, comprise a large-scale, deep-level underground gold mining and processing facility situated within the West Wits Goldfield, near Carletonville, Gauteng Province. The operation is one of the deepest gold mines in the world, with working levels reaching approximately 3 800 metres below surface. Gold is extracted from the Ventersdorp Contact Reef (VCR) and Carbon Leader Reef (CLR) using conventional breast mining methods. Ore is hoisted via the main shaft to the surface for processing at the adjacent Mponeng Gold Plant. Waste rock is either backfilled underground or disposed of on surface at the Mponeng Return Water Dam (RWD). Dewatering is a critical aspect of operations, with significant volumes of groundwater abstracted and partially reused onsite or discharged via Covalent Water Company infrastructure

The Mponeng Gold Plant utilises crushing, milling, leaching, and carbon-in pulp processes to recover gold. Water is extensively used throughout the plant for ore slurry preparation, reagent mixing, gold recovery, and Carbon-In-Pulp (CIP) operations. The tailings slurry generated from the plant is pumped via a pipeline to the Mponeng Tailings Storage Facility (TSF) for deposition. Return water from the TSF is collected in the Mponeng RWD and recycled back to the plant to reduce reliance on freshwater. All stormwater generated within the Mponeng Gold Plant area is conveyed via trenches to Pollution Control Dams (PCDs), as it may contain gold bearing material. From the lower PCD, water is pumped to the square reservoir and reused in the processing circuit. Specific to the project, the proposed activities are summarized in **Table 4** below.

Table 4: Summary of proposed activities

Activity	Description / Auxiliary Activity
Recommencement of deposition on Mponeng Lower Compartment TSF	The proposed Mponeng Lower Compartment TSF is proposed within an existing TSF footprint which extends over 102ha. Approximately 200m^2 of the TSF footprint was converted into a General Waste Landfill. The proposed Mponeng Lower Compartment TSF is proposed adjacent to the Mponeng Upper Compartment TSF. The Mponeng Lower Compartment TSF will be approximately 102ha in size and store approximately 43 million tons of tailings material. It is anticipated to accommodate tailings deposition for a period of 10 years at a rate of 350 kilotonnes per month (ktpm). The end-of-life limiting factors considered were a rate of rise below 4 meters per annum and a final facility height of 60 meters, ensuring safe and sustainable deposition over the operational life of the facility. A facility with an alternative barrier system is proposed due to the fact that tailings have already been deposited on the proposed footprint below the level that a liner can be safely installed.
Construction of slurry and return water pipelines	In order to redeposit on the Mponeng Lower Compartment TSF from the Savuka Plant, slurry pipelines will need to be constructed from the Savuka Plant to the TSF. The proposed new residue pipeline route is approximately 3.36km long while the proposed new return water pipeline route is approximately 4.85km long. The 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.
Construction of pipeline bridge	In order for the pipes to connect Savuka Plant and the Mponeng Lower Compartment TSF, a new pipe bridge approximately 100m long and 5m

Activity	Description / Auxiliary Activity
	wide will be required to cross the channelled valley bottom wetland. An engineered solution to prevent spillages from the pipeline from entering the wetland are being investigated.
Construction of pipeline culvert	In order for the pipes to connect Savuka Plant and the Mponeng Lower Compartment TSF, a new pipeline culvert approximately 12m long and 10m wide will be required to cross the surfaced road immediately north of the Mponeng Lower Compartment TSF.
Upgrade of Return Water Dam (RWD)	The current RWD does not have sufficient capacity to accommodate both current and future operational demands. Therefore, the existing dam will need to be enlarged to provide adequate capacity to contain the 1:50-year, 24-hour storm event above the mean operating level The proposed Mponeng Lower Compartment TSF RWD will be of the earth fill embankment type, with an upstream and downstream slope of 1:3 (V:H). The RWD will have a footprint is approximately 8.20ha with a capacity of 327,000m^3. This capacity is sufficient to contain all dirty water inflows without the dam spilling more than once in 50 years. A Class C performance barrier system has been opted for the RWD.
Installation of Clean Water Diversion System - Spring Diversion	The spring water currently daylighting in the northern portion of the proposed footprint will also require diversion around the TSF. A dedicated spring capturing and diversion system will be required prior to the installation of sub-surface drains. This system may be implemented on the upstream side of the currently active spring located along the northern boundary of the proposed lower compartment footprint. The purpose of this spring capturing system is to intercept and manage any clean groundwater emerging from the surrounding higher-elevation areas before it enters the TSF footprint. Further investigations into the most appropriate options to capture and divert the spring water are being undertaken and will be investigated further.
Installation of Dirty Water Systems	Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources Government Notice 704 (GN704) requires that all dirty water collection and conveyance systems associated with mining-related activities be designed to prevent seepage of polluted water and promote the reuse of water. To achieve both regulatory compliance and cost efficiency, trapezoidal concrete-lined channels are planned to be installed within the existing, unlined paddocks. These channels will serve to collect and convey dirty water in a controlled manner, minimising seepage and preventing contamination of the surrounding environment. The channels will discharge into concrete silt traps before entering the RWD.
Undertaking of ground improvement	In addition to the presence of a spring within the footprint and the proposed groundwater-intercepting sub-surface drainage network designed to manage seepage and maintain slope stability, there is also a landfill site located on the northern portion of the facility that poses a significant geotechnical and environmental risk. The landfill site contains heterogeneous and potentially compressible waste materials, which introduces the possibility of uneven settlement over time, especially under the loading conditions imposed by the overlying tailings. To mitigate this risk, long-term ground improvement measures are necessary. Ground improvement, such as dynamic compaction, is recommended to densify the underlying landfill material, reduce voids, and improve uniformity in stiffness and bearing capacity across the area. To further support the foundation and distribute applied loads evenly, a load-distribution platform should be constructed.

2.2 RECOMMENCEMENT OF DEPOSITION ON MPONENG LOWER COMPARTMENT TSF

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 5**).

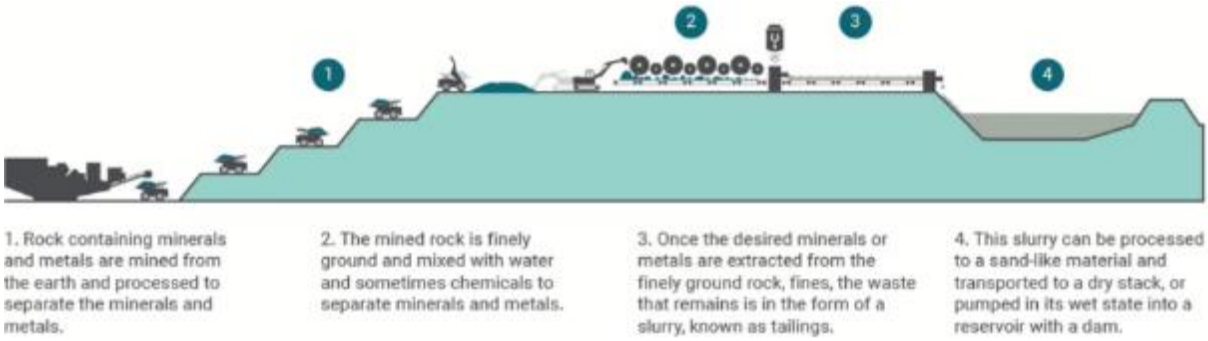


Figure 5: Tailings Storage Facility Process (International Council on Mining and Metals, 2023).

From the mill, the tailings are 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 Mponeng Lower Compartment TSF is a slurry TSF (refer to **Figure 6**) and will cover a footprint of approximately 102ha. Based on the Mponeng Lower Compartment Tailings Storage Facility Pre-Feasibility Study Report (Eco Elementum, 2025), the Mponeng Lower Compartment TSF was designed to meet the client's minimum capacity requirement of 40.3 million tonnes (Mt). The current design exceeds this target, providing a total storage capacity of approximately 43 Mt. This design was developed with operational and geotechnical constraints in mind, specifically aiming to limit the rate of rise to a maximum of 4 meters per annum and to cap the final facility height at 60 meters, ensuring safe and sustainable deposition over the operational life of the facility.

The facility will include a starter wall and a toe wall as part of its initial construction phase. The TSF will be raised in successive 8 m high lifts, each separated by 8 m wide benches. This stepped configuration not only aids in structural stability and erosion control but also provides access for construction and inspection activities as the facility is developed over time. At this stage the proposed delivery system is expected to consist of hydrocyclones. The underflow material (coarse, dewatered tailings) is separated from the slurry by the hydrocyclones and deposited at the outer core. The overflow material (fine tailings and slurry water) is deposited in the basin. The facility will be served by hydrocyclones on three sides (north, east, and south) with a proposed spigot system to deposit tailings at the interface of the upper and lower compartments.

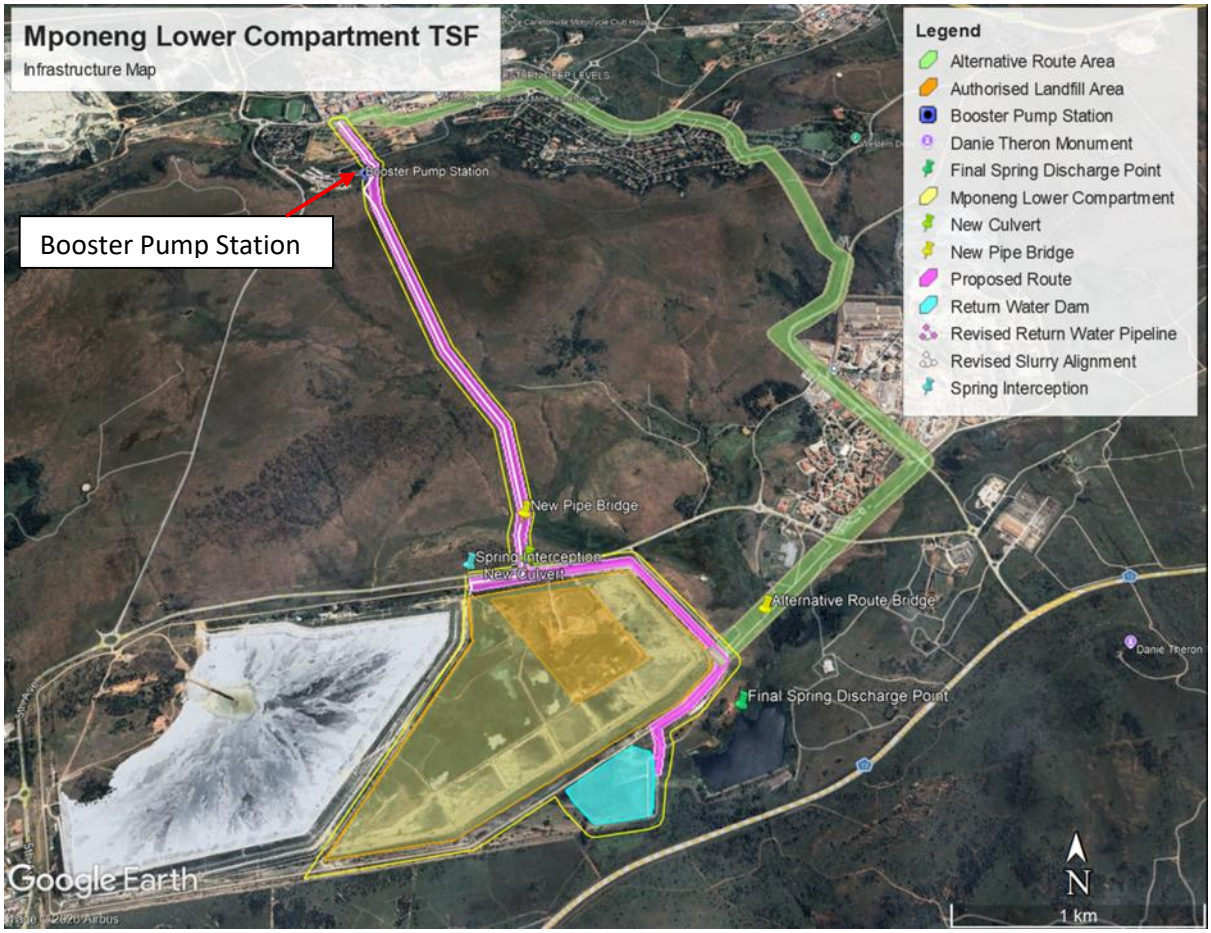


Figure 6: Aerial view of Mponeng Tailings Storage Facility and proposed infrastructure at the Harmony West Wits Region Operations (Google Earth, 2025).

Supernatant water (the liquid that remains above a solid residue after a mixture has been allowed to settle or has been centrifuged to separate components) is decanted by a gravity penstock system through a flanged steel pipe encased in concrete beneath the pollution control barrier. The penstock outfall pipe discharges water into the solution trench from where the water is conveyed via the concrete-lined dirty canal system and silt trap to the RWD.

2.3 DESIGN CONSIDERATIONS

The precise dimensions and details of the proposed new Mponeng Lower Compartment TSF are not final at this stage as the engineering designs are still being completed however, it should be emphasised that the deposition and storage of slurry (TSF) itself will be on the existing Mponeng Lower Compartment TSF footprint. Based on the Phase 2 Engineering Designs (Eco Elementum and Engineering (Pty) Ltd (2025)) the following information is presented:

- Mponeng Lower Compartment TSF: the TSF will cover a total area of approximately 102 hectares (ha). The Mponeng Lower Compartment TSF will store approximately 43 Mt. The facility is expected to accommodate tailings deposition for a period of 10 years at a rate of 350 ktpm. The end-of-life limiting factors considered a rate of rise below 4 meters per annum and a final facility height of 60m.
- The underflow material (coarse, dewatered tailings) is separated from the slurry by the hydrocyclones and deposited at the outer core. The overflow material (fine tailings and slurry water) is deposited in the basin.
- Contamination from the facility is expected to be relatively low as previous studies have shown very low seepage rates below/around the facility (mainly due to low permeability bedrock and artesian

conditions). Additionally, unique geotechnical conditions are present at the site, including tailings below the level a liner can be safely stored, landfill waste and previously saturated zones, create a risk of differential settlement and localised weak zones affecting stability. These conditions hinder the safe and effective installation of an HDPE liner. The proposed re-commissioning concept therefore comprises an alternative barrier system facility supported by a robust seepage control system, with the objective of maintaining global stability and limiting seepage impacts to an acceptable level during operation and post-closure.

- 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.
- Construction of pipeline bridge (designs still in progress) is likely to make use of two concrete pillars (beams) approximately 100m apart on either side of the channelled valley bottom wetland with the pipelines running from one end to the other on top of an approximately 5m wide steel trusses framework.
- Construction of pipeline culvert (designs still in progress): the culvert will approximately 12m long and 10m wide arch, circular or box culvert made of concrete or corrugated metal.
- Upgrade of Return Water Dam (RWD) to a Class C lined, earth fill embarkment RWD with a capacity of 327,000m^3. This capacity is sufficient to contain all dirty water inflows without the dam spilling more than once in 50 years.
- Installation of Clean Water Diversion System (Spring Diversion): the spring water currently daylighting in the northern portion of the proposed footprint will require diversion around the TSF. A dedicated spring capturing and diversion system will be required prior to the installation of sub-surface drains.
- Installation of Dirty Water Systems: to achieve both Government Notice 704 (GN704) regulatory compliance and cost efficiency, trapezoidal concrete-lined channels are planned to be installed within the existing, unlined paddocks. Supernatant water is decanted by a gravity penstock system through a flanged steel pipe encased in concrete. The penstock outfall pipe discharges water into the concrete-lined channels.
- Undertaking of ground improvement: in addition to the presence of a spring, there is also a landfill site located on the northern portion of the TSF that poses a significant geotechnical and environmental risk as it contains heterogeneous and potentially compressible waste materials, which introduces the possibility of uneven settlement over time. To mitigate this risk, long-term ground improvement measures are necessary. Ground improvement, such as dynamic compaction, is recommended to densify the underlying landfill material, reduce voids, and improve uniformity in stiffness and bearing capacity across the area.

The engineering designs are attached as **Appendix 8**.

2.4 OPERATIONAL PHASE

This section discusses the two main operational process namely, deposition and water recycling.

2.4.1 DEPOSITION

Tailings will be deposited using hydrocyclones, a method of 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 7**). 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 7: 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 **cyclone deposition has higher water recovery rates and is also preferred from a geotechnical perspective**.

Golden Core Trade and Invest proposes to implement the hydrocyclone deposition method. The hydrocyclone is a widely used classifier in the mineral-processing industry. It is installed in close circuit between the grinding and conditioning paths for flotation of complex base metal ore. It consists of a cylindrical section at the top connected to a feed chamber for continuous inflow of pulp, which is then expelled through an overflow pipe. The unit continues downward as a conical vessel and opens at its apex to the underflow of coarse material (**Figure 8**). The feed is pumped under pressure through the tangential entry that imparts a spinning motion to the pulp. The separation mechanism works on this centrifugal force to accelerate the settling of particles. The velocity of slurry increases as it follows in a downward centrifugal path from the inlet area to the narrow apex end. The larger and denser particles migrate nearest to the wall of the cone. The finer/lighter particles migrate toward the center axis of the cone, reverse their axial direction, and follow a smaller diameter rotating path back toward the top. The oversized discharge fractions return to the mill for regrinding, while the undersized fractions move to the conditioning tank for flotation. Hydrocyclones perform at higher capacities relative to their size and can separate at finer sizes than other screening and classification equipment.

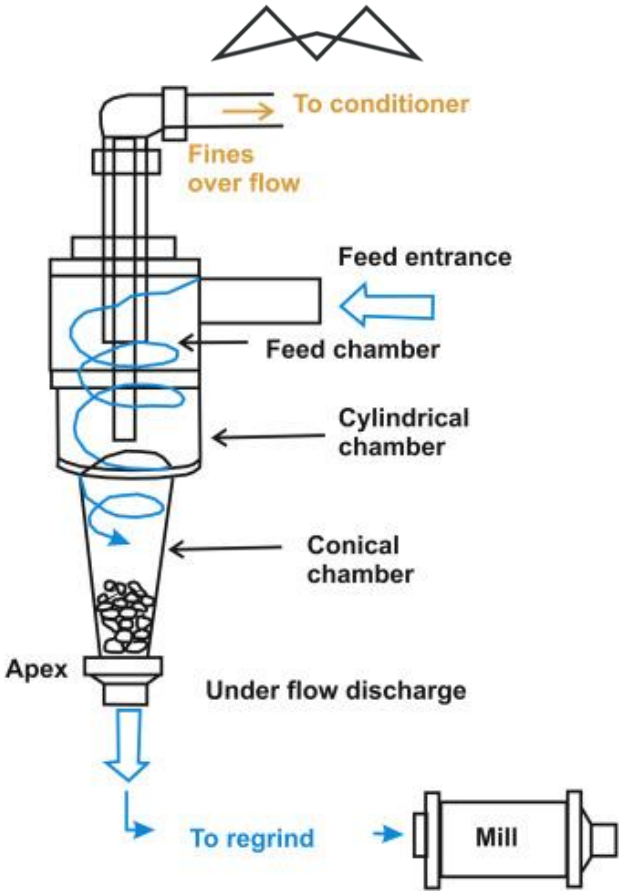


Figure 8: Sketch diagram showing the working principle of a hydrocyclone in close circuit classification (Haldar, 2018)

With no moving parts, hydrocyclones are inherently simple and robust, leading to lower initial investment and reduced maintenance needs. They can be compact and occupy less space, and multiple units can be arranged in parallel or series to handle large volumes. Hydrocyclones can process large volumes of material, making them efficient for high-capacity applications. They can operate at high temperatures and can handle both liquid mists and dry materials, depending on the application. However, a significant drawback is their high energy requirement due to the pressure drop across the unit, leading to high operating costs. Their efficiency drops significantly for very fine particles (under 5-10 micrometers) and can be poor at less-than-capacity flow. While simple, the abrasive nature of the slurry can cause wear and tear on the cyclone's materials over time. They are also unsuitable for processing sticky or adhering materials, which can clog the cyclone.

2.4.2 WATER USE AND RECYCLING

Water use in the gold recovery process includes:

- Ore slurry transport,
- Reagent preparation,
- Thickening and clarification,
- Process cooling (e.g., fridge and ice plants),
- Dust suppression, and
- Effluent and sludge handling.

Potable water is supplied to the plant through Rand Water infrastructure, and effluent from the gold plant is routed into containment or reuse systems wherever possible. All significant water-related processing activities are accounted for in the monthly site water balance reports. The final treated residue from the Mponeng Gold Plant is pumped to the Mponeng TSF Complex. Water is decanted using the penstocks at the facility's centre and

piped into the RWDs. The water in the RWDs is recirculated to the plant as process water. The delivery pipelines to the tailings dam are open-ended, and the manual operation of the discharge valves controls the tipping area. Conventional hand packing and mechanical ditching methods construct the sidewalls.

The Mponeng RWD is located downstream of the Mponeng TSF and receives return water from the tailings facility, as well as runoff from the surrounding operational area. Water is recirculated to the Mponeng Gold Plant for reuse in the milling and CIP process. The Mponeng Operations also include several engineered surface water dams that play a critical role in managing return water, runoff, seepage, and stormwater within the mine boundary. These dams are integral to the site's pollution control system and contribute to water reuse, effluent regulation, and containment of potentially contaminated flows. The dams are designed to operate under a closed-loop system, where process water and runoff are captured, monitored, and reused where feasible, minimising the discharge to the surrounding environment. The Water Use Licence(08/C23E/AFGJCEI/12157) regulates the operation of these dams, with specific conditions relating to freeboard, lining, monitoring, and overflow control.

2.5 DECOMISSIONING AND CLOSURE PHASE

The closure of TSFs will involve the rehabilitation of the facility. Contour walls will be constructed, after which additives will be applied in order that favourable conditions for plant growth can occur. Once this has been achieved, vegetation will be planted on top and on the sides of the tailings to stabilise the tailings against wind and water erosion. When the vegetation has been established maintenance and monitoring of the tailings dam will take place. The maintenance will take place over a period of three years, while the monitoring will take place over a period of five years on a quarterly basis by analysing samples for pollutants.

2.5.1 LANDFORM

The Mponeng Lower Compartment TSF as designed by Eco Elementum consists of five (5) benches to a final height of approximately 37 meters. The benches are designed to be at a slope of 1:2.5 which will ultimately be at an overall rehabilitated slope of 1:4. The final elevation of the TSF is designed to be a flat elevation with no slope added to the top of the TSF. All underdrainage systems are to drain out within the RWD as designed. It is assumed that sufficient topsoil and cover materials are available and can be sourced from borrow pits nearby if and where required for the capping system.

A landform dividing into four chutes is proposed to assist with shorter slopes and less cut to fill work. A cut to fill balance will be achieved with this alternative by utilising material from the side slopes to shape the flat basin for free drainage. To achieve the final landform a cut to fill shaping exercise of the dried tailings material will be required. The slopes to be achieved ranges from between 1:100 to 1:150 with four valleys created in the Northern, Eastern and two in the Southern directions to divert the clean water from the facility.

2.5.2 CAPPING SYSTEM

For the proposed landform a compliant Class C Capping system is proposed catering for a worst-case scenario. The cover system described in this Closure and Rehabilitation Report (MineLock Environmental Engineers, 2026) is conceptual, however it is recommended that the following design process is followed in detail before closure:

- Taking into consideration all applicable design criteria and waste classification;
- Conducting a trade-off assessment of a compliant capping system versus an alternative system considering the seepage risks.
- Development of a capping composition that satisfy the regulatory requirements as well as the norms and standards (to NEMWA (Act 26 of 2014) and regulations R635 and R636 and the NEM:WA 2008 (CT No. 59 of 2008) and the associated regulations (R. 632, July 2015 as amended on 21 September 2018; R634, August 2013; R635);
- Considering the total tensile strain in geomembrane should this be a preferred option;
- Conducting an in-detail veneer stability analysis as well as a detailed geotechnical investigation.

- Understanding in depth the geohydrological and hydrological aspects in and around the site. This includes an understanding of erosion risks and mitigation measures.
- Conducting a detailed soil source investigation as well as understanding the vegetation requirements.

Two details are proposed for the two types of slopes apparent on this facility:

2.5.2.1 FLAT BASIN AREA

The conceptual design gave consideration to the requirements in terms of the amendment to NEMWA (Act 26 of 2014) and regulations R635 and R636 on the flat areas of the landform design of the TSF facility. The different aspects of the capping system are discussed below with **Figure 9** as reference:

- The final TSF landform will be compacted with a Bomag roller 212D-0 (3 passes every 300 mm) on the flat areas to ensure final compaction and further limiting oxygen from entering;
- A 1.5 mm HDPE geomembrane will be placed directly on top of the fine tailings material;
- A 300mm subsoil clayey type layer from a specified borrow pit in the area. This material will assist with the composite effect of the barrier system and act as an additional protection layer since the placed and spread topsoil/growth medium layer will have to be loosened (ripped); and
- The 200 mm topsoil layer that will be adequately vegetated are place on top of the clay layer to act as a growth medium to further limit infiltration and prevent erosion.

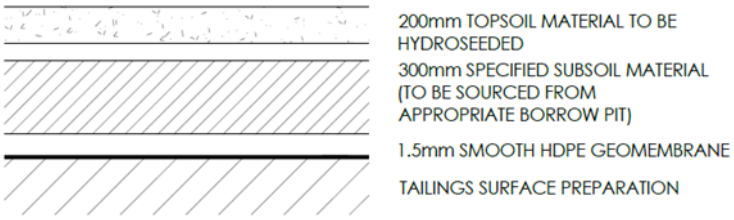


Figure 9: Proposed capping system for flat areas (MineLock, 2026).

2.5.2.2 SIDE SLOPE AREAS

Given the 1:4 side slope of the facility, a strengthened capping system is proposed for the side slopes to achieve a water shedding cover system. The different aspects of the side slope capping system are discussed below with **Figure 10** as reference:

- The final TSF landform will be compacted with a Bomag roller 212D-0 (3 passes every 300 mm) on the flat areas to ensure final compaction and further limiting oxygen from entering;
- A 350mm subsoil clayey type layer from a specified borrow pit in the area. This material will assist with the composite effect of the barrier system and act as an additional protection layer since the placed and spread topsoil/growth medium layer will have to be loosened (ripped);
- The 200 mm topsoil layer that will be adequately vegetated are place on top of the clay layer to act as a growth medium to further limit infiltration and prevent erosion; and
- A coconut fibre woven mesh is to be placed on top of the topsoil material as erosion control during establishment of vegetation

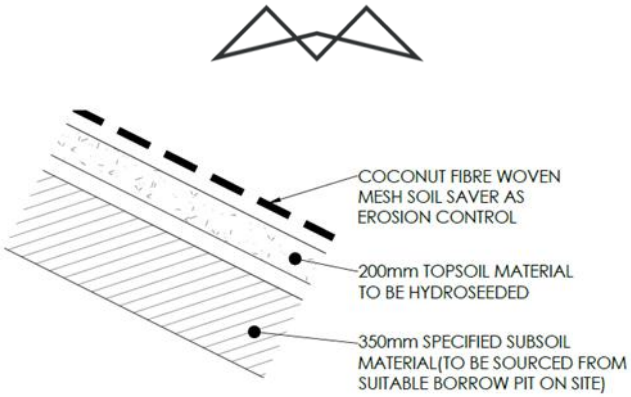


Figure 10: Proposed capping system for side slopes (MineLock, 2026).

2.5.3 LEACHATE MANAGEMENT

Leachate will be managed with a network of existing designed subsoil drainage systems. The subsoil drainage system will flow into the proposed new return water dam as designed by Eco Elementum. During operation the leachate water will flow into the concrete lined channels which flows into the return water dam. After the life of the facility, when rehabilitation will occur, the concrete channels will be removed and replaced with a clean water diversion dish. A cutoff trench will be installed at the toe of the facility to intercept the existing leachate pipes to still flow into the return water dam for monitoring purposes.

Figure 11 illustrates the location of the interception trench that will be used to intercept all contaminated seepage from the facility which will be collected in the return water dam. The trench is to be filled with 19mm washed stone, with a geocomposite drain attached to a wastex pipe to promote waterflow into the interception trench.

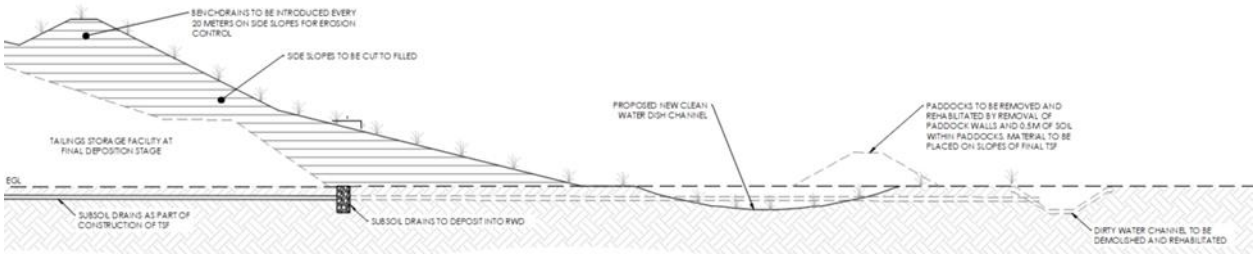


Figure 11: Detail of proposed stormwater infrastructure (MineLock, 2026).

2.5.4 STORMWATER MANAGEMENT

The dirty channels around the facility are to be removed and re-structured as a clean water dish with outlet structures in specified intervals. Benchdrains are introduced on the side slopes of the tailings facility to facilitate with water flow and erosion protection. Stormwater chutes are to be constructed on the side slopes of the TSF for safe water conveyance and are to be sized accordingly (refer to **Figure 12**).

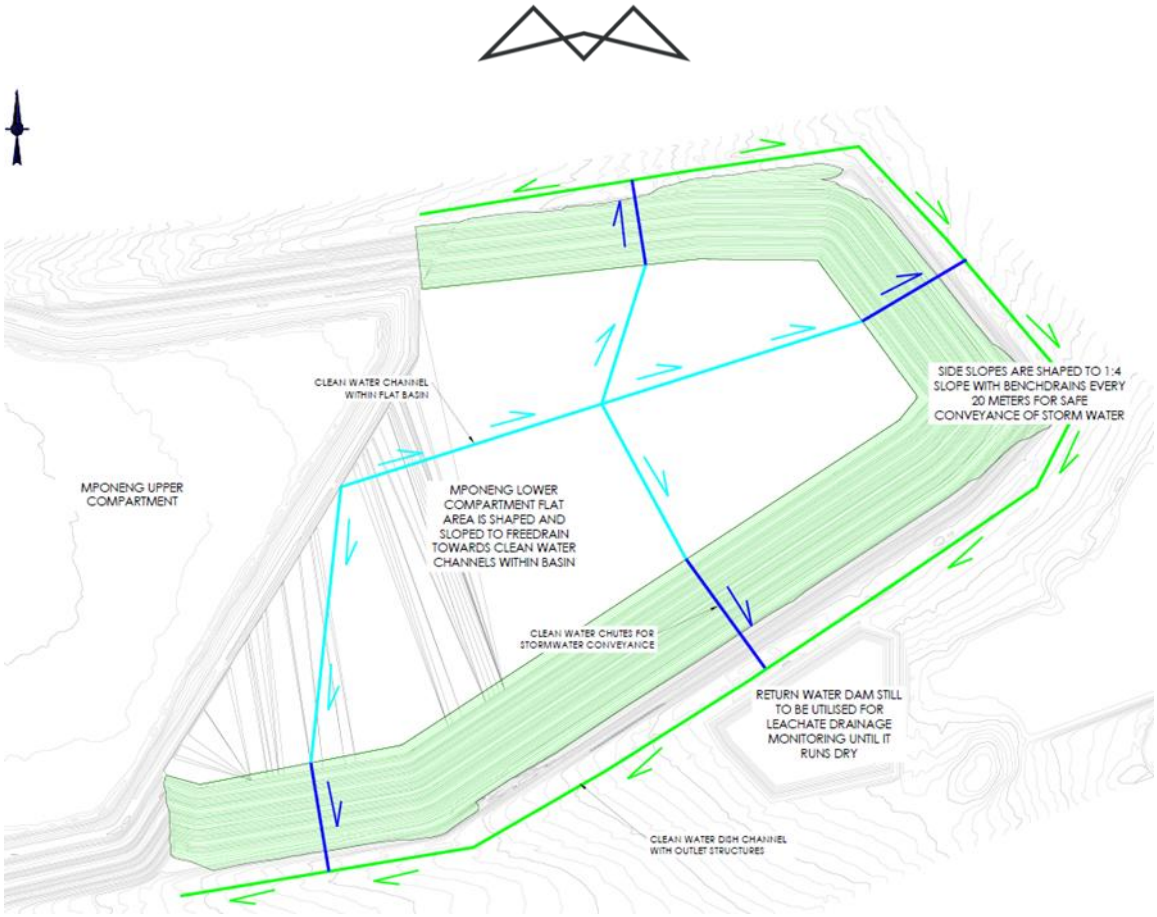


Figure 12: Storm water management for scheduled closure of Mponeng lower compartment (MineLock, 2026).

The proposed details for all the channels can be seen in **Figure 13** to **Figure 16**.

- Clean water channels within the basin of the TSF are designed to be shaped into the landform design of the tailings facility, thus the channel is a v-shaped channel with side slopes of 1:150 to promote a flat and natural aesthetic. The channels are to be lined by the same capping system as proposed for the landform and vegetated as per the specifications (**Figure 13**).

- Clean water chutes are proposed to be concrete lined channels with stone pitching protruding from the concrete as erosion control measures for the steep side slopes of 1:4. The chutes are to be trapezoidal channels with side slopes of 1:3 (**Figure 14**).

- Clean water dish channel should be sized to accommodate all water from the TSF facility. The dish is designed to emulate the natural surroundings as closely as possible and to safely convey all clean stormwater away from the tailings facilities (**Figure 15**).

- Energy dissipating attenuation outlet structures are introduced in intervals along the alignment of the clean water dish channel to assist with the safe conveyance of stormwater during a storm event and to minimise erosion and scouring of the channel.

- Benchdrains are introduced every 20 meters on the 1:4 side slopes of the tailings facility as erosion control mechanisms during a storm event. The purpose of the benchdrains is to convey any and all stormwater along the slope towards the storm water chutes in a controlled manner to avoid erosion and scouring of the designed capping system (**Figure 16**).

Seeding can be done by manual sowing or mechanically using agricultural seeding equipment. All seeded areas need to be rolled to improve soil/seed contact.

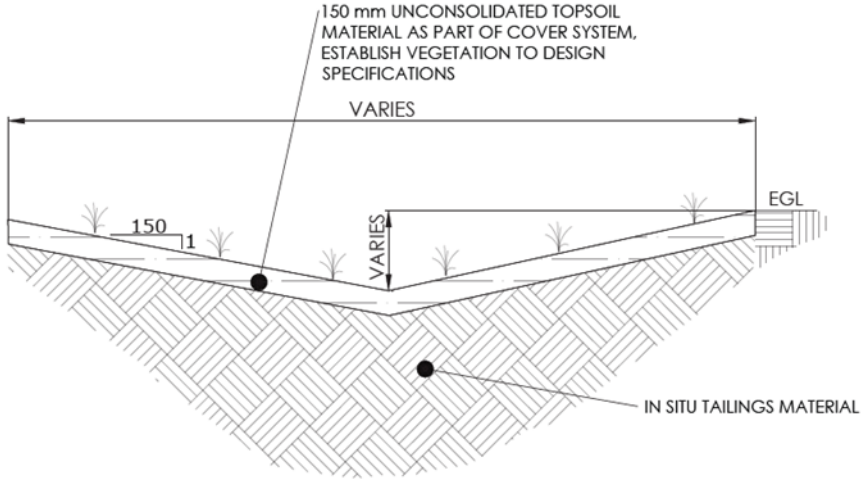


Figure 13: Typical detail of clean water channel within basin (MineLock, 2026).

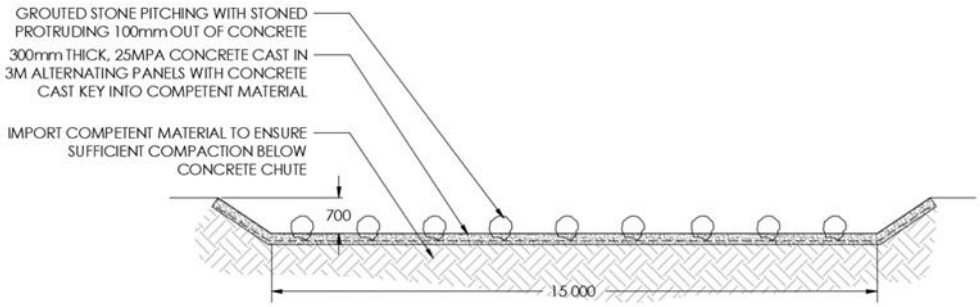


Figure 14: Typical detail of clean water chutes (MineLock, 2026).

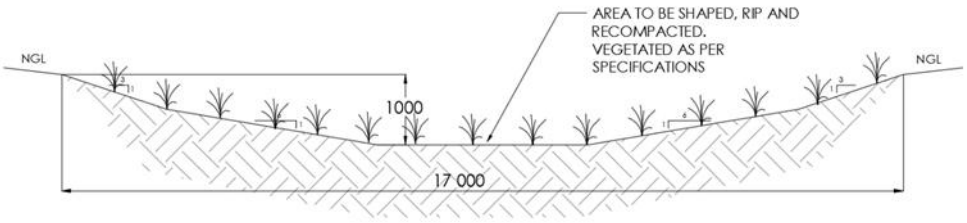


Figure 15: Typical detail of clean water dish channel (MineLock, 2026).

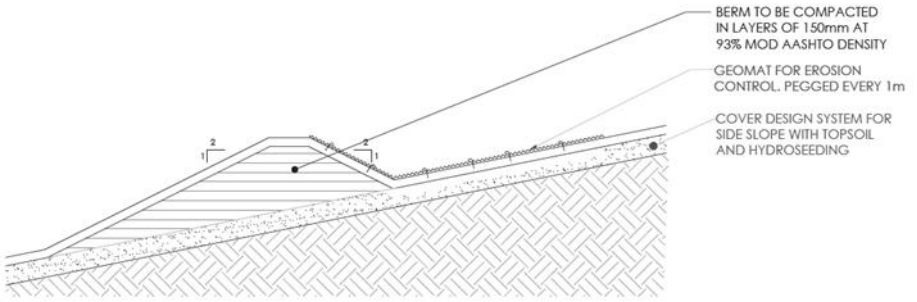


Figure 16: Typical detail of bench drains (MineLock, 2026).

2.5.5 MONITORING

Allowance was made for the following:

- Air (Dust) monitoring at a monthly frequency for decommission phase and allowance was made for 6 months at closure phase;
- Groundwater quality analysis on a quarterly basis and water level monitoring monthly
- Surface water monitoring at a quarterly frequency.
- Biodiversity and soils monitoring should be done (visually) on a monthly basis at decommissioning phase and annual vegetation and rehab survey at closure phase

The post closure phase will be from after closure phase with the allowance of surface water quality monitoring for 5 years and annual groundwater quality monitoring annually for the next 50 years.

2.6 EXTENT OF THE ACTIVITY

The proposed Mponeng Lower Compartment TSF is proposed within an existing TSF footprint which extends 102ha wide. The end-of-life limiting factors considered were a rate of rise below 4 meters per annum and a final facility height of 60 meters, ensuring safe and sustainable deposition over the operational life of the facility.

2.7 KEY ACTIVITY PROCESSES AND PRODUCTS

Materials are being deposited on specialised drainage infrastructure, as such the only key product is the tailings being deposited from the Savuka and Mponeng Plant. As part of the tailings being deposited, wastewater is produced which follows the existing drainage infrastructure to return water dams.

2.8 ACTIVITY LIFE DESCRIPTION

The Mponeng Lower Compartment TSF will accommodate tailings deposition for a period of 10 years at a rate of 350 ktpm.

2.9 ACTIVITY INFRASTRUCTURE DESCRIPTION

For a full description of the technical aspects of the infrastructure for the Savuka 7a &7b TSFs, please refer to **Section 2.1** of this report.

2.10 KEY WATER USES AND WASTE STREAMS

The following details are relevant to the current application, these are already licensed under the current WUL:

- Radioactive waste is handled and disposed of as per the requirements of the Certificate of Registration (COR - 58A 0192) issued in terms of the National Nuclear Regulator (NNR) Act, 1999 (Act No. 47 of 1999);
- TSF for storing of slimes affected water;
- Return Water Dam for re-use of water from the TSF operations; and
- Domestic Waste is sorted on site and disposed to a registered Mponeng Landfill Site which will be decommissioned as part of the recommencement of deposition on the Mponeng Lower Compartment.

2.11 ORGANISATIONAL STRUCTURE OF ACTIVITY

The reporting structure/procedure for Mponeng Operations / Harmony in relation to environmental management is presented in **Figure 17** below.

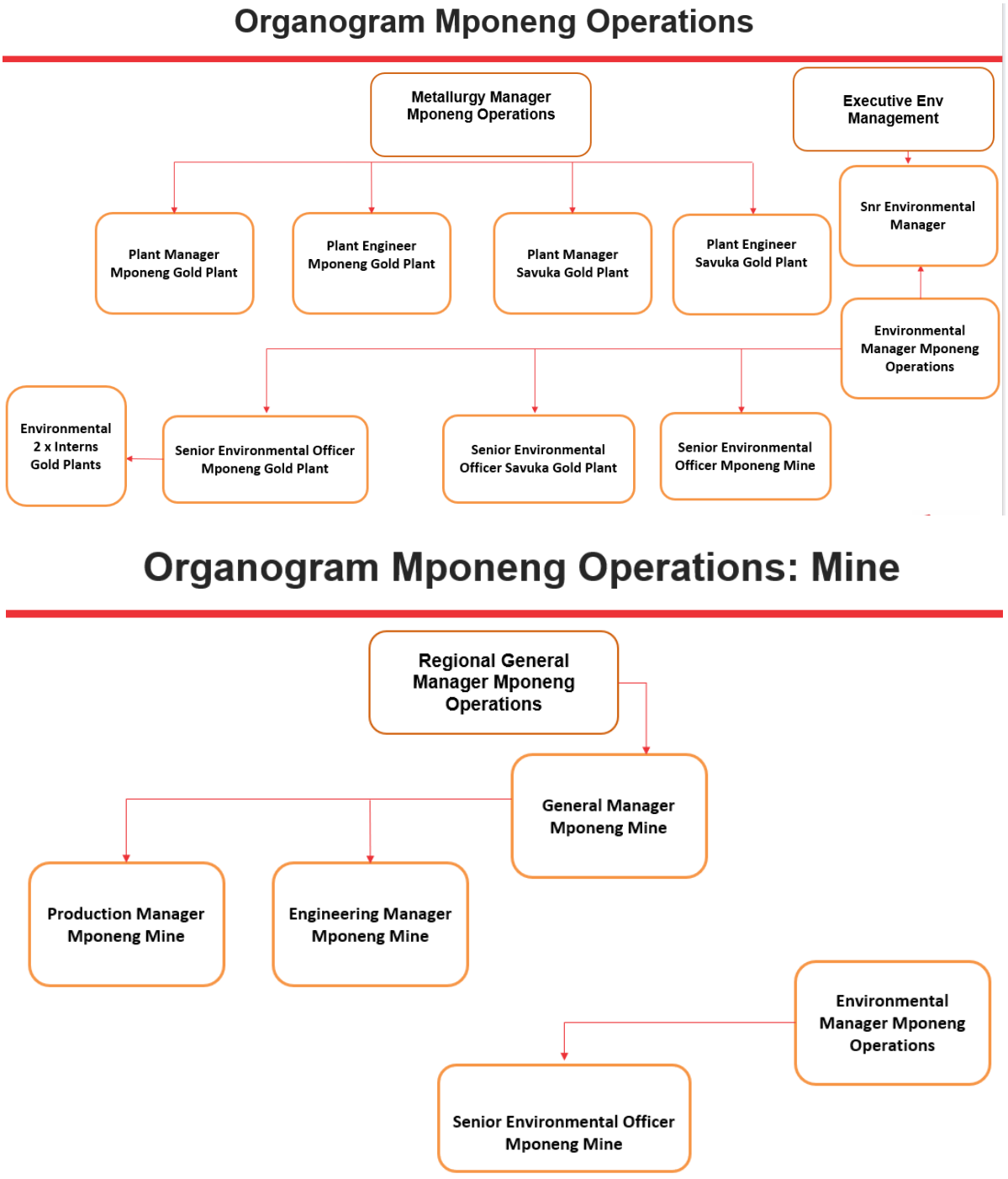


Figure 17: Environmental Organogram of Harmony Gold Mponeng Operations.

2.12 BUSINESS AND CORPORATE POLICIES

The applicable business corporate policy of the Applicant is the Health Safety and Environment Policy. The policy emphasises the company's commitment to:

- Conform to the Health, Safety and Environment Legislation;

- Manage and maintain an HSE and Quality System that is in line with internationally recognised quality management systems;
- Conduct business in a manner that safeguards its people and the environment from harm; and
- To communicate with employees, the community and authorities on issues that is relevant to the mine and the community.

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

This IWWMP forms part of the WULA application for Mponeng Lower Compartment TSF. This section will discuss the various regulatory requirements relevant to the IWWMP including the water uses being applied for, as well as details on the existing lawful uses and exemption to GN 704.

3.1 SUMMARY OF WATER USES

This section focuses on the water use activities to be applied for as part of the WULA. A summary of the water uses applied for is indicated in **Table 5** and illustrated in **Figure 18**.

Table 5: Proposed water uses to be licensed

Water use	Description	Property Description	Coordinates	Volumes discharged per tonnes per annum / Storage capacity m^3 and area m^2 OR Length
Section 21 (c) & (i) *Dam, HGM 1 & 2 and NFEPA River*	Mponeng Lower Compartment TSF	RE/23/115 of Farm Elandsfontein 115IQ	26°27'10.48"S; 27°24'43.20"E	Capacity of 43 000 000 tonnes or 121 762 440m^3
Section 21 (c) & (i) *Dam, HGM 1 & 2 and NFEPA River*	Spring Interception System	RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°26'54.67"S; 27°24'25.92"E **End:** 26°26'48.66"S; 27°24'58.07"E	1km long
Section 21 (c) & (i) *HGM 1 & 2*	Slurry pipe alternative route 1 *NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. Flanged steel pipeline installed above-ground on pre-cast concrete plinths.*	Portion 3 of Farm Blyvooruitzicht 116 IQ, RE/5/115 of Farm Elandsfontein 115IQ, and RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°25'24.94"S; 27°23'59.15"E **End:** 26°26'57.98"S; 27°24'31.52"E	3.4km long
Section 21 (c) & (i) *Artificial Dam, HGM 1 & 3 and NPD*	Slurry pipe alternative route 2 *NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. Flanged steel pipeline installed above-ground on*	Portions 3, 4 & 5 of Farm Blyvooruitzicht 116 IQ, RE/5/115 of Farm Elandsfontein 115IQ, and RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°25'24.94"S; 27°23'59.15"E **End:** 26°27'6.68"S; 27°25'10.23"E	6.7km long

Water use	Description	Property Description	Coordinates	Volumes discharged per tonnes per annum / Storage capacity m^3 and area m^2 OR Length
	pre-cast concrete plinths.			
Section 21 (c) & (i) *HGM 1 & 2*	Return water pipe alternative route 1 *NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. Flanged steel pipeline installed above-ground on pre-cast concrete plinths.*	Portion 3 of Farm Blyvooruitzicht 116 IQ, RE/5/115 of Farm Elandsfontein 115IQ, and RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°25'24.94"S; 27°23'59.15"E **End:** 26°27'23.20"S; 27°25'0.57"E	4.9km long
Section 21 (c) & (i) *Artificial Dam, HGM 1 & 3 and NPG*	Return water pipe alternative route 2 *NB diameter of more than 360mm with a peak throughput of more than 120 ℓ/s. Flanged steel pipeline installed above-ground on pre-cast concrete plinths.*	Portions 3, 4 & 5 of Farm Blyvooruitzicht 116 IQ, and RE/23/115 of Farm Elandsfontein 115IQ RE/5/115 of Farm Elandsfontein 115IQ,	**Start:** 26°25'24.94"S; 27°23'59.15"E **End:** 26°27'23.20"S; 27°25'0.57"E	6.9km long
Section 21 (c) & (i)	Pipeline Bridge	RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°26'48.19"S; 27°24'38.65"E **End:** 26°26'42.69"S; 27°24'39.09"E	100m long
Section 21 (c) & (i)	Pipeline Culvert	RE/23/115 of Farm Elandsfontein 115IQ	**Start:** 26°26'53.30"S; 27°24'39.57"E **End:** 26°26'52.97"S; 27°24'39.49"E	12m long
Section 21 (c) & (i)	Upgrade of Return Water Dam	RE/23/115 of Farm Elandsfontein 115IQ and RE/27 of Farm Elandsfontein 144IQ	26°27'25.00"S; 27°24'54.93"E	Capacity of 327 000m^3

Water use	Description	Property Description	Coordinates	Volumes discharged per tonnes per annum / Storage capacity m^3 and area m^2 OR Length
Section 21 (g)	Mponeng Lower Compartment TSF	RE/23/115 of Farm Elandsfontein 115IQ	26°27'10.48"S; 27°24'43.20"E	Capacity of 43 000 000 tonnes or 121 762 440m^3
Section 21 (g)	Upgrade of Return Water Dam	RE/23/115 of Farm Elandsfontein 115IQ and RE/27 of Farm Elandsfontein 144IQ	26°27'25.00"S; 27°24'54.93"E	Capacity of 327 000m^3

Notes:

HGM 1 – Channelled Valley Bottom Wetland; HGM 2 – Unchannelled Valley Bottom Wetland; HGM 3 – Hillslope Seep; NFEPA - National Freshwater Ecosystem Priority Areas; NPD – Non-perennial Drainage

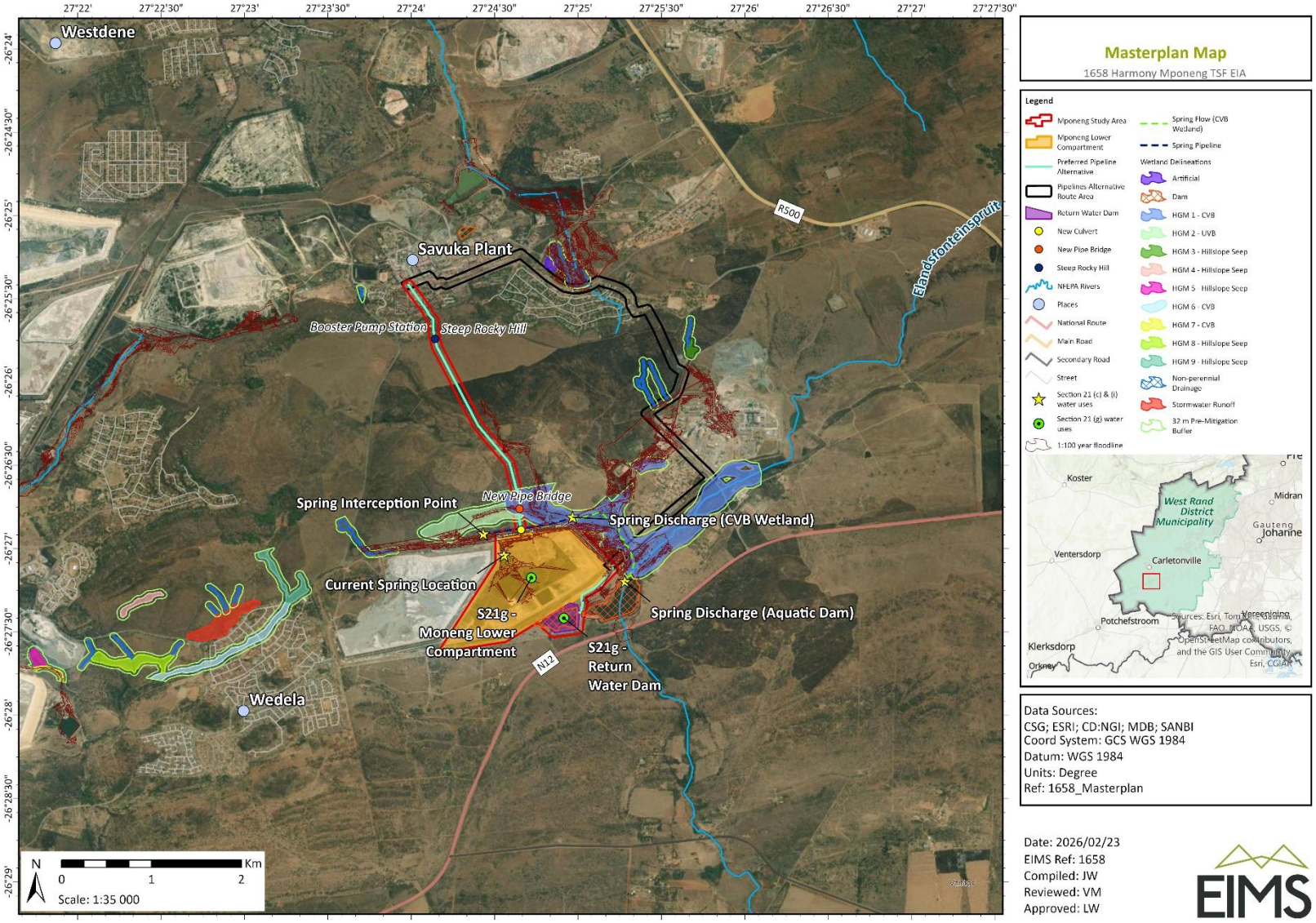


Figure 18: Master Plan Map indicating geographical locations of water uses for the Mponeng Lower Compartment TSF

3.2 EXISTING LAWFUL USES

In terms of Section 32 of the NWA, an existing lawful water use is defined as follows:

"*Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act*".

The Applicant has various existing water uses for its operations in the greater West Wits region. These uses include but are not limited to plant activities, TSF facilities, pipelines, return water dams etc. The Water Uses Licensed under WUL 08/C23E/AFGJCEI/12157 are described in the **Table 6** below.

Table 6: Existing licensed water uses for Mponeng Operations.

Water use	Purpose / Description	Volumes / Capacity / Dimensions	Property Description	Coordinates
Section 21 (a)	Abstraction of extraneous underground mine water for reuse in the process.	250 000 m^3/a	Portion 5 of Farm Elandsfontein 115 IQ	26° 26'15.2" S 27° 25 41.1"E
Section 21(c) and (i)	Proximity of the Mponeng Shaft PCD to the Elandsfonteinspruit and its associated valley bottom wetland area.	Length = 350m Breadth = 115m Height = 10 m	Portion 5 of Farm Elandsfontein 115 IQ	26° 26'31.16" S 27° 25'59.28" E
Section 21(e)	Disposal by irrigation at Mponeng Tailings dam	400 000 m^3/a	Portion 23 of Farm Elandsfontein 115 IQ	26° 27'6.447" S 27° 25'11.958" E
Section 21(f)	Discharge of purified sewage effluent into a tributary of the Elandsfonteinspruit from Mponeng WWTW	1 900 000 m^3/a	Portion 3 of Farm Blyvooruitzicht 116 IQ	26° 25'03.1" S 27° 24'18.7" E
Section 21(g)	Mponeng TSF	2 000 000 t/a	Portion 23 of Farm Elandsfontein 115 IQ	26° 27'6.447" S 27° 25'11.958" E
	Mponeng Return Water Dam	Capacity: 36 200 m^3	Portion 23 of Farm Elandsfontein 115 IQ	26° 27'23.669" S 27° 24'59.298" E
	Mponeng shaft PCD	Capacity: 67 586 m^3	Portion 5 of Farm Elandsfontein 115 IQ	26° 26'16.305" S 27° 20'41.903" E
	Mponeng Holding Dam	Capacity: 367 000 m^3	Portion 23 of Farm Elandsfontein 115 IQ	26° 26'55.973" S 27° 24'50.052" E
	Mponeng waste rock dump	240 000 t/a	Portion 5 of Farm Elandsfontein 115 IQ	26° 26' 6099" S 27° 25'51.050" E

Water use	Purpose / Description	Volumes / Capacity / Dimensions	Property Description	Coordinates
	Mponeng Gold Plant Pollution Control Dam	Capacity: 8 600 m^3	Portion 5 of Farm Elandsfontein 115 IQ	26° 26'19.229" S 27° 26'11.768" E
Section 21(j)	Removing water found underground from Mponeng shaft.	14 000 000 m^3/a	Portion 5 of Farm Elandsfontein 115 IQ	26° 26'15.2" S 27° 25'41.1" E

3.3 THE REQUIREMENTS OF GN 704 OF 4 JUNE 1999

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established General Notice (GN) 704 (dated 4 June 1999) to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The conditions of GN704 relevant to this project are as follows:

- **Condition 4** – Restrictions on locality – No person in control of a mine or activity may:

  (a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked -***the existing footprint cant be changed so proximity to water resource is a given, pipelines are linear and cannot fully avoid watercourses but mitigation measures will be put in place to minimize impacts***

- **Condition 5** – Restrictions on use of material

  No person in control of a mine or activity may use any residue or substance which causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road or railway, or for any other purpose which is likely to cause pollution of a water resource – ***this relates to possible use of Tailings Material as part of the barrier design (if required)***

General Notice (GN) 704 (dated 4 June 1999) placed certain restrictions on mining and related activities for the protection of water resources. In terms of Regulation 3, the Minister may in writing authorise an exemption from the requirements of regulations 4, 5, 6 and 7 on his or her own initiative or on application, subject to such conditions as the Minister may determine. The proposed recommencement of deposition of tailings on the Mponeng Lower Compartment TSF, will require exemptions from GN704 as listed above.

Harmony currently holds no exemptions to the regulations of GN 704 for their Mponeng operations. Motivation for the requested exemptions related to this specific application for the recommencement of deposition on Mponeng Lower Compartment TSF, can be found in Section 3.8.

3.4 GENERAL AUTHORISATION WATER USES

No general authorisations are currently in place nor will there be any general authorisation applications as part of the Mponeng Lower Compartment TSF project.

3.5 WATER USES TO BE LICENCED

Only the water uses being applied for in **Table 5** are relevant to this application. The following water uses are applied for as part of this WULA:

- Section 21 (c) - Impeding or diverting the flow of water in a watercourse;

- Section 21 (g) - Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21 (i) - Altering the bed, banks, course or characteristics of a watercourse.

3.6 WASTE RELATED AUTHORISATIONS

The Mponeng Lower Compartment TSF is by its nature a waste storage facility and as such authorisations will be required in terms of the National Environmental Waste Act, 2008 (NEMWA). Waste is accordingly governed by the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

Section 16 of the NEMWA must be considered which states as follows:

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 Environmental Management Programme (EMPr) to be implemented for this project.

Waste can be defined as either hazardous or general in accordance to 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. Under Category A (hazardous waste), the act makes allowance for, but not limited to, "wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal; oil wastes and wastes of liquid fuels; and construction wastes".

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 Mponeng Lower Compartment 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 Mponeng Lower Compartment TSF, and which form the basis of this waste management licence application, are A14, B7, B10 and B11 presented in **Table 9**.

Table 7: 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 A, Activity A14	The decommissioning of a facility for a waste management activity listed in Category A or B of this Schedule.	The current licensed Mponeng Landfill Site located on the Mponeng Lower Compartment TSF needs to be decommissioned from site and relocated to a different area.
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 establishment

3.6.1 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; and
- 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.

Although Golden Core Trade and Invest prefers an unlined facility, the Mponeng barrier system will be determined in consultation with DWS and will be in compliance with these norms and standards.

3.6.2 NEMWA PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS REGULATIONS, 2015 (GNR 632)

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. The pollution control barrier system shall be defined by the-
    - National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and
    - National Norms and Standards for Disposal of Waste to Landfill, 2013[1].

3.7 OTHER AUTHORISATIONS

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

[1] Note that in terms of these N&S, alternative elements of proven equivalent performance have been considered for the liner system for the Mponeng TSF

acquire mineral and petroleum rights in South Africa. The MPRDA further governs the sustainable utilisation of South Africa's mineral resources. In the event that the proposed activities require material (e.g., sand, gravel, aggregate) for the purposes of construction then the provisions of the MPRDA may apply.

The proposed recommencement of Deposition on Mponeng Lower Compartment triggers an Environmental Authorisation ("EA") for listed activities contained in the Environmental Impact Assessment (EIA) Regulations Listing Notices of 2014, as amended and published in terms of sections 24(2), 24 (5), 24D, 44 and 47(A) (1) (b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"). For the EA application, a Scoping and EIA process is required in accordance with the NEMA EIA Regulations, 2014 (GN R982 of 4 December 2014) ("GN R982"), as amended. It should be noted that at the time of compilation of this report, the EA application was also underway in a separate but parallel process. **Table 8** below indicates the listed activities that have been applied for as part of the above-mentioned application.

Table 8: Applicable NEMA EIA Regulations Listed activities applied for in the EA application.

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 Mponeng from either of the operational plants (Kusasalethu or Savuka), 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 12	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	The proposed TSF and associated infrastructure such as RWD upgrade, pipelines, drainage systems, culvert and bridge exceed the 100m^2 threshold and are located within a natural spring, channelled valley bottom, aquatic dam and proximity of the Elandsfonteinspruit
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 10m^3 to ensure structural integrity.
GN983, Activity 21D	Any activity including the operation of that activity for which the Minister responsible for mineral resources has issued an exemption in a Government Notice in terms of section 106(1} of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the exercising of such exempted activity	Amendment of the approved Mining Right EMPr through a MPRDA Section 102 application may be required.
GNR983 Activity 21F	Any activity including the operation of that activity required for the reclamation of a residue stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit	The residue stockpile may eventually be reclaimed once deposition has been completed and the reclamation process is considered a viable process.

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
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 Mponeng Lower Compartment TSF will involve the disposal of waste with potential to cause pollution, thus, requiring a Water Use Licence in terms of Section 21g.
GN984, Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation.	There will be clearance requirements of indigenous vegetation which may exceed 20ha to allow for the necessary stabilization and installation/upgrades of associated infrastructure required for the recommencement of deposition on Mponeng Lower Compartment TSF.
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. ***c. Gauteng*** *ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans.*	Clearance of vegetation in the preparation of the construction footprint will result in a potential impact on Critical Biodiversity Areas (CBA) 2 and Ecological Support Areas (ESA) 1.
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. ***c. Gauteng*** *ii. National Protected Area Expansion Strategy Focus Areas;* *iii. Gauteng Protected Area Expansion Priority Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority.*	The proposed footprint for the TSF, pipelines and access roads is located within 32m of wetlands, will exceed 10 square metres and will result in a potential impact on Critical Biodiversity Areas (CBA) 2 and Ecological Support Areas (ESA) 1.
GN985 Activity 23	The expansion of— (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs— (a) within a watercourse;	The RWD requires an upgrade to a Class C lined, earth fill embarkment RWD with a capacity of 327,000m^3. This capacity is sufficient to contain all dirty water inflows without the dam spilling more than once in 50 years.

Activity No(s):	Activity	Portion of the proposed project to which the applicable listed activity relates.
	(b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. ***c. Gauteng*** *ii. National Protected Area Expansion Strategy Focus Areas;* *iii. Gauteng Protected Area Expansion Priority Areas;* *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;* *vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority.*	

3.8 APPLICATION FOR EXEMPTION TO REGULATION GN 704 OF JUNE 1999

The following GNR 704 exemptions are applied for as part of this application. The table below includes an impact assessment, a management plan and a monitoring plan in support of the exemption application.

Table 9: Exemption motivations to the GNR 704.

No.	GN 704 Regulation	Activity requiring exemption	Motivation and reason for exemption
1.	4a. Restrictions on locality No person in control of a Mine or activity may – Regulation 4(a): locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100-year flood-line or within a horizontal distance of 100 metres from any watercourse.	Mponeng Lower Compartment TSF	<u>Impact assessment:</u> The watercourses were delineated as part of the Aquatics and Wetland Impact Assessment for the Proposed recommencement of deposition on Mponeng Lower Compartment TSF. The impacts on the watercourses were assessed as part of the above-mentioned report that are attached as **Appendix 3**. The risk assessment is also included in **Section 5.5**. <u>Management plan:</u> Refer to **Section 5.7** for measures to minimise the impact on the watercourses. <u>Monitoring plan:</u> Refer to **Section 5.4** for the monitoring plan applicable to this application.
2	Condition 5: No person in control of a mine or activity may use any residue or substance which causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road or	Mponeng Lower Compartment TSF - Utilising tailings material as part of the barrier system of the TSF.	<u>Impact assessment:</u> The geohydrological environment was assessed as part of the Geohydrological Impact Assessment for the Proposed TSF. The impacts on the groundwater environment were assessed as part of the above-mentioned report.

No.	GN 704 Regulation	Activity requiring exemption	Motivation and reason for exemption
	railway, or for any other purpose which is likely to cause pollution of a water resource		. Management plan: Refer to **Section 5.7** for measures to minimise the impact on the groundwater. Monitoring plan: Refer to **Section 5.4** for the monitoring plan applicable to this application

4 PRESENT ENVIRONMENTAL STATUS

This section of the 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, are described. This information has been sourced from existing information available for the area as well as information received from specialists and engineers.

4.1 LOCATION

The project area falls within the West Rand District Municipality in Gauteng Province. Development area falls within Wards 11, 14 and 27 of Merafong City Local Municipality administrative area. The Mponeng Lower Compartment TSF is located at 26°27'10.53"S; 27°24'39.93"E in Wadela, immediately north of the N12. The site is approximately 7km northwest of Fochville, 10km south of Carletonville central and 20km west of Westonaria.

4.2 TOPOGRAPHY

The area north of the Mponeng TSF is characterized by a series of parallel hills that form the Gatsrand and have an elevation of approximately 1 770 metres above mean sea level (mamsl) (**Figure 19**). The Mponeng Lower Compartment TSF is located at approximately 1 538 mamsl. The difference in elevation of approximately 230mamsl symbolizes the ridge between the TSF and the Savuka Plant.

The study area features a varied aesthetic and visual landscape, with mining activities predominating the western and northern sections of the study area and savannah-covered grassland and agriculture in the southern regions. The northwestern and western sections consist of gently undulating land that slopes westward and southward towards drainage lines that generally flow west and northwest. The topography rises in the central parts of the study area immediately north of the Project site, which is mostly undeveloped and composed of gentle rolling grassland. Residential areas, linked to the mines, are situated immediately west (Wedela), northwest (Harmony housing), and north of the Project site (Western Deep Levels housing). South of Wedela and the Project site is a grassland area with savannah-covered slopes. These areas are primarily used for grazing. The far southern sections of the study area comprise agricultural lands. Refer to **Figure 20** for the regional topography of the area.

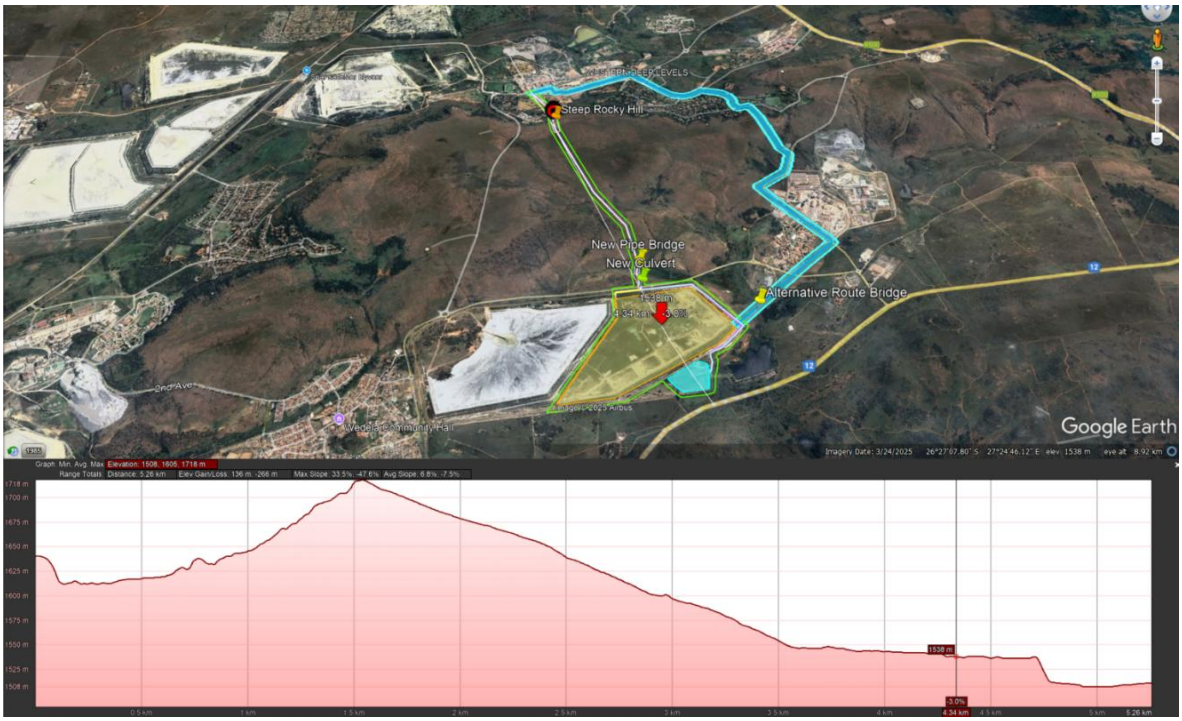


Figure 19: General topography of the study area

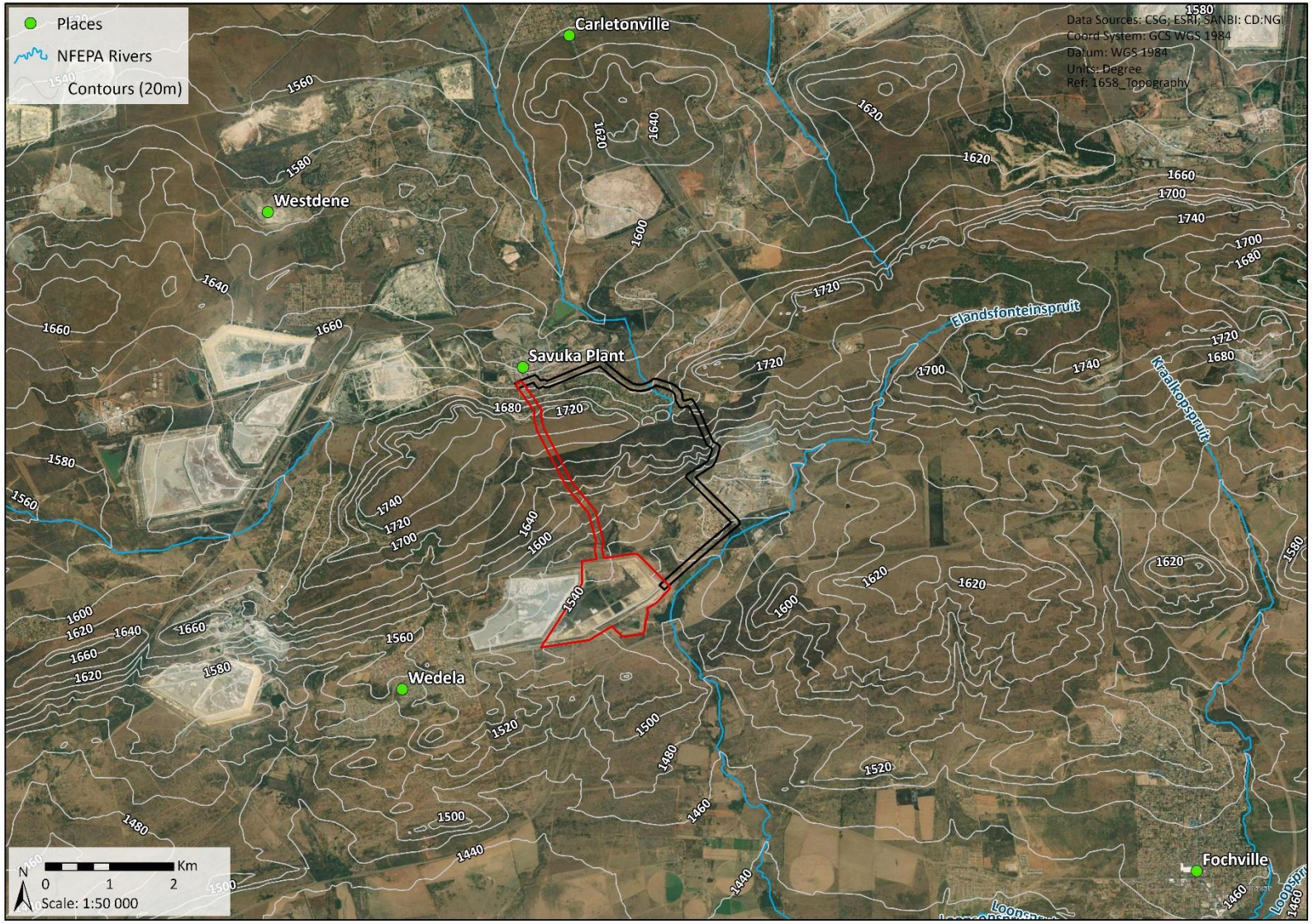


Figure 20: Regional Topography of the study area.

4.3 GENERAL SITE CONDITIONS / LAND USES

The proposed Mponeng Lower Compartment TSF development is situated within an area consisting mainly of mining activities, grazing and naturally occurring dams. Residential areas, waterbodies, wetlands, mines and ridges are also located within and surrounding the study area. The larger area surrounding the proposed plant is classified as industrial in nature.

The study area can be distinguished into two sections: the southern (TSF) section and the northern (pipelines) section. The TSF section is a disturbed area consisting of mining residue, holding dam, landfill, two return water dams (north dam and south dam) and gravel access and maintenance roads. This area consists of an area previously disturbed and vegetation re-establishing itself with significant alien infestation present. The pipeline section is largely an undisturbed area consisting of a rocky ridge, uniform vegetation, tributaries and Eskom powerlines. The vegetation in this section is largely intact and uniform with the exception of the first part of the pipeline routes where the pipes extend from the Savuka Plant on an area where there were demolitions of buildings / infrastructure including the Western Deep Levels Hospital resulting in disturbance of the vegetation. There was evidence of some alien species along the section. Refer to **Figure 21** to **Figure 31** for the site conditions.

Figure 21: Mponeng Upper Compartment TSF immediately west of Mponeng Lower Compartment TSF.

Figure 22: View of the Mponeng Lower TSF from the Mponeng Upper Compartment TSF.

Figure 23: View of the current holding dam on the Mponeng Lower TSF.

Figure 24: View of the existing landfill site on the Mponeng Lower TSF.

Figure 25: Steep embarkment of the Mponeng Lower TSF with alien vegetation and maintained gravel access road.

Figure 26: Current conditions of Mponeng Lower TSF Return Water Dam.

Figure 27: Natural (aquatic) dam approximately 150m southeast of the Mponeng Lower TSF (Young, 2025). The image also shows some of the grazing activities in the area.

Figure 28: Google Earth view showing the close proximity of the (aquatic) dam southeast of the Mponeng Lower TSF. The dam is fed by the Elandsfonteinspruit.

Figure 29: Northern boundary of the Mponeng Lower TSF showing the steep embarkment and vegetation including alien invasive trees and a potential wetland.

Figure 30: Northern view of the pipeline section showing a channelled valley bottom wetland, uniform vegetation of low-lying grass and sections of trees and shrubs within the rocky ridge.

Figure 31: Current conditions of the rocky ridge.

The proposed pipelines traverse through a Class 2 Ridge (Gauteng sensitive quartzite rocky ridge) from the main road along the alternative pipeline section (**Figure 31** left). The area consists of medium high grass and thick vegetation comprising of trees and shrubs. One of the Eskom Powerlines within this section can be seen on the image. There are also several Harmony Gold pipelines running along the road and across this section. View of the transformed area currently under rehabilitation on the northern section of the ridge (**Figure 31** right image). The area consisted of a Western Deep Levels Hospital which has since been demolished.

4.4 CLIMATE

4.4.1 CURRENT CLIMATIC CONDITIONS

According to Köppen-Geiger Climate classification, Carletonville has a Subtropical steppe climate (Classification: BSh). The summers are long, warm, and mostly clear and the winters are short, cold, dry, and clear. Over the course of the year, the temperature typically varies from 2°C to 27°C and is rarely below -2°C or above 31°C. **(Figure 32**). Carletonville experiences significant seasonal variations in monthly rainfall, average monthly rainfall reaching 96 mm in January and being as low as 2mm in July. 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 **Figure 32** and shows the site has an annual potential evaporation of 2,240mm

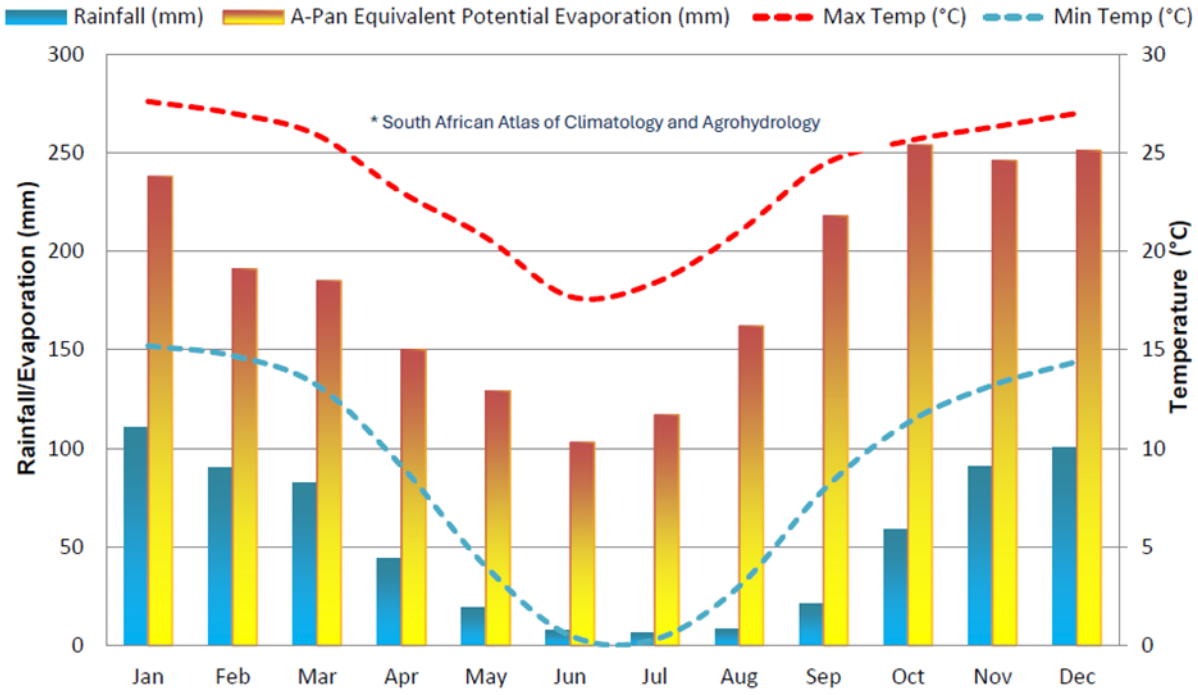


Figure 32: Average climatic conditions (Hydrological Consulting, 2025).

The climate is a typical Southern African Highveld climate with warm to hot summers and warm sunny winter days with frosty nights. Rainfall occurs predominantly during the summer months because of thunderstorm activity. The mean annual precipitation ranges from 565 mm to 697 mm per annum depending on the location of the weather station. Rainfall data was obtained from several sources, including mine data and data from the South African Weather Service. The rainfall for the region is summarised in **Table 10**.

Table 10: Rainfall Summary (MvB Consulting, 2025)

Period	**1927-2000**	**1962-2008**	**1983-2004**	**1966-2012**	**1900-2000**	**1958-2011**	**Regional Average**
Station Name	**Fochville**	**Carltonville**	**Wes Driefontein**	**Westonaria**	**Zuurbekom (RWB)**	**Randfontein**	
Station Number	**474899**	**4746809**	**04747421**	**04751744**	**475528**	**04753389**	
Month	**Average Monthly Rainfall (mm)**						

Period	1927-2000	1962-2008	1983-2004	1966-2012	1900-2000	1958-2011	Regional Average
Station Name	**Fochville**	**Carltonville**	**Wes Driefontein**	**Westonaria**	**Zuurbekom (RWB)**	**Randfontein**	
Station Number	**474899**	**4746809**	**04747421**	**04751744**	**475528**	**04753389**	
January	104	118	98	130	113	126	**115**
February	81	86	74	85	98	92	**86**
March	80	77	70	81	78	83	**78**
April	45	52	33	48	46	52	**46**
May	18	14	14	13	17	12	**15**
June	9	7	8	6	6	7	**7**
July	5	3	2	3	5	2	**3**
August	7	7	8	10	7	6	**7**
September	23	19	18	21	19	20	**20**
October	56	70	69	72	68	69	**67**
November	95	87	80	100	100	99	**94**
December	97	111	92	129	111	104	**107**
Total	**620**	**651**	**565**	**697**	**668**	**672**	**646**

4.4.2 CLIMATE CHANGE / RISK PROFILE

According to DEA (2018), a key feature of the projected climate change futures of South Africa is that temperatures are to increase drastically under low mitigation scenarios. For the far-future period of 2080-2099, temperature increases of more than 4 °C are likely over the entire South African interior, with increases of more than 6 °C plausible over large parts of the western, central and northern parts. Such increases will also be associated with drastic increases in the numbers of heat-wave days and very hot days, with potentially devastating impacts on agriculture, water security, biodiversity and human health. The model projections are indicative that a modest-high mitigation pathway can still significantly decrease the amplitude of this warming – most projections suggest that under Representative Concentration Pathway 4.5(RCP4.5), for example, temperature increases over the interior can be constrained to 2.5 to 4 °C. Nevertheless, it should be realised that South Africa is plausibly committed to relatively large (compared to the global average) increases in near-surface temperatures, even under high-mitigation futures. South Africa is expected to experience:

- Increase in mean, maximum and minimum temperatures.
- Increase in very hot days – above 35 °C and the frequency of heat wave events.
- Drier conditions in the future, with regional variation.

- Slight increases in rainfall towards the north-eastern region.
- A strong drying signal over the southwestern region, which could result in reductions in rainfall of more than 40 mm per year.
- Increase in the frequency of extreme rainfall events (20 mm of rain falling within 24 hours) over eastern parts during the summer months.
- Sea level rise and an increase in the frequency and intensity of sea storms, accompanied by increases in wave heights
- Increase in the number of high fire danger days over north-eastern region and along the Cape south coast and the south-western Cape.

Climate Risk Profile report for the West Rand District Municipality (WRDM) was compiled by the Council for Scientific and Industrial Research (CSIR) in 2024. The Climate Risk Profile report, as well as the accompanying Climate Change Adaptation Plan, were developed specifically for the WRDM, to support its strategic climate change response agenda. Both documents are primarily informed by the GreenBook, which is an open-access, online planning support system that provides quantitative scientific evidence in support of local government's pursuit in the planning and design of climate-resilient, hazard-resistant settlements.

An ensemble of very high-resolution climate model simulations of present-day climate and projections of future climate change over South Africa has been performed as part of the GreenBook. The regional climate model used is the Conformal-Cubic Atmospheric Model (CCAM), a variable-resolution Global Climate Model (GCM) developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). CCAM runs coupled to a dynamic landsurface model CABLE (CSIRO Atmosphere Biosphere Land Exchange model). GCM simulations of the Coupled Model Inter-Comparison Project 5 (CMIP5) and the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), obtained for the emission scenarios described by Representative Concentration Pathways 4.5 and 8.5 (RCP 4.5 and RCP 8.5) were first downscaled to 50 km resolution globally. The simulations span the period 1960– 2100. RCP 4.5 is a high mitigation scenario (assuming a reduction in CO_2 emissions into the future), whilst RCP 8.5 is a low mitigation scenario (assuming "business as usual" emissions). After completion of the 50 km resolution simulations described above, CCAM was integrated in stretched-grid mode over South Africa, at a resolution of 8 x 8 km (approximately 0.08° degrees in latitude and longitude). The findings of the report which may affect the proposed activity are indicated below:

a) **Temperature**: The WRDM experiences average annual temperatures ranging between 16 and 18 °C, with lower averages found along the lower southeastern parts of Mogale City and the upper northeastern parts of Rand West City Local Municipality. The projections show average annual temperature increases of 2.5 °C across the district into the future including the study area, under a low mitigation, "business as usual" emissions scenario.

b) **Rainfall**: The WRDM experiences current GCM derived average annual rainfall of between 800 and 1200mm, with lower averages found along the central parts of the district, particularly in Rand West City's settlements of Azaadville, Randfontein and West Rand. Future projections show an average annual rainfall increase of between 100 and 200 mm, with most of the increase expected to occur in the southern parts of the district including the study area, under a low mitigation, "business as usual" emissions scenario.

c) **Heat**: Under baseline climatic conditions, there are no more than 10 very hot days experienced within the district. The number of very hot days are projected to increase by between 0 and 30 into the future, under an RCP8.5 emissions scenario. Most heatwaves days are likely to take place in the southern parts of the district, under baseline conditions mostly affecting Merafong City Local Municipality. Conversely, most of the increase in the number of heatwave days is projected to occur in the northern parts of West Rand, affecting large parts of Mogale City and the northern parts of Rand West City. The study area is expected to have low heat risk likelihood of increase in extreme heat.

d) **Flooding**: The flood hazard index is based on the catchment characteristics and design rainfall, averaged at the Quinary catchment level. There is some variation of the flood hazard index across the district.

Most parts of the district have a medium flood hazard index, with pockets of low, high, and very high flood hazard index. The settlements of Glen Harvie and Hills Haven in Rand West City are amongst those facing a high risk of flooding into the future, while the majority of settlements could face a low to moderate flood risk. The study area is predicated to have moderate flood risk likelihood.

The engineering designs are anticipated take into consideration the climate change impacts to ensure there is less likelihood of structural / dam failure and/or risk of the TSF. The final designs will be assessed and provided to the competent authority for consideration.

4.5 GEOLOGY

The geology of the study area has been described in detail by several authors and mine geologists. The following section describes the regional and local geology abstracted from the Baseline Report - Hydrogeological Assessment for The Proposed Tailings Redeposition on The Harmony Mponeng Lower Compartment Tailings Storage Facility (MvB Consulting, 2025). The regional surface geology includes, in chronological order:

- Witwatersrand Supergroup.
- Ventersdorp Supergroup.
- Transvaal Supergroup.
- Karoo Supergroup.

The surface geology is presented in **Figure 33**.

4.5.1 WITWATERSRAND SUPERGROUP

Truswell (1977) describes the geology of the Witwatersrand Basin as a thick sequence of shale, quartzite and conglomerate. There are two main divisions, a lower predominantly argillaceous unit, known as the West Rand Group and an upper unit, composed almost entirely of quartzite and conglomerates, known as the Central Rand Group.

The West Rand Group is divided into three subgroups namely the Hospital Hill, Government Reef and Jeppestown. These rocks comprise mainly shale, but quartzite, banded ironstones, tillite and intercalated lava flows are also present. The rocks were subjected to low - grade metamorphism causing the shale to become more indurated and slaty. The original sandstone was recrystallised to quartzite.

The Central Rand Group is divided into the Johannesburg and Turffontein Subgroups and is composed largely of quartzite, within which there are numerous conglomerate zones. The conglomerate zones may contain any number of conglomerate bands, with individual bands interbedded with quartzite. The upper conglomerates are usually thicker with coarser fragments. An argillaceous zone known as the Booysens Shale (also known as the Kimberley Shale) separates the Johannesburg and Turffontein Subgroups.

The economic gold placers (reefs) are restricted to the Central Rand Group of the Witwatersrand Supergroup. A primary economic horizon that is mined in all the mines in the region is the Ventersdorp Contact Reef (VCR), at the base of the Ventersdorp lava. The Carbon Leader is also mined extensively in the region. Mponeng exploits the Ventersdorp Contact Reef (VCR) via a twin-shaft system to depths of between 2 800m and 3 400m below surface (AngloGold Ashanti, 2018).

4.5.2 VENTERSDORP SUPERGROUP

The younger Ventersdorp Supergroup overlies the Witwatersrand rocks. Although acid lavas and sedimentary intercalations occur, the Ventersdorp is composed largely of andesitic lavas and related pyroclastics. The Ventersdorp Supergroup consists of the Platberg Group and the Klipriviersberg Group. The Klipriviersberg Group consists of the Alberton and Westonaria Formations.

The Ventersdorp lava plays an important role in terms of groundwater ingress into the underground workings. As a rule of thumb, areas that have less than 50 m of lava have a greater risk of water ingress. This is especially the case were mining takes place above the Witwatersrand strata, such as mining of the VCR at the base of the

Ventersdorp succession. The lava acts as an impermeable barrier, largely preventing water from the overlying dolomite aquifer entering the mine.

4.5.3 TRANSVAAL SUPERGROUP

Overlying the Ventersdorp Lavas are the Black Reef quartzite and dolomite of the Transvaal Supergroup. The Black Reef quartzite comprises coarse to gritty quartzite with occasional economically exploitable conglomerates (reefs). The entire area was peneplained in post-Ventersdorp time and it was on this surface that the Transvaal Supergroup was deposited, some 2200 million years ago. The deposition commenced with the Kromdraai Member with the Black Reef at its base. The Black Reef has eroded the Witwatersrand outcrop areas and as a result contains zones (reef) in which gold is present. The occurrence of the gold is not as widespread as in the Witwatersrand and mainly restricted to north-south trending channels. The Black Reef is overlain by a dark, siliceous quartzite with occasional grits or small pebble bands. The quartzite grades into black carbonaceous shale. The shale then grades into the overlying dolomite through a transition zone of approximately 10 m thick.

Overlying the Kromdraai Member is the dolomite of the Malmani Subgroup of the Chuniespoort Group. The dolomites vary between 200 m and 1 500 m in thickness. According to Parsons (1991) only the two lower formations of the Malmani Subgroup are present in the study area. The lowermost is the Oaktree Formation, which is succeeded southward by the Monte Christo Formation. The Oaktree Formation consists of chert-poor homogenous dark-grey dolomite containing interbeds of carbonaceous shale, which decrease in frequency and thickness from the base of the formation upwards. Columnar stromatolytes are numerous within this sequence and the formation follows conformably on the Black Reef Formation with a transitional mixed zone consisting of carbonaceous and calcareous argillaceous and arenaceous sediments (Parsons, 1991).

The Monte Christo Formation follows conformably on the Oaktree Formation. The Monte Christo Formation consists of alternating chert-rich and chert-poor, dark to light-grey dolomite and has an estimated thickness of 700 m (Brink, 1979). A 1.5 m thick chert layer, consisting of 10 cm to 15 cm thick layers of chert separated by manganese-rich bands, is present towards the base of the formation. Layers of crystalline, coarse-grained dark dolomite, laminated calcareous shale, shaley dolomite and fine-grained white dolomite occur in the sequence, parts of which are chert-rich, containing numerous chert layers, 10 cm to 20 cm in thickness (Parsons 1991).

The Pretoria Group rocks overlie the dolomite aquifer and is also the surface geology at Mponeng mine. The Rooihoogte Formation forms the basal member of the Pretoria Group, consisting of the Bevets conglomerate, shale and quartzite. The Bevets conglomerate varies in thickness between 3 m and 60 m (Parsons and Killick, 1985). Overlying the Bevets conglomerate is shale and sporadically developed quartzite, referred to as the Pologround quartzite. Where developed the Pologround quartzite is overlain by 150 m – 200 m of pink to purple shales, forming the basis of the Timeball Hill Formation. The shale is overlain by quartzite, which forms the linear north-westerly trending ridges in the central portion of the study area.

Further south is the Hekpoort and Strubenkop Formations. These formations consist predominantly of andesite lava (Hekpoort Formation) and ferruginous shale (Strubenskop Formation). The weathering of the shale and the lava results in grey to dark grey silty sand and clay. The Hekpoort Andesite Formation is visible through a number of scattered lava outcrops, giving it an uneven landscape. The quicker erosion of the softer tuffaceous sediments, interbedded between the amygdaloidal lava flows is believed to be the cause of the topographical features. The weathering of the Hekpoort Andesite results in dark to reddish – brown silty sand. These can contain fragments of lava and quartz ranging between pebble to cobble size.

The Strubenkop Formation achieves a maximum thickness of 130 m and consists predominantly of ferruginous shale. The contact between the Hekpoort and Strubenkop Formations is difficult to identify in the field, especially in view of the fact that localised intrusions of younger dolerite occur. Most of these rocks, especially in the lower lying areas, are concealed beneath a cover of younger sedimentary rocks, residual soils and alluvium. There is also a significant accumulation of hillwash and transported sediments. The floodplains of the Loopspruit and its tributaries contain grey, silty to clayey soils.

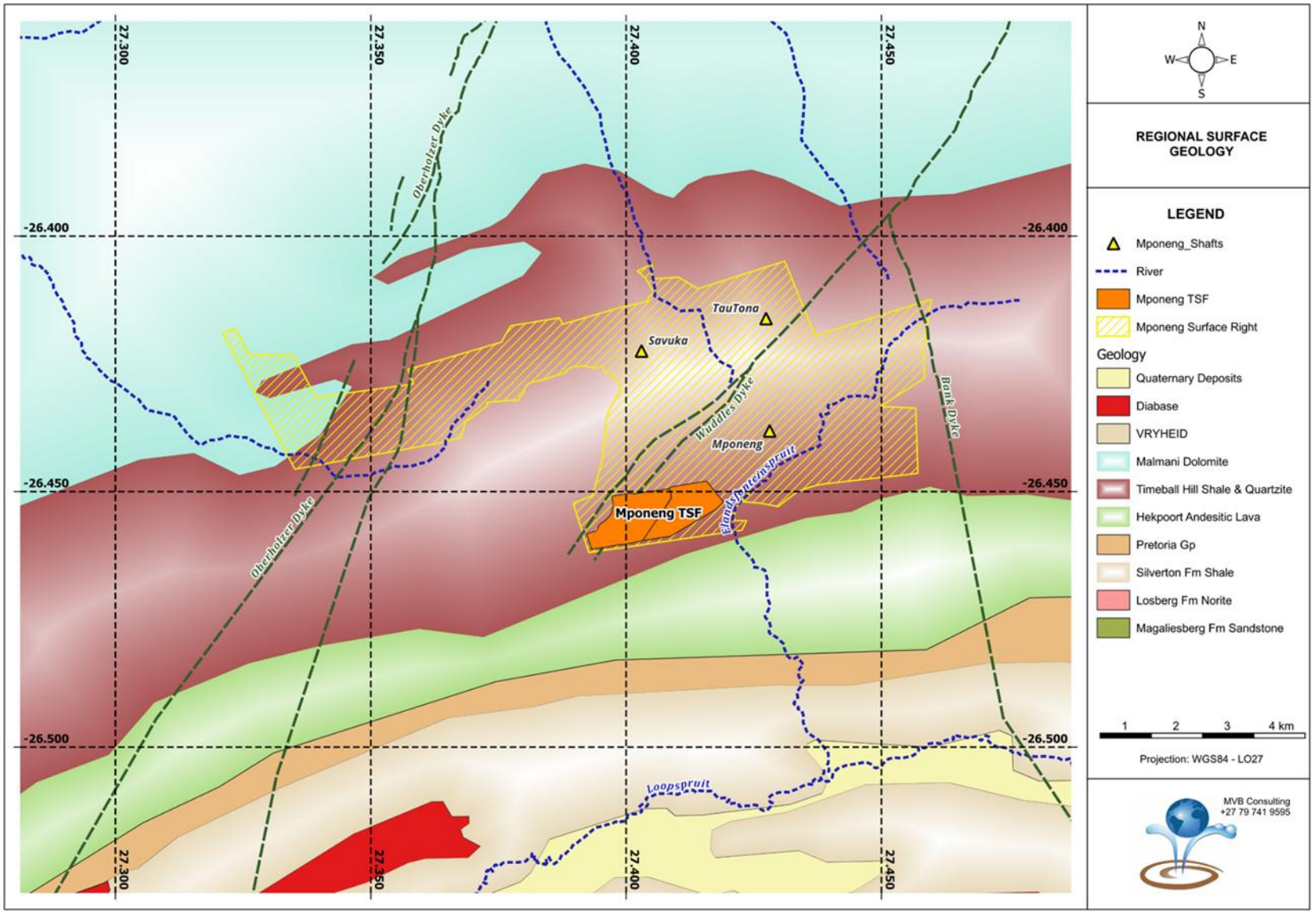


Figure 33: Regional surface geology (MvB Consulting, 2025)

4.5.4 KAROO SUPERGROUP

The Karoo Supergroup was deposited approximately 345 million years ago. It commenced with glacial period during which most of South Africa was covered by a thick sheet of ice. This ice cap slowly moved towards the south, causing extensive erosion as a result of accumulated debris at the base. This debris was eventually deposited as the Dwyka tillite. The Dwyka, which generally form an impermeable barrier to the downward percolation of groundwater, is absent in most parts of the study area. Younger superficial deposits cover the Karoo in places. The Karoo strata filled the extremely rugged paleo-topography of the underlying karst dolomite to form a relatively even topography that is visible today.

4.6 SOILS AND AGRICULTURAL POTENTIAL

Based on the Soil and Agricultural Report for the proposed Mponeng Lower Compartment Tailings Storage Facility (The Biodiversity Company, 2025), the geology of the area includes the sedimentary rocks such as the shale and andesite from the Pretoria Group (Transvaal Supergroup). The area is also underlain by Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup). The area is characterised by land type Fb and Ib, with shallow Mispah soils forms. According to the land type database (Land Type Survey Staff, 1972 - 2006) the assessment area to be focused on mainly falls within the Fb 5 and Fb 15 land types (**Figure 34**). The Fb 5 and Fb 15 land types consist of Mispah, Glenrosa, Hutton, Arcadia, Rensburg, Oakleaf and Dundee soil forms according to the Soil classification working group (1991), with the occurrence of other soils and rocky areas within the landscape. The Fb land types are characterised with shallow soils such as Glenrosa and Mispah soil forms. Lime is usually rare in the upper landscape but generally present in the lower terrains. The land terrain units for the featured land types are illustrated in **Figure 35** and **Figure 36**, with the expected soils listed in **Table 11** and **Table 12**

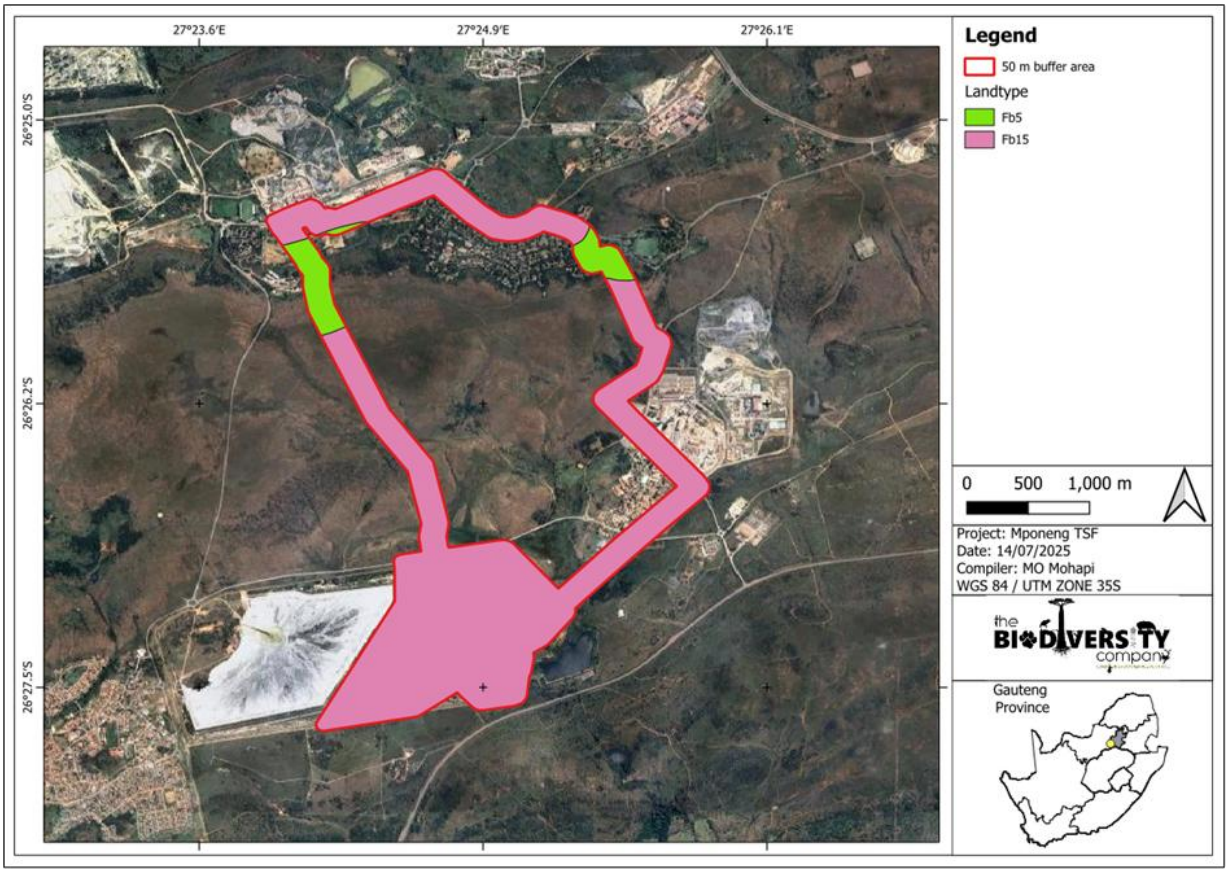


Figure 34: Land type associated with the proposed project area (The Biodiversity Company, 2025)

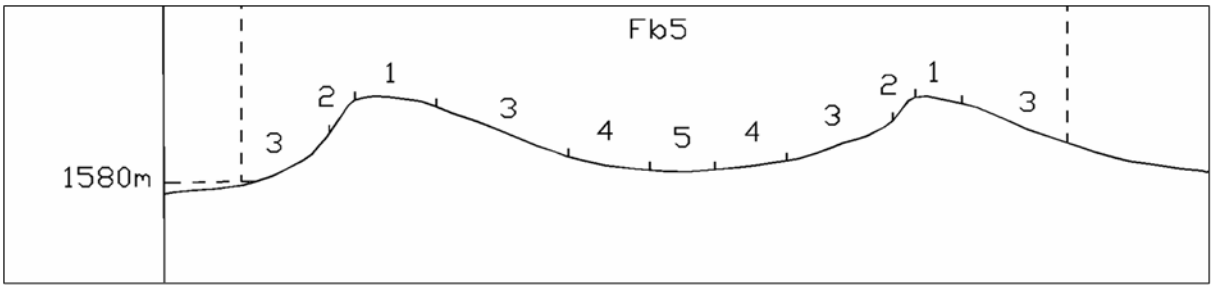


Figure 35: Illustration of land type Fb 5 terrain units (Land Type Survey Staff, 1972 – 2006)

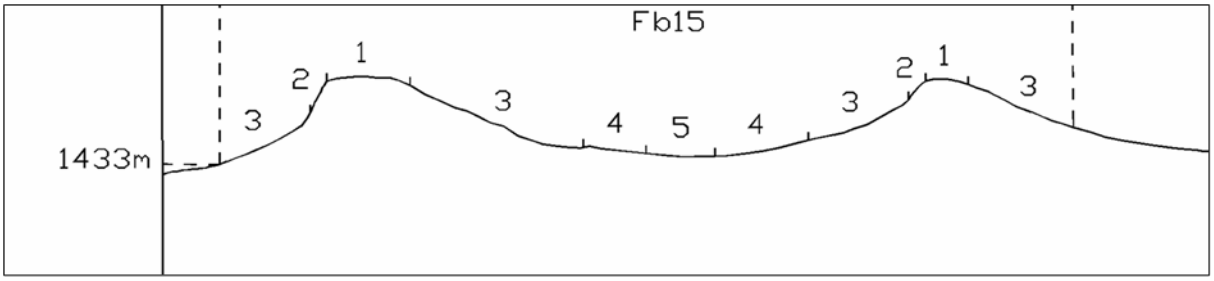


Figure 36: Illustration of land type Fb 15 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 11: Soils expected at the respective terrain units within the Fb 5 land type (Land Type Survey Staff, 1972 - 2006)

TERRAIN UNITS									
1 (15%)		**2 (5%)**		**3 (33%)**		**4 (42%)**		**5 (5%)**	
Bare Rock	40 %	Bare Rock	70 %	Glenrosa	29 %	Hutton	48 %	Arcadia, Rensburg	52 %
Mispah	33 %	Mispah	20 %	Mispah	25 %	Glenrosa	12 %	Mispah	16 %
Glenrosa	23 %	Glenrosa	10 %	Hutton	23 %	Mispah	11 %	Bare Rock	12 %
Hutton	4%			Bare Rock	21 %	Clovelly	10 %	Stream beds	10 %
				Hutton, Shortland	2%	Oakleaf, Dundee	9%		
						Bare Rock	5%		
						Hutton, Shortland	3%		
						Avalon	2%		

Table 12: Soils expected at the respective terrain units within the Fb 15 land type (Land Type Survey Staff, 1972 - 2006)

TERRAIN UNITS									
1 (15%)		**2 (5%)**		**3 (33%)**		**4 (42%)**		**5 (5%)**	
Bare Rock	40%	Bare Rock	70%	Glenrosa	29%	Hutton	48%	Arcadia, Rensburg	52%
Mispah	33%	Mispah	20%	Mispah	25%	Glenrosa	12%	Mispah	16%
Glenrosa	23%	Glenrosa	10%	Hutton	23%	Mispah	11%	Bare Rock	12%
Hutton	4%			Bare Rock	21%	Clovelly	10%	Oakleaf, Dundee	10%

TERRAIN UNITS									
				Hutton, Shortlands	2%	Oakleaf, Dundee	9%	Avalon	10%
						Bare Rock	5%		
						Hutton, Shortlands	3%		
						Avalon	2%		

The six (6) representative soil forms identified within the proposed project area include the Carolina, Glenrosa, Mispah and three technosols (Witbank, Stilfontein and Johannesburg) soil forms (**Figure 37**). Based on the verified baseline findings, the proposed Lower Compartment TSF lower compartment was found to be dominated by the disturbed Witbank soils from the mine tailings deposits. The Witbank soils resulted due to human intervention and are collected from the surrounding mining dumps. Due to extensive disturbance, the Witbank soils lack evidence of morphological order and are considered to have low suitability for agricultural potential. Artificial waterbodies with Stilfontein soils were also identified adjacent to the proposed Lower Compartment TSF lower compartment. The Stilfontein soils comprise of anthropogenic materials that have undergone saturation due to human activities. In addition, the northern portion of the proposed project area was found to be dominated by Johannesburg technosols. The Johannesburg technosols refers to urban developments such as roads, buildings, construction buildings and recreational areas. All the technosols for the purpose of this project are considered to have a low suitability, due to their morphological composition that extensively inhibits agricultural activities.

Furthermore, the proposed pipeline was found to be dominated by the semi-impermeable to impermeable Mispah and Glenrosa soil forms, while its significant portion comprised of Carolina soil forms. The Mispah soil form comprises of an orthic topsoil on top of a hard rock horizon. The Glenrosa soil form comprises of an orthic topsoil on top of a lithic subsoil horizon. Lastly, the Carolina soil form comprises of an orthic topsoil on top of a yellow-brown apedal subsoil that is underlain by a hard rock horizon. The Mispah soils are marked by shallow depth, impermeable underlying horizons, and the presence of parent materials. Due to their restricted permeability, the Mispah soils have limited root penetration and water movement, which inhibits crop production. Consequently, the soils are concluded to have a low sensitivity and low productivity, which are more suitable for grazing and supporting natural vegetation rather than intensive crop production. The identified Glenrosa soil forms are characterised by gleylithic subsoil, with signs of wetness. The gleylithic subsoil horizons were shallow with the presence of weathering parent material. Lastly, the Carolina soil form is characterised by very shallow apedal soils with freely drained upper horizons and restrictive underlying horizon. The soils are mostly suitable for shallow rooted crops and is considered to have a moderate agricultural potential. Some of the identified soil horizons within the proposed project area are illustrated in **Figure 37** and **Figure 38**.

Accordingly, following Smith, (2006) which the national Department of Agriculture, Forestry and Fisheries (DAFF), (2017) land capabilities protocols were further expanded from, the above-mentioned identified soil forms are restricted to land capability classes IV (i.e. Carolina soil form) categorised by LC 6-8 (Low to Moderate), land capability VI (i.e. Glenrosa and Mispah soil forms) categorised by LC 1-5 (Very low to Low), land capability VII (i.e. Stilfontein and Witbank soil forms) categorised by LC 1-5 (Very low), and land capability VIII (i.e. Johannesburg soil forms) categorised by LC 1-5 (Very low). The baseline soil land capability was aligned and compared to the National Land Capability data (DAFF, 2017). A climate capability level 8 has been assigned to the area given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates.

By using the determined land capability for the most sensitive soil (Carolina soil form) and the determined climate capability, a land potential of “L6” was calculated. Furthermore, the calculated land potential for less sensitive soils (i.e. Glenrosa and Mispah soil forms) is land potential L7, and technosols including Johannesburg, Stilfontein and Witbank is land potential L8. According to Smith (2006), the “L6” land potential is characterised by very restricted potential with regular and or severe limitations due to soil, slope, temperature or rainfall. The “L7” land potential level is characterised by a low potential with a severe limitation due to soil, slope,

temperatures, or rainfall. The “L8” land potential level is characterised by a very low potential with very severe limitations due to soil, slope, temperatures, or rainfall. The areas associated with the “L6, L7 and L8” land potentials are considered to be non-arable (**Figure 39**). Therefore, **the proposed project area falls predominately on non-arable soils**.

The following land potential levels have been determined;

- Land potential level 6 (this land potential is characterised by very restricted potential. Regular and/ or severe limitations due to soil, slope, temperatures or rainfall). Non-arable;
- Land potential level 7 (this land potential is characterised by low potential. Severe limitations due to soil, slope, temperatures or rainfall). Non-arable; and
- Land potential level 8 (this land potential is characterised by very low potential. Very severe limitations due to soil, slope, temperatures or rainfall). Non-arable

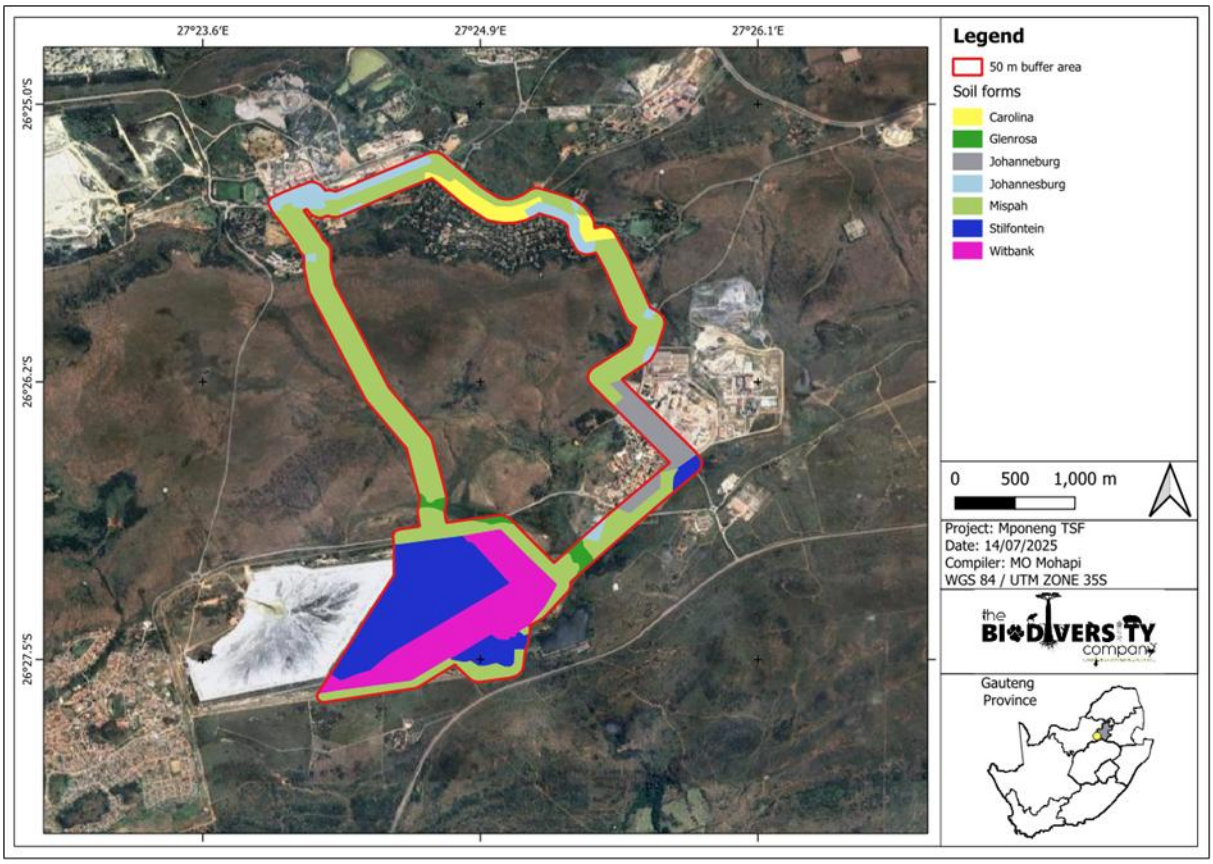


Figure 37: Soil forms found within the proposed project area (The Biodiversity Company, 2025).

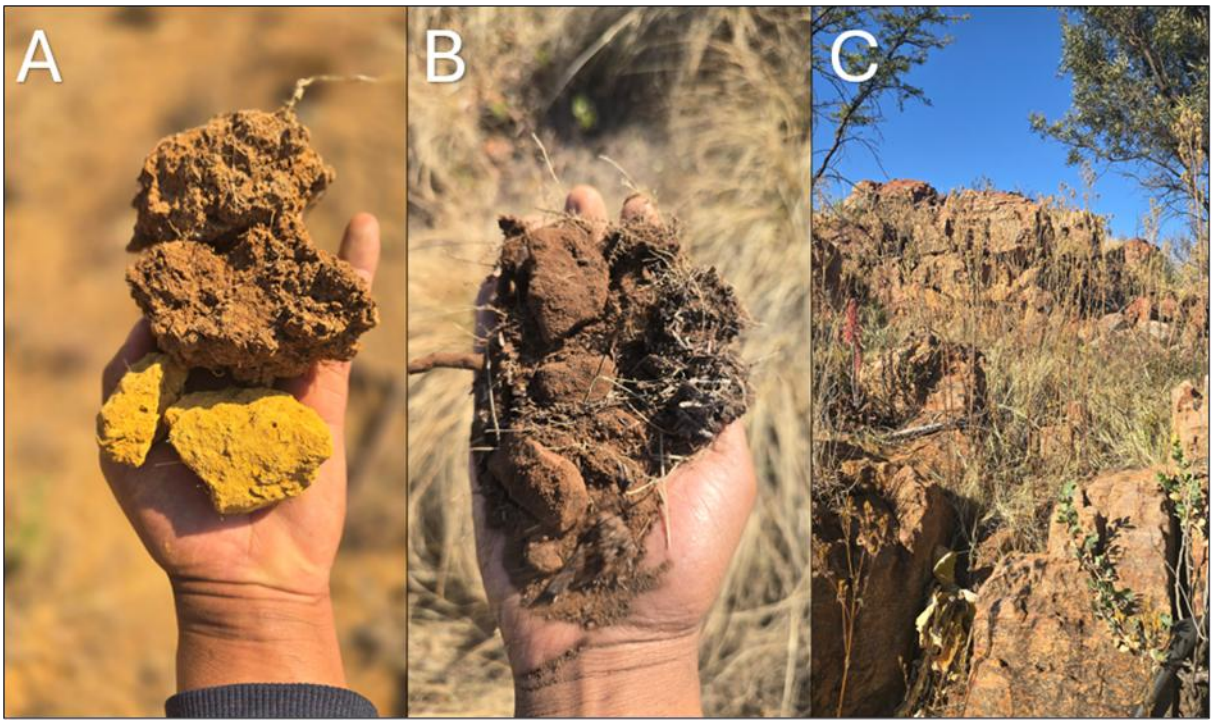


Figure 38: Soil forms found within the proposed project area; A) Carolina soil form; B) Glenrosa soil form; and C) Mispah soil form (The Biodiversity Company, 2025).

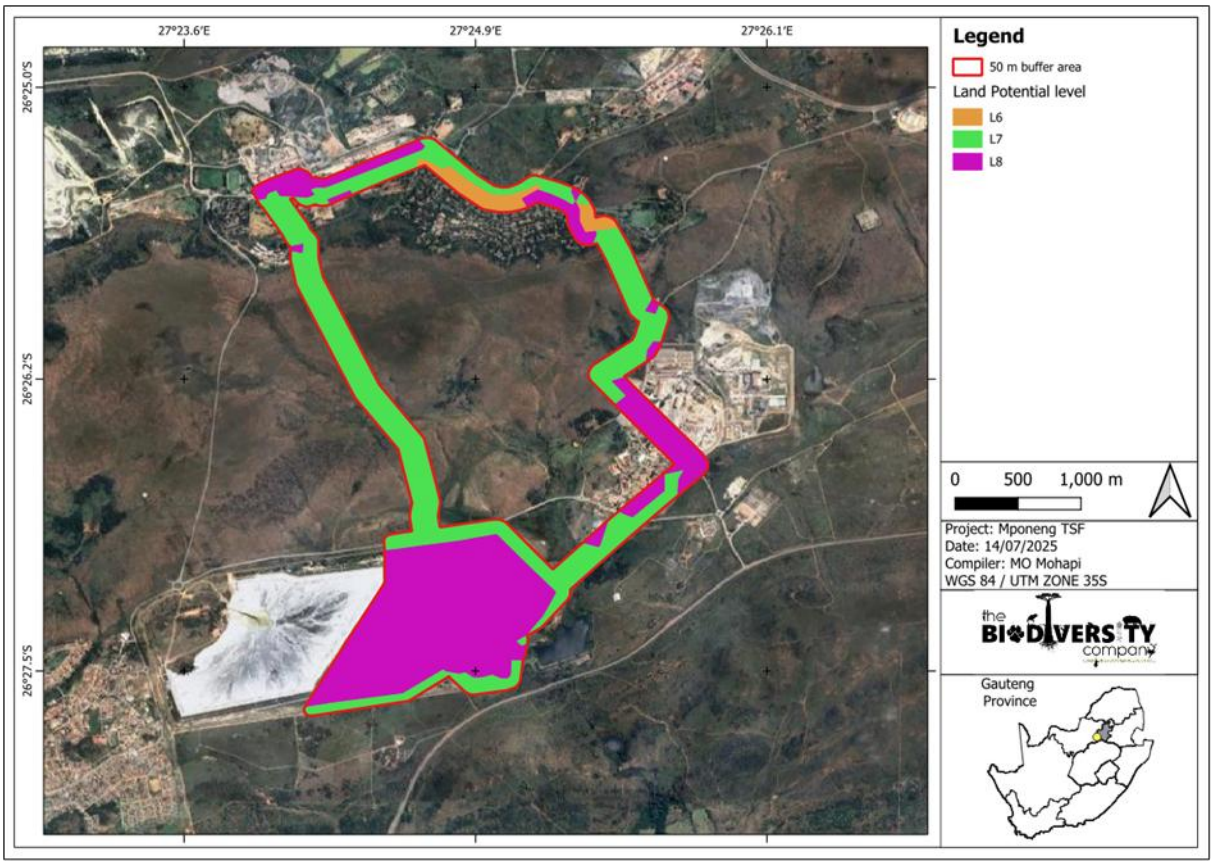


Figure 39: Land Potential of the proposed project area (The Biodiversity Company, 2025)

The land capability dataset (DAFF, 2017) indicates that the proposed project area falls evenly within the “Low to Moderate” land capability sensitivity and the “Moderate to High” land capability sensitivity, with a marginal

having a “Very low to Low” land capability sensitivity. No field crop boundaries were identified within the proposed project area, according to the agricultural screening tool (DFFE, 2025).

The baseline soil findings and the current land uses disputes all areas associated with the “Moderate to High” land capability sensitivity. It further concurs with the “Low to Moderate” land capability sensitivity to an extent and fully correlates with the demarcated “Very low to Low” land capability sensitivity. Based on the verified findings, the moderate to high land capability areas were found to be dominated by very low to low potential soils including the Glenrosa, Mispah and technosols. Furthermore, the marginal confirmed low to moderate land capability areas are comprised of moderate potential soils i.e. Carolina soil form. The remaining very low to low land capability areas are comprised of low potential soils including the Mispah and Glenrosa soil forms. The proposed project and the associated activities are expected to have acceptable changes to the soil resources, and they are anticipated to have minimal impact on the soil resources. Therefore, the overall site sensitivity of the proposed project area is concluded to be predominately “Low”, with a marginal “Medium” agricultural sensitivity along the pipeline alternative route 2 option in an area of residential development where the soil has already been disturbed and fragmented deeming it infeasible for cropping practices.

4.7 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 Mponeng Lower Compartment TSF are obtained from the Baseline Terrestrial Biodiversity Assessment for The Proposed Mponeng Lower Compartment Tailings Storage Facility undertaken by the Biodiversity Company, 2025 are discussed below.

4.7.1 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 13: Desktop and background spatial features examined

DESKTOP INFORMATION CONSIDERED	RELEVANT/IRRELEVANT: REASONING	SECTION IN REPORT
Ecosystem Threat Status (RLE 2021)	Relevant. The study area overlaps with a ‘Least Concern’ ecosystem.	**4.7.2.2**
Ecosystem Protection Level (NBA, 2018)	Relevant. The study area overlaps with a ‘Poorly Protected’ Ecosystem.	**4.7.2.3**

DESKTOP INFORMATION CONSIDERED	RELEVANT/IRRELEVANT: REASONING	SECTION IN REPORT
Key Biodiversity Areas (KBA)	Irrelevant. Not located within 10 km of any KBA	Nil
South African Protected and Conservation Areas Databases (2024) (SAPAD and SACAD)	Irrelevant. The study area is not within range of any relevant SAPAD or SACAD areas. The Gauteng C-Plan does however show a Protected Area to the east of the study area.	Nil
National Protected Areas Expansion Strategy (NPAES)	Relevant. The study area overlaps with portions of NPAES areas.	**4.8.4**
Strategic Water Source Areas (SWSA)	Irrelevant. The study area does not transect any nor is within close proximity of National Freshwater Ecosystem Priority Areas.	Nil
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Relevant. The study area overlaps with CR SAIIAE wetlands and a CR/EN River	**4.8.5**
National Freshwater Priority Area (NFEPA)	Relevant. The study area overlaps with unclassified NFEPA wetlands and a Class D: Largely Modified and a Class C: Moderately Modified River.	**4.8.3**

4.7.2 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).

4.7.2.1 VEGETATION TYPE

The study area is situated within the Savanna biome. The Savanna biome of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006). The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Vachellia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the study area overlaps with Gauteng Shale Mountain Bushveld vegetation type (**Figure 40**). This vegetation unit occurs mainly on the ridge of the Gatsrand south of Carletonville-Westonaria-Lenasia. It also occurs as a narrow band along the ridge that runs form a point between Tarlton and Magaliesberg in the west, through Sterkfontein, Pelindaba, Atteridgeville to Klapperkop and southeastern Pretoria in the east. The altitude ranges between 1300 to 1 750m. It consists of low, broken ridges varying in steepness and with high surface rock cover. Vegetation is a short, semi-open thicket dominated by a variety of woody species. The

understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover

4.7.2.2 ECOSYSTEM THREAT STATUS - RED LIST OF ECOSYSTEMS

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 Gauteng Shale Mountain Bushveld vegetation type (**Figure 40**).

This vegetation type is classified as Least Concern (RLE, 2022). The national target for conservation protection for this vegetation type is 24%. Less than 1% is statutorily conserved, for example, the Skanskop and Hartbeesthoek Nature Reserves, Magaliesberg Nature Area and Groenkloof National Park. Additionally, over 1% conserved in other reserves including the John Nash Nature Reserve, Cheetah Park and Hartbeesthoek Radio Astronomy Observatory. About 21% transformed mainly by urban and built-up areas, mines and quarries, cultivation and plantations. Wattles a common invasive plant in places.

4.7.2.3 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 Gauteng Shale Mountain Bushveld (**Figure 40**). The Gauteng Shale Mountain Bushveld is a PP ecosystem.

4.7.2.4 FLORA

According to the Baseline Terrestrial Biodiversity Assessment undertaken by the Biodiversity Company (2025), the Global Biodiversity Information Facility (GBIF) database lists 98 flora species expected to occur within the area. Four (4) of these species are considered as Species of Conservation Concern (SCC). Two (2) species were listed as per the DFFE Screening Tool Report (**Table 14**).

Please note that the Screening Tool report includes lists of bird, mammal, reptile, amphibian, butterfly, and plant species of conservation concern known or expected to occur on the proposed development footprint. Some of these SCC are sensitive to illegal harvesting. Such species have had their names obscured and are listed as sensitive plant unique number / sensitive animal unique number. As per the best practise guideline that accompanies the protocol and screening tool (Species Environmental Assessment Guideline, 2022), the name of the sensitive species may not appear in any reports released into the public domain. It should be referred to as sensitive plant or sensitive animal and its threat status may be included, e.g. critically endangered sensitive plant or endangered sensitive animal.

Table 14: Threatened flora species that are expected to occur within the extended study area (The Biodiversity Company, 2025)

SPECIES NAME	REGIONAL	IUCN	HABITAT	SCREENING TOOL SENSITIVITY	LIKELIHOOD OF OCCURRENCE	REASON
Adromischus umbraticola	NT	NE	Plants grow on south-facing rock crevices on ridges	-	Confirmed	Suitable habitat within study area

SPECIES NAME	REGIONAL	IUCN	HABITAT	SCREENING TOOL SENSITIVITY	LIKELIHOOD OF OCCURRENCE	REASON
Khadia beswickii	VU	CR	Open shallow soil over rocks in grassland.	Medium	Confirmed	Suitable habitat within study area
Lithops leslie subsp. lesliei	VU	NE	Occurs primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses	-	Moderate	Suitable habitat within study area
Sensitive Species 1248	VU	NE	-	Medium	Moderate	Suitable habitat within study area
Legend: VU = Vulnerable, CR = Critically Endangered, NT = Near Threatened and NE = Not Evaluated						

4.7.2.5 FAUNA

4.7.2.5.1 AMPHIBIANS

Based on the FrogMap, 22 amphibian species are expected to occur within the extended study area. One (1) amphibian SCC, the *Pyxicephalus adspersus* (Giant Bull Frog) is expected to occur within the project area (**Table 15**).

4.7.2.5.2 REPTILES

Based on the ReptileMAP database, 67 reptile species are expected to occur within the area. Three (3) species are regarded as SCCs (**Table 15**). No species were listed by the Screening Tool.

4.7.2.5.3 MAMMALS

The MammalMap lists 108 mammal species that could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Fifteen (15) of these expected species are regarded as SCC (**Table 15**). Of these 15 SCCs, 11 have been assigned a low likelihood of occurrence based on the lack of suitable habitat in the project area. Four (4) species have been assigned a moderate likelihood of occurrence. Two (2) species were listed by the Screening Tool.

4.7.2.5.4 AVIFAUNA

The Southern African Bird Atlas Project (SABAP) 2 data indicate that 278 avifauna species are expected for the project area and surrounding areas. Of these, 27 are considered SCC **(Table 15**). The likelihood of occurrence within the project area is included. The Screening Tool lists three (3) avifauna SCC that could be expected to occur.

Table 15: Threatened flora species that are expected to occur within the extended study area (The Biodiversity Company, 2025)

SPECIES	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
		REGIONAL	GLOBAL	
SCC amphibian species that are expected to occur within the project area				
Pyxicephalus adspersus	Giant Bull Frog	NT	LC	Moderate
SCC reptile species that are expected to occur within the project area				
Chamaesaura aenea	Coppery Grass Lizard	LC	NT	Moderate

SPECIES	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
		REGIONAL	GLOBAL	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
Homoroselaps dorsalis	Striped Harlequin Snake	LC	NT	Moderate
SCC mammal species that are expected to occur within the project area				
Aonyx capensis	African Clawless Otter	NT	NT	Low
Atelerix frontalis	Southern African Hedgehog	NT	LC	Moderate
Cloeotis percivali	Percival's Short-eared Trident Bat	EN	LC	Low
Crocidura maquassiensis	Makwassie Musk Shrew	VU	LC	Moderate
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
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	African White-tailed Rat	VU	EN	Low
Otomys auratus	Southern African Vlei Rat (Grassland type)	NT	NT	Moderate
Panthera pardus	Leopard	VU	VU	Low
Pipistrellus rusticus	Rusty Pipistrelle	LC	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Rhinolophus blasii	Blasius's Horseshoe Bat	NT	LC	Low
Threatened avifauna species that are expected to occur within the project area				
Anhinga rufa	African Darter	NT	LC	High
Tyto capensis	African Grass Owl	VU	LC	Confirmed
Circus ranivorus	African Marsh Harrier	VU	LC	Moderate
Circus maurus	Black Harrier	EN	EN	Low
Nycticorax nycticorax	Black-crowned Night Heron	NT	LC	Moderate
Elanus caeruleus	Black-winged Kite	NT	LC	High
Glareola nordmanni	Black-winged Pratincole	LC	NT	Moderate
Spatula smithii	Cape Shoveler	NT	LC	Moderate
Gyps coprotheres	Cape Vulture	VU	VU	Low
Calidris ferruginea	Curlew Sandpiper	VU	VU	Moderate
Hydroprogne caspia	Caspian Tern	VU	LC	Low
Eupodotis senegalensis	White-bellied Korhaan	VU	LC	Moderate
Coracias garrulus	European Roller	NT	LC	Moderate
Dendrocygna bicolor	Fulvous Whistling Duck	NT	LC	Low
Podiceps cristatus	Great Crested Grebe	VU	LC	Low
Ardea alba	Great Egret	NT	LC	High
Phoenicopterus roseus	Greater Flamingo	NT	LC	Low
Scopus umbretta	Hamerkop	NT	LC	High

SPECIES	COMMON NAME	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE
		REGIONAL	GLOBAL	
Charadrius pecuarius	Kittlitz's Plover	NT	LC	Moderate
Sarkidiornis melanotos	Knob-billed Duck	NT	LC	Moderate
Falco biarmicus	Lanner Falcon	NT	LC	Moderate
Phoeniconaias minor	Lesser Flamingo	VU	NT	Low
Falco naumanni	Lesser Kestrel	VU	LC	High
Oxyura maccoa	Maccoa Duck	VU	EN	Moderate
Asio capensis	Marsh Owl	NT	LC	High
Mirafra cheniana	Melodious Lark	NT	LC	Moderate
Anas erythrorhyncha	Red-billed Teal	NT	LC	High
Sagittarius serpentarius	Secretarybird	VU	EN	High
Netta erythrophthalma	Southern Pochard	NT	LC	Moderate
Anas undulata	Yelow-billed Duck	NT	LC	High
Legend: EN = Endangered, LC = Least Concern, NT = Near Threatened and VU = Vulnerable				

According to the list of protected species under Schedule 6, if any individuals of these species are to be disturbed, permits must be obtained from the Provincial Department (GDARD).

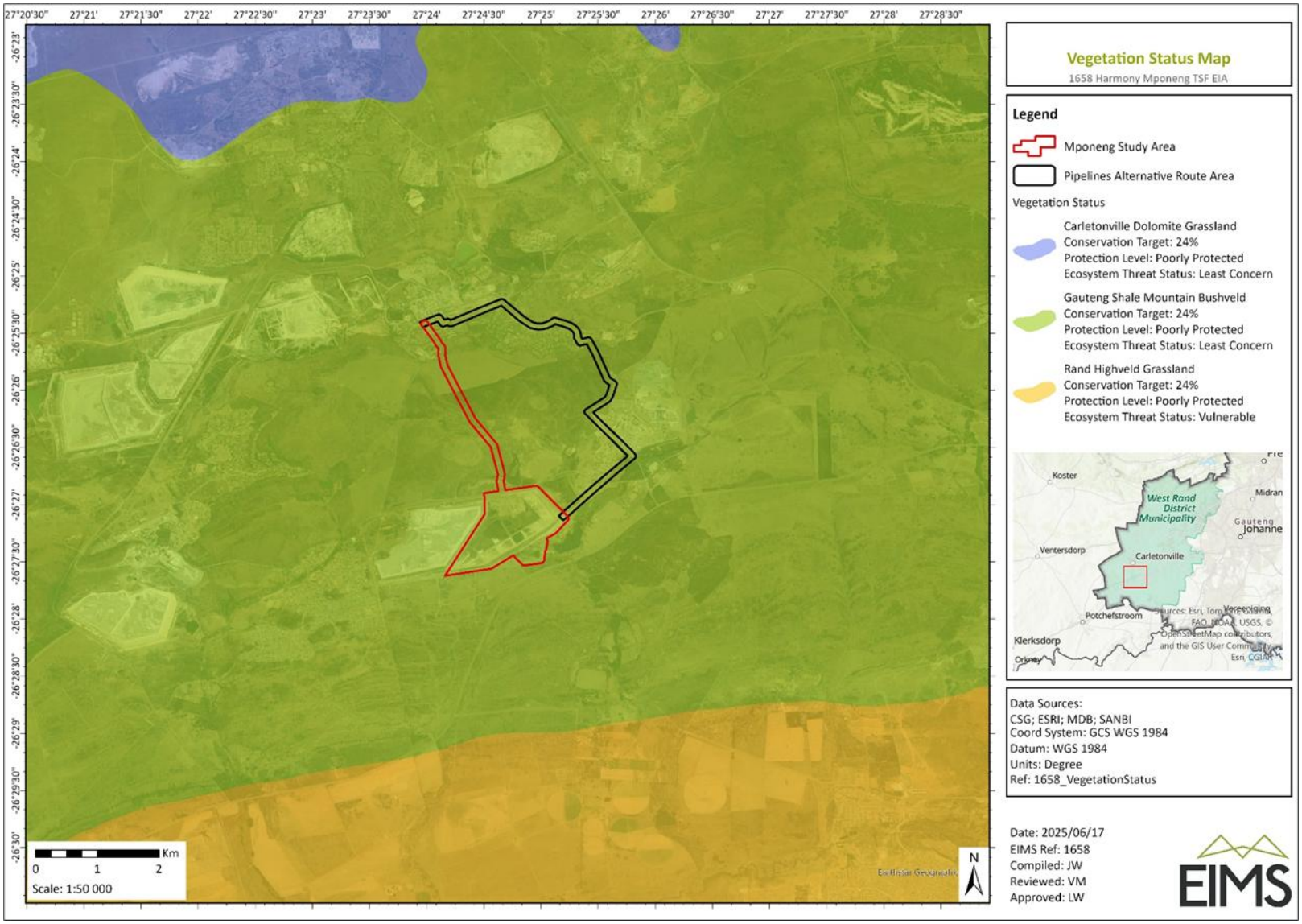


Figure 40: Map illustrating the vegetation type and status of the project area.

4.8 SURFACE WATER AND WETLANDS

4.8.1 SURFACE HYDROLOGY

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 Hydrologic Consulting (2025), the Mponeng Lower Compartment TSF is the site is located within the Highveld Ecoregion, within the Vaal-Orange WMA. The Vaal-Orange Water Management Area (WMA) is South Africa's largest and most economically significant WMA, formed by the merger of the Vaal and Orange River systems. It covers parts of six provinces and crosses international borders, impacting Botswana, Lesotho, Namibia, Zimbabwe, Mozambique, and Eswatini. Managed by the Vaal-Orange Catchment Management Agency (VOCMA), this area is vital for the nation's economy, serving major industrial, mining, and agricultural sectors, as well as urban and rural communities. The study area is located within the Upper Vaal-Orange WMA. The Upper Vaal-Orange WMA is the combined management area for the Upper Vaal WMA and the Upper and Lower Orange WMAs, now managed collectively as the Vaal-Orange WMA (WMA 4). It is a critical and central region in South Africa, encompassing the headwaters of the Vaal River and supporting the economic heartland of the country's urban, industrial, and mining sectors. This combined area is vital for national GDP, receives water from the Lesotho Highlands Water Project, and faces significant water resource challenges due to heavy development.

The study area is positioned within quaternary catchment C23J with the proposed pipelines extending to quaternary catchment C23E (see **Figure 41**). Quaternary catchment C23J is part of the Vaal River system, specifically within the Upper Vaal WMA, which is characterized by intensive industrial, mining, and urban water use, impacting its water resources and contributing significantly to South Africa's GDP. This catchment is a smaller hydrological unit that falls under the jurisdiction of the VOCMA, which is responsible for managing the water resources within the Vaal-Orange WMA. The nearest River to the study area is the Elandsfonteinspruit River to the south-east of the site, however, this river is only labelled in the 1:500,000 river dataset for South Africa. The NGI's 1:50,000 topographical map data illustrates numerous nonperennial river systems to the north and south, both of which converge to the southeast of the site. The northern system feeds the Elandsfonteinspruit, enabling perennial flows (per the NGI's classification).

The northern and southern system are associated with a vlei to the east and dams both north and south to the site. There are upstream furrows directing runoff from part of the greater Mponeng Operation (south of the Old North Complex TSF) and along the Mponeng TSF trenches draining to the non-perennial rivers to the west. The southern system is characterised by two larger dams, one of which is listed as the proposed return water dam for the Mponeng TSF.

At the time of compilation of this report, flood lines assessment was still in progress. Based on the draft 1:100year floodlines, some of the proposed activities fall within the 1:100-year floodline (**Figure 18**). Additional information will be provided in the final report.

4.8.2 TOPOGRAPHICAL RIVER LINES AND INLAND WATER AREAS

The topographical inland and river line data for the "2627" dataset indicated several inland water areas, which were classified as numerous dams, one marsh vlei and three large reservoirs (**Figure 42**). Furthermore, several topographic non-perennial drainage features were identified within the study area, along with one perennial river, the Elandsfonteinspruit.

4.8.3 NATIONAL FRESHWATER PRIORITY AREA

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver et al., 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel et al., 2011).

Within the study area, several NFEPA features are evident (**Figure 43**). Notably, a channelled valley-bottom wetland, present in the southern portion of the study area. This wetland is associated with a network of non-perennial drainage lines and is situated adjacent to the main infrastructure footprint. In addition, several seep wetlands are distributed along the periphery of the study area, particularly to the north and east and, several wetland flats were identified within the study area. Furthermore, a NFEPA river (Elandsfonteinspruit), traverses the southeastern boundary of the study area, providing important ecological connectivity. According to the dataset, all identified wetlands have been classified as artificial and to have a "Z3 - Heavily to Critically Modified" condition and are classified as "non-priority" systems.

4.8.4 NATIONAL PROTECTED AREAS EXPANSION STRATEGY

The National Protected Area Expansion Strategy 2018 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2018). The study area overlaps with portions of NPAES areas (**Figure 44**).

4.8.5 SOUTH AFRICAN INVENTORY OF INLAND AQUATIC ECOSYSTEMS

Several wetland types are present, including channelled valley-bottom wetlands, unchannelled valley-bottom wetlands, and seep wetlands **(Figure 45**). The channelled valley-bottom wetlands are primarily concentrated along the eastern and southern boundaries of the study area, closely associated with the Elandsfonteinspruit river, which flows through the southeastern section of the study area. Unchannelled valley-bottom wetlands are scattered throughout the mid-western and northern portions of the study area, often following natural drainage lines. Seep wetlands are more isolated, occurring in smaller patches along the periphery of the site. The wetlands have been classified according to the dataset to either have a "A/B – Natural/Largely Natural", "C – Moderately Modified" or a "D/E/F – Largely/Seriously/Critically Modified" condition. Furthermore, all wetlands are considered to be "Critically Endangered" and "Not Protected" with regard to Ecosystem Threat and Protection Status, respectively. According to the dataset, the Elandsfonteinspruit River is classified as a "Critically Endangered" ecosystem and is considered to be "Poorly Protected".

4.8.6 WETLANDS SURVEY

Three (3) Hydrogeomorphic (HGM) units were identified within the encompassing 500 m Mponeng Lower Compartment TSF study area. These were classified as; one (1) channelled valley-bottom, one (1) unchannelled valley-bottom and one (1) Hillslope Seep (**Figure 46).** Several dams were identified within the study area, most of which were in-stream features with only one off-channel feature. In addition, several non-perennial drainage features were identified, none of which have any connectivity to a river. A summary of the wetland features is provided in **Table 16** below.

Table 16: Wetland classification as per SANBI guideline (The Biodiversity Company, 2025).

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Highveld	Central Bushveld Group 1	Valley floor	Channelled valley-bottom	N/A	N/A
HGM 2	Inland	Highveld	Central Bushveld Group 1	Valley floor	Unchannelled valley-bottom	N/A	N/A
HGM 3	Inland	Highveld	Central Bushveld Group 1	Slope	Seep	Without channelled outflow	N/A

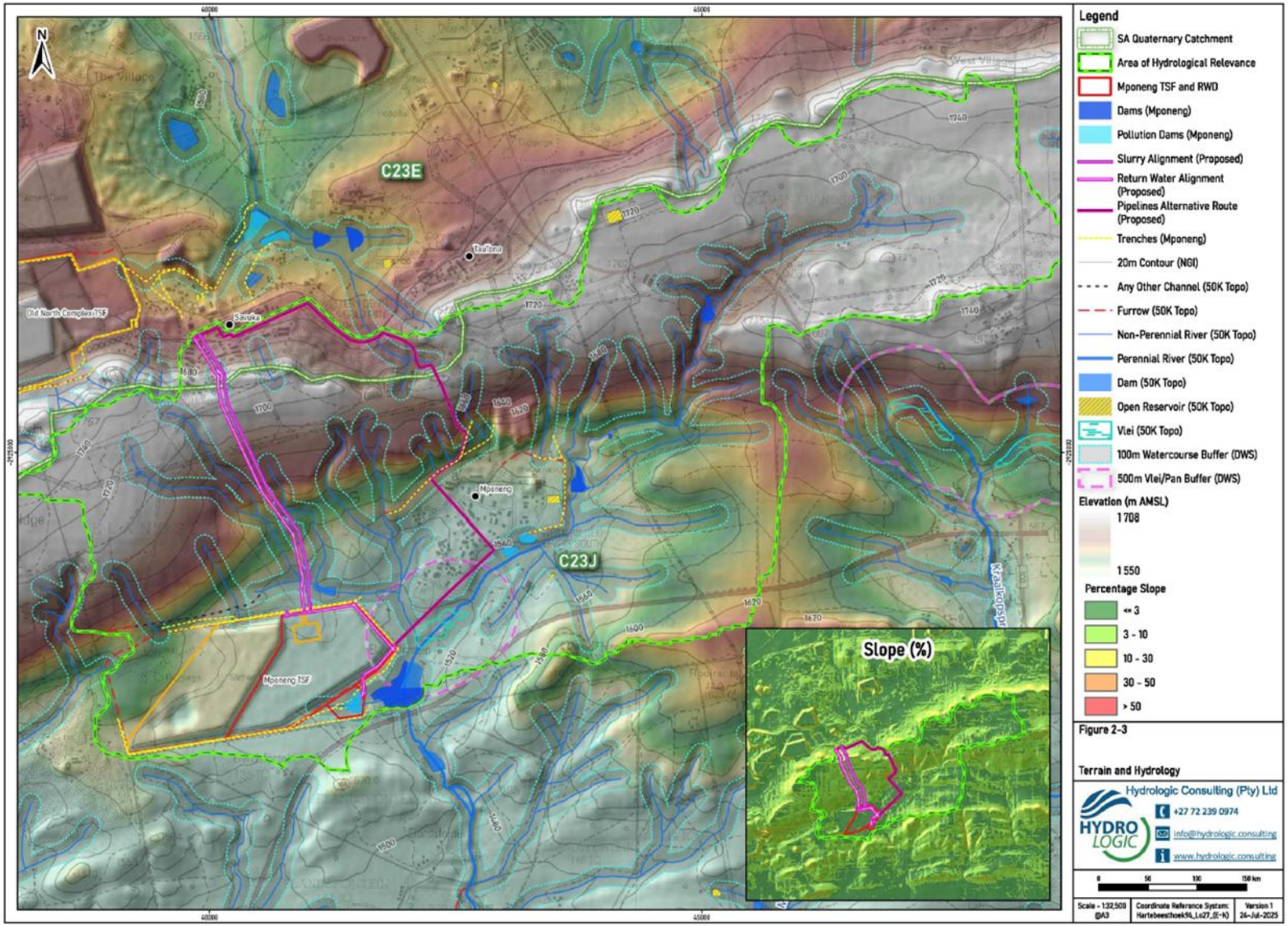


Figure 41: Hydrological setting of the site (Hydrologic Consulting, 2025).

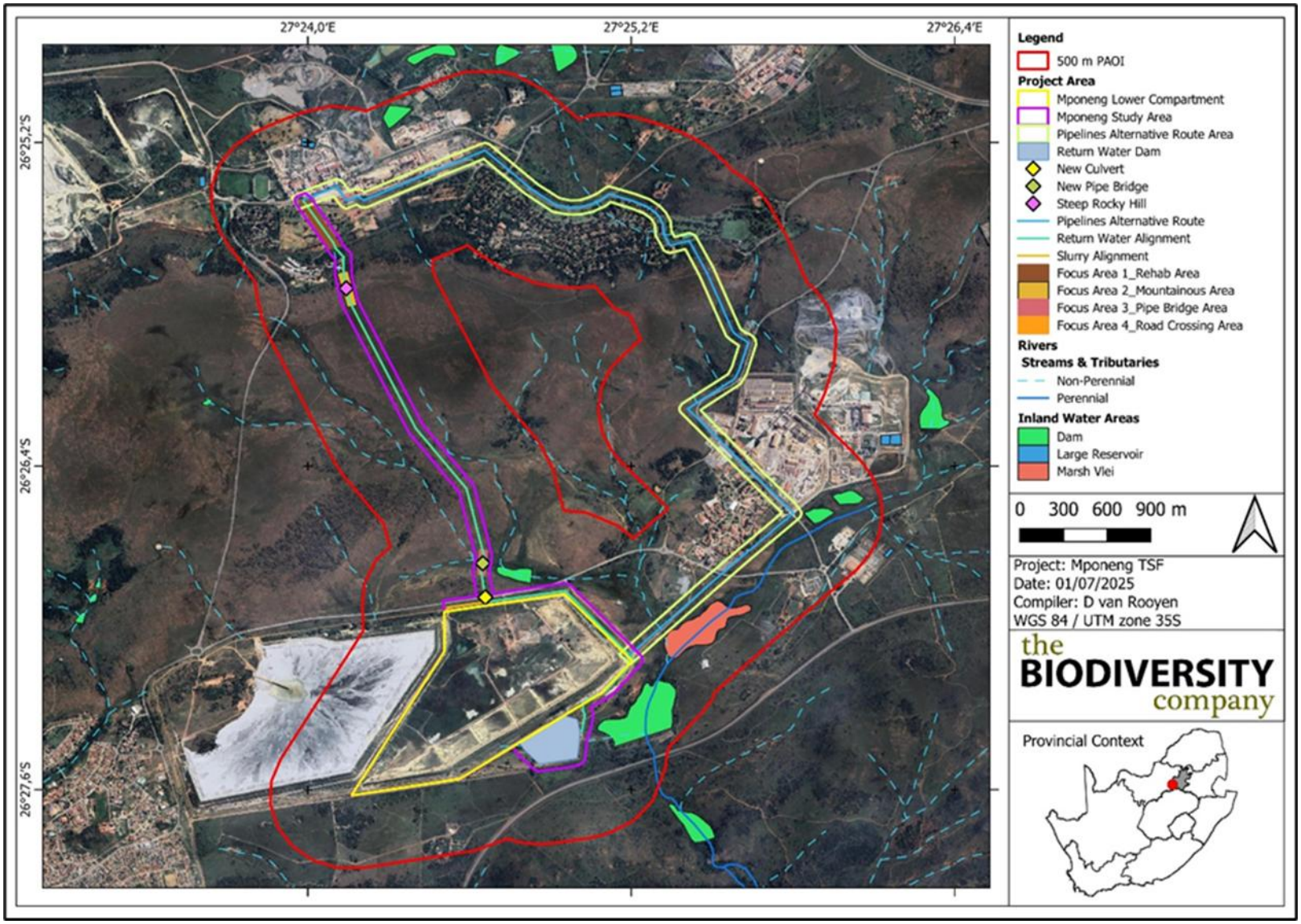


Figure 42: Topographical inland water areas and river lines that intersect the Project Area of Influence (The Biodiversity Company, 2025).

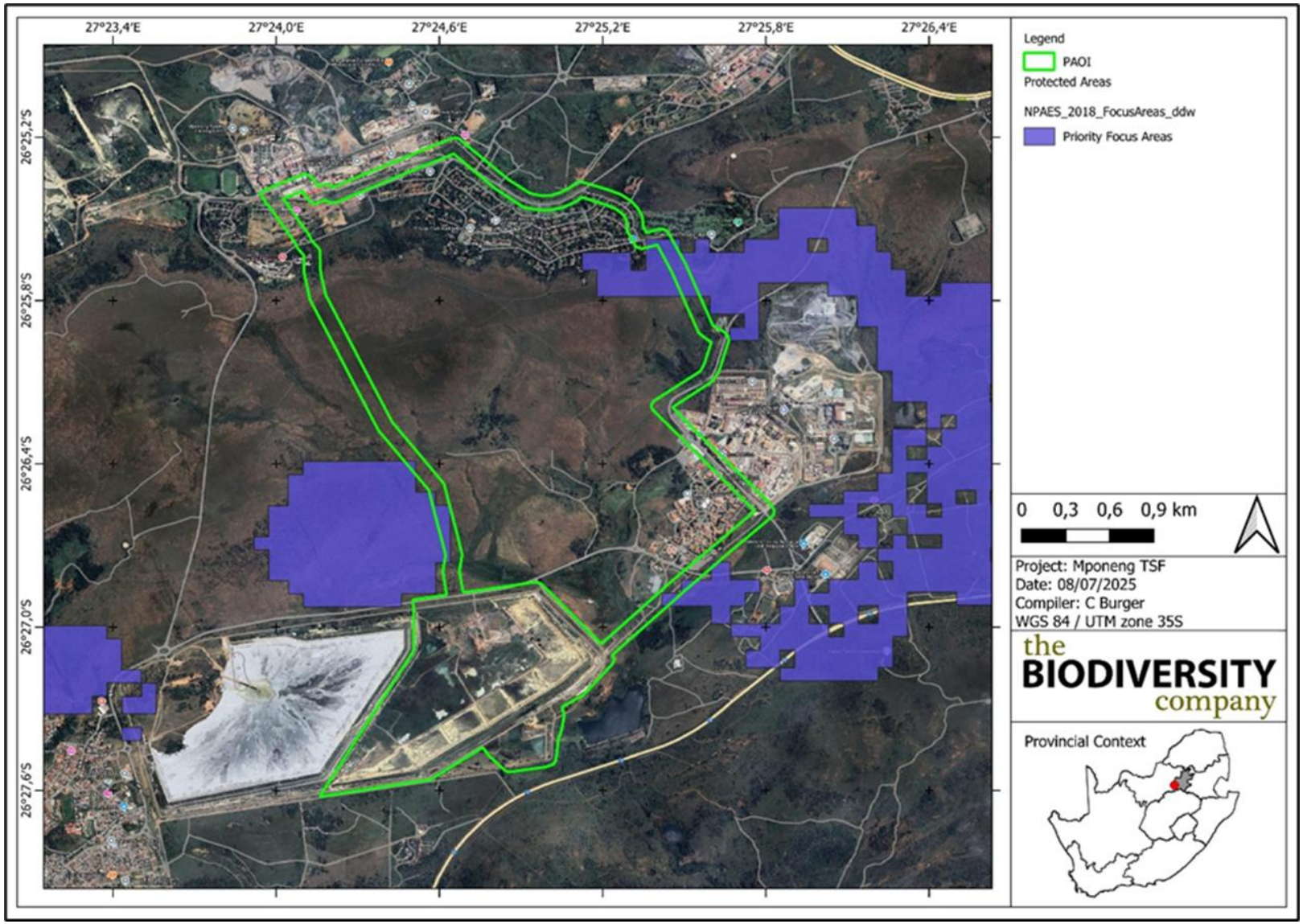


Figure 43: The study area in relation to the National Protected Area Expansion Strategy (The Biodiversity Company, 2025).

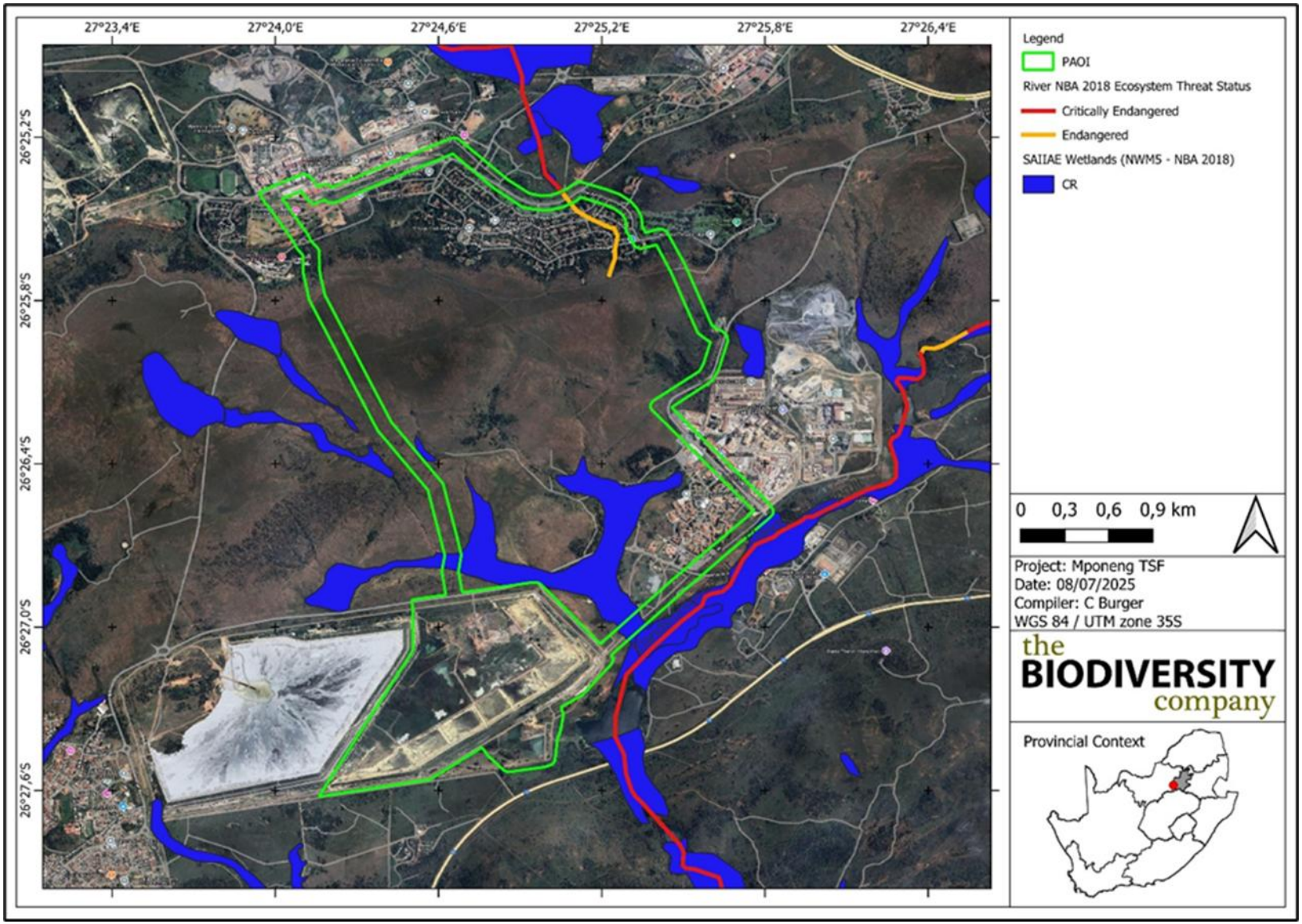


Figure 44: Map illustrating the SAIIAE threat status of rivers and wetland systems within the study area (The Biodiversity Company, 2025).

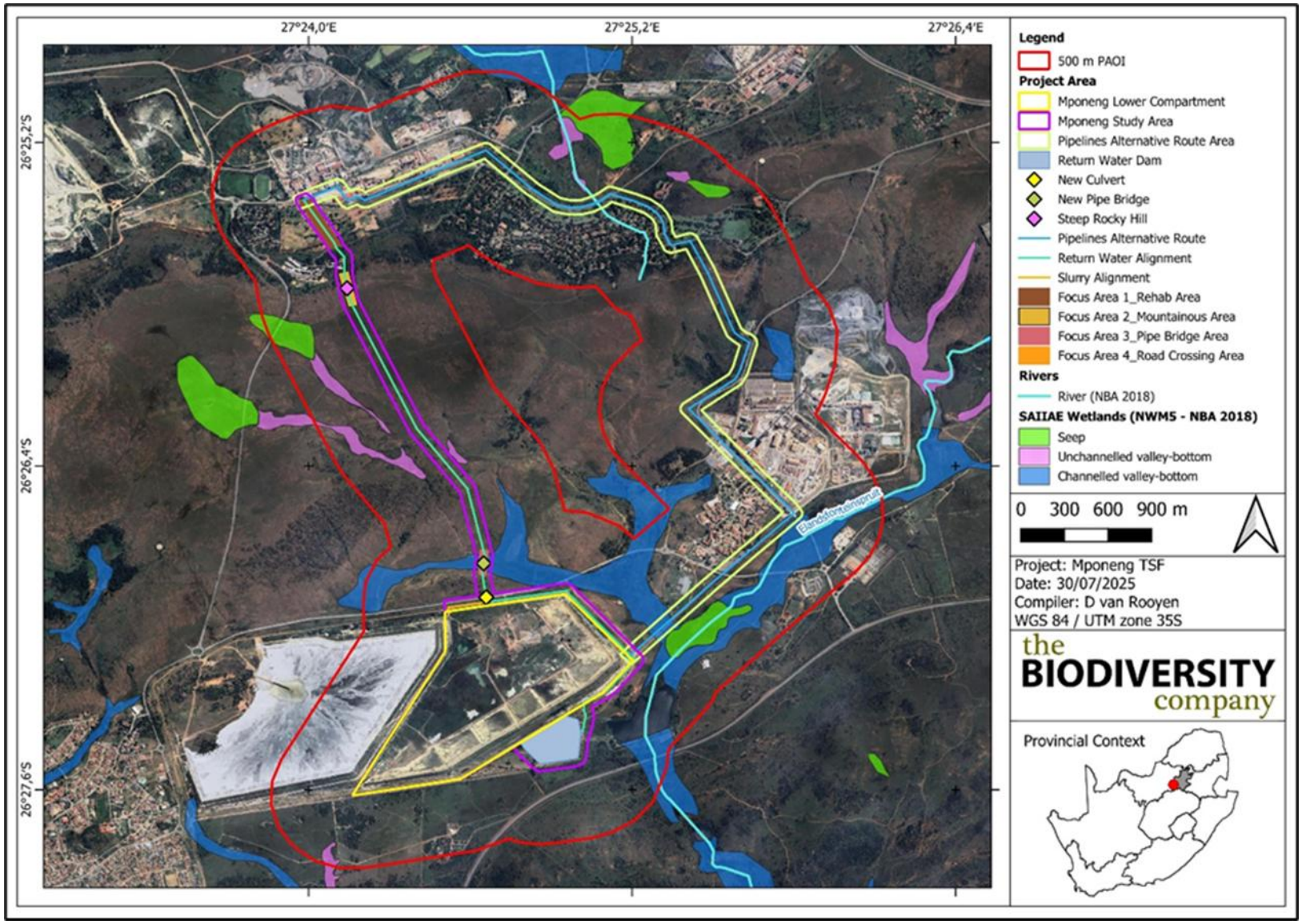


Figure 45: Wetland features identified within the study area (The Biodiversity Company, 2025).

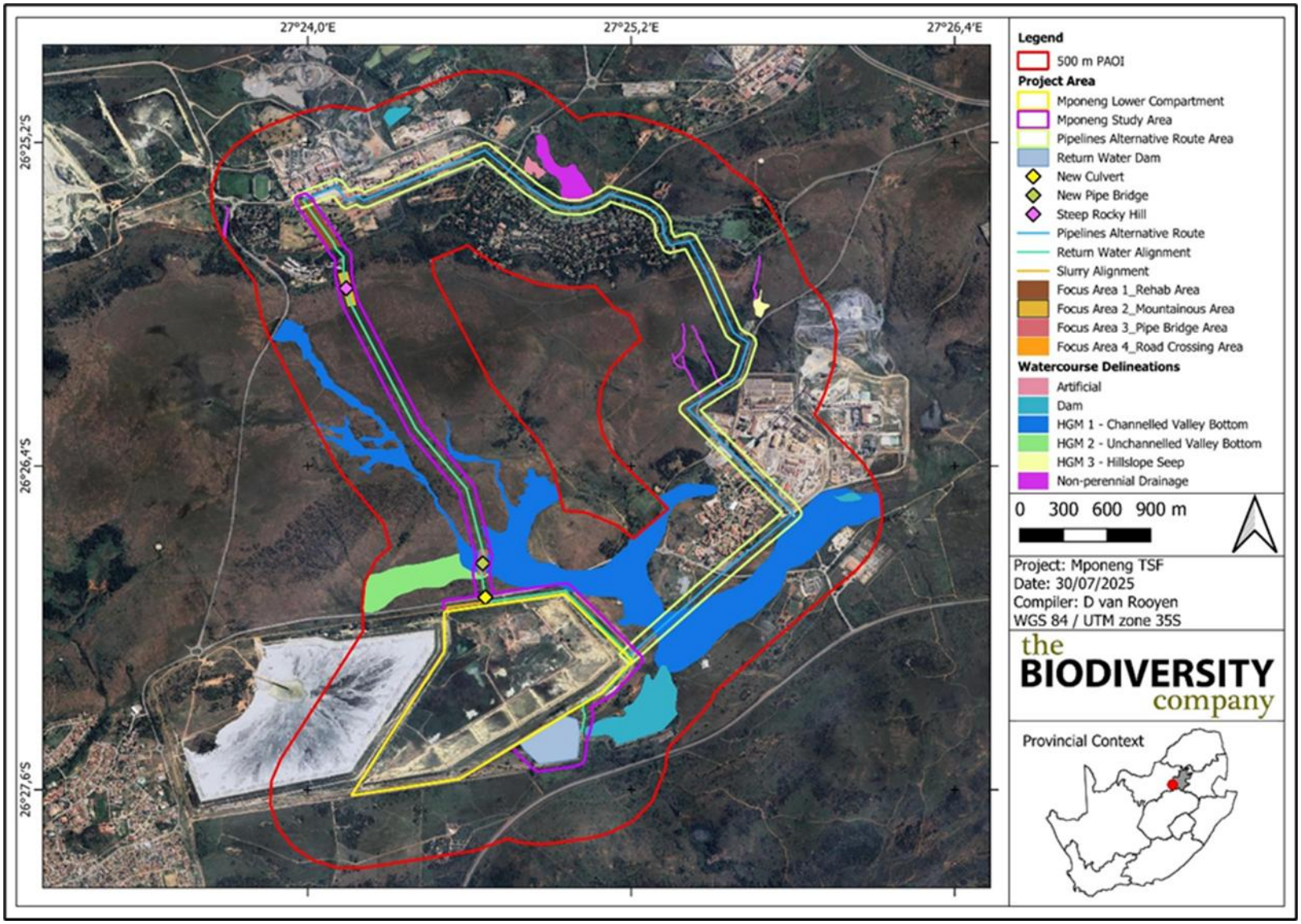


Figure 46: Delineation of watercourses within the study area (The Biodiversity Company, 2025).

4.8.7 DEPARTMENT OF WATER AND SANITATION GOVERNMENT NOTICE (GN) 704

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established Government Notice (GN) 704 to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. This includes the following condition:

Condition 4 – Restrictions on locality – No person in control of a mine or activity may:

e) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked.

The 100 m watercourse buffer is consequently one of the main guiding aspects in the assessment of site sensitivities given its relevance to GN 704, and its applicability to both flooding and the potential for contaminants to enter a watercourse (i.e. a wider river buffer is more likely to keep infrastructure/works outside of areas prone to regular or irregular flooding while enabling more time for containments within runoff, to settle out before entering the watercourse). A 100 m watercourse buffer distance is, however, limited in its application since the proposed activities will either fall within or without this buffer distance, with no grading in site sensitivity possible. An expanded approach to the 100 m river buffer was consequently adopted utilising a variation in buffer distances modelled flooding and contour analysis.

Several topographic non-perennial drainage features were identified within the study area, along with one perennial river, the Elandsfonteinspruit (**Figure 42**). There is also constructed drainage present (furrows). Where furrows appear to manage larger areas or are otherwise extensions of non-perennial rivers, they are assumed to fall within the conceptual definition of a watercourse insofar as having the potential to cause flooding and route pollutants downstream.

Watercourse buffers have consequently been derived from the 1:50,000 topographical map features inclusive of dams, furrows, the non-perennial river, non-perennial pans and vleis. Open reservoirs have been excluded on the basis that inflows are managed (and that there is no significant upslope catchment area of relevance). Watercourse buffers are technically applicable from the edge (top of the bank) of the watercourse and not from the centreline (as in the case of rivers, drainage canals and furrows). The absence of a river survey means that the river centreline has nevertheless been used to define buffers.

The following sensitivity bands were classified:

- Prevent Development
    - A 32m watercourse buffer (also applicable to NEMA activities) was used to define the functional area of the watercourse excluding water crossings such as the pipeline bridge and culvert.
    - This 32m buffer factors in the potential error in the 1:50,000 topographical map dataset.
    - All development should be prevented in this area, unless water-compatible or otherwise crossing over a watercourse (with flood risk factored in).
- High
    - A 100m buffer distance matches GN 704's and DWS Notice 4167 of 2023 prescribed buffer distance and is the minimum distance to a watercourse requiring motivation if works/infrastructure are going to be permitted, including a written exemption from the Minister of the Department of Water and Sanitation.
    - There is a strong disincentive towards development within this area.

- Medium
    - A 200m buffer distance was included as an intermediate buffer distance to the 100m buffer distance above and the 500m buffer distance below.
    - There is a medium disincentive towards development within this area.
- Low
    - A 500m buffer distance is a reasoned maximum distance from a watercourse which in most instances will reflect the largest distance over which flooding would need to be considered.
    - DWS Notice 4167 of 2023 also outlines how a 500m buffer distance is applicable to wetlands (which includes pans and vleis as present in this study area). The hydrologist, however, does not focus on wetlands and only considers the 1:50,000 topographical map rivers. There is a low disincentive towards development within this area.
- Remainder
    - There is no sensitivity classification for the remainder of the site.

GN 704 restricts development within 100m of a watercourse (e.g. dam or river) and the above outline does not attempt to remove this restriction but is instead a high-level 'scaled' version of this buffer distance. This classification only partly considers the 500 m wetland buffer that applies. This wetland buffer was more comprehensively assessed as part of a wetland survey of the site (refer to **Section 4.8.6**) and not the higher-level datasets present with the NGI's 1:50,000 topographical map dataset. Current surface water monitoring sites include:

- North Boundary Dam – monitored as a compliance point; however, no discharge occurs from this dam due to poor water quality;
- Nursery Dam and Koffer Dam – internal stormwater and effluent holding dams;
- Downstream tributaries of the Wonderfonteinspruit and Elandsfonteinspruit; and
- Trench water and seepage channels around the TSFs and WRDs.

Results from the 2023 Annual Water Quality Monitoring Report and 2024 Monthly Site Reports are indicated in **Table 17**.

Table 17: Water Quality Trends (2023–2024) (Gomelelo, 2025).

Parameter	Current WUL Limit	Range Observed (2023–2024)
Sulphate (SO_4^{2-})	600 mg/L	430 – 820 mg/L
EC	70 mS/m	60 – 142 mS/m
TDS	450 mg/L	400 – 1 100 mg/L
NH_4^+	1 mg/L	0.2 – 2.4 mg/L
Faecal Coliforms	0 per 100 mL	0 – 500 cfu/100 mL

Exceedances were often linked to RWD overflow events, particularly the July 2024 incident, which led to a short-term spike in COD and microbial contamination at NBD, seepage from WRDs and TSFs, particularly Savuka and Old North Complex areas and seasonal runoff after intense rainfall, mobilising accumulated sediments and contaminants. The recurring exceedances of sulphate, electrical conductivity (EC), and metals such as iron and manganese at the North Boundary Dam and nearby stormwater trenches indicate persistent surface water contamination risks. These exceedances—recorded against DWAF aquatic and irrigation guideline values—are

likely linked to seepage from legacy TSFs, process water return lines, and insufficient stormwater separation. In light of these findings, the following management actions are recommended:

- Maintain or expand trench capacity and containment volumes;
- Improve stormwater diversion and separation of clean and dirty water flows;
- Continue seasonal biomonitoring and SPI/SASS5 analyses to track ecological trends; and
- Investigate the feasibility of installing low-maintenance treatment systems — such as constructed wetlands, vegetated swales, or reactive material trenches — in areas where contaminated water from seepage trenches or dams may migrate into the environment. These passive systems help to filter, absorb, and break down pollutants such as sulphates, metals, and nutrients through natural processes (e.g., plant uptake, microbial action, or geochemical reactions), thereby improving water quality prior to reaching downstream ecosystems or surface water bodies.

4.9 GEOHYDROLOGY / GROUNDWATER

A description of the conceptual hydrogeological model is important to provide an understanding of the regional geology (refer to **Section 4.5**), which is the governing factor in both the aquifer formation and the movement of groundwater, as well as the hydrogeological setting and groundwater occurrence in the mining area. The hydrogeological 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.
- Aquifer classification.

4.9.1 BOREHOLE INFORMATION

There are several groundwater monitoring boreholes in the vicinity of the Mponeng Lower Compartment TSF. No private boreholes could be located within a 2km radius of the TSF as there no major groundwater users in the area. The localities of the available boreholes are shown on **Figure 47** and summarised in **Table 18**.

4.9.2 AQUIFER TYPE

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Weathered and fractured rock aquifer in the Transvaal Formations.
- Dolomitic and Karst Aquifers.

Although the dolomite aquifer is the most prominent aquifer in the region, it does not play any role in the activities at the Mponeng Lower Compartment TSF. The Mponeng Lower Compartment TSF is predominantly located on the shale of the Timeball Hill formation. The dolomite is ±400m below surface at the Mponeng TSF site. Evidence has shown that there is no connectivity between the weathered / fractured aquifer and the underlying dolomite aquifer. Even in compartments where the dolomite aquifer is dewatered the groundwater levels in the weathered / fractured aquifer remains unaffected.

4.9.2.1 WEATHERED AND FRACTURED AQUIFER

Groundwater occurs in the near-surface geology in the weathered and fractured sedimentary deposits (quartzite and shale) of the Transvaal strata. The lava of the Hekpoort Formation has similar weathering characteristics to

that of the shale and is therefore deemed as the same aquifer. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected. Groundwater occurrences are mainly restricted to the weathered formations, although fracturing in the underlying "fresh" bedrock may also contain water. Experience has shown that these open fractures seldom occur deeper than 60m. The base of the aquifer is the impermeable quartzite, shale and lava formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined. The two aquifers (weathered and fractured) are mostly hydraulically connected, but confining layers such as clay and shale often separate the two. In the latter instance the fractured aquifer is classified as confined. The aquifer parameters, which includes transmissivity and storativity is generally low and groundwater movement through this aquifer is therefore also slow.

4.9.2.2 DOLOMITE AQUIFER

Dolomite aquifers in the region are known to contain large quantities of groundwater and are commonly associated with sustainable groundwater abstraction. The water that plaques the underground mining is primarily derived from the dolomite aquifer overlying the workings. The depth to groundwater in the region ranges from 4m to 41m below surface in the non-dewatered groundwater compartments (Zuurbekom and Boskop/Turffontein). This is in contrast to the groundwater levels in excess of 200 m in the dewatered compartments (Gemsbokfontein West, Venterspost, Bank and Oberholzer). The unsaturated zone in the dolomite aquifer ranges from weathered wad material and Karoo sediments within deep solution cavities or grykes (deeply weathered paleo-valley within the dolomite) to relatively fresh fractured dolomite between major solution cavities and at depth.

The shallow weathered dolomite aquifer has been formed because of the karstification which has taken place prior to the deposition of the Karoo sediments on top of the dolomites. There is general agreement that this aquifer is the significant source of water within the dolomite. The base of the weathered dolomite (aquifer) is irregular in nature and there are zones of deep weathering (grykes). The maximum depth to the base of this aquifer is in the order of 200m below surface. The non-weathered dolomite approximates a traditional fractured rock aquifer at depth where dissolution has been less pronounced. It is extremely unlikely that any significant groundwater flow occurs below these depths except along intersecting structural conduits to the underlying mine workings.

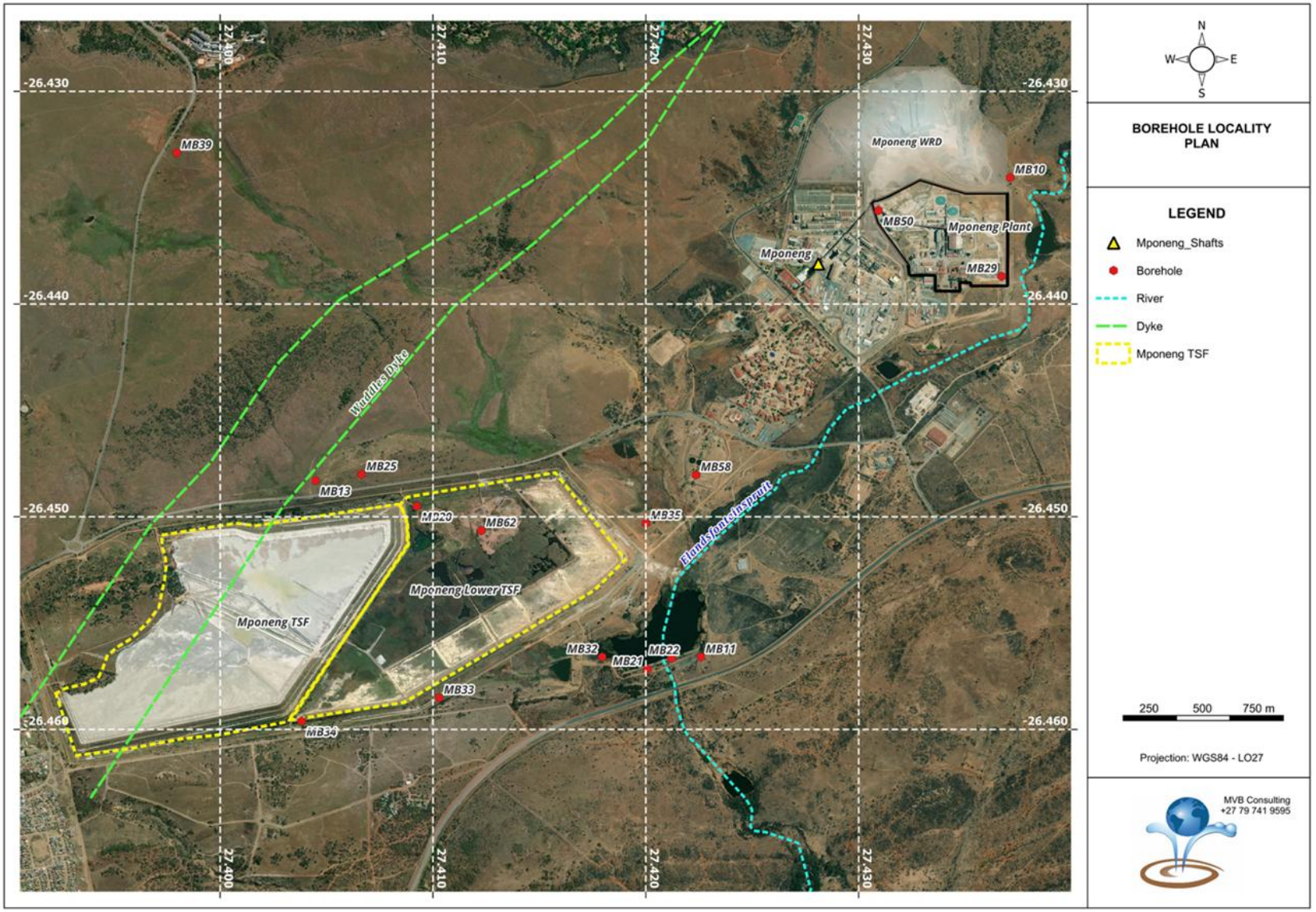


Figure 47: Monitoring boreholes in the vicinity of the Mponeng TSF (MvB Consulting, 2025).

Table 18: Mine monitoring boreholes (GCS, 2023).

BH ID	Longitude	Latitude	Z	Description	Borehole Depth (m)	Geology
MB10	27.43712	-26.43405	1569.26	SE of Mponeng RD; N of Mponeng GP	29.66	Timeball Hill Shale and Quartzite
MB11	27.42259	-26.45659	1499.16	SE of Mponeng TSF and Below aquatic Dam	30.00	Shales
MB13	27.40448	-26.44829	1560.05	N of Mponeng TSF, N road,	33.50	Timeball Hill Shale and Quartzite
MB20	27.40925	-26.44950	1541.87	Next to the eye (fountain),	30.00	Shales (weathered / fractured)
MB21	27.42008	-26.45717	1498.45	SE of Mponeng TSF, SE Mponeng RWD	30.00	Shales
MB22	27.42121	-26.45666	1497.81	SE of Mponeng TSF, SE Mponeng RWD	30.00	Shales and andesite lava
MB25	27.40665	-26.44800	1556.15	N of Mponeng TSF	100.00	Timeball Hill Shale and Quartzite
MB29	27.43672	-26.43869	1555.53	South of anti pollution dams at Mponeng Plant		-
MB32	27.41795	-26.45659	1507.50	S of S Mponeng RWD		-
MB33	27.41029	-26.45851	1524.70	South of South TSF below van Eeden dam		Borehole dry / blocked
MB34	27.40383	-26.45961	1535.43	South of South TSF below partition of 2 dams		Borehole dry / blocked
MB35	27.42000	-26.45030	1512.43	E of S s/dam next to soccer field	30.00	Timeball Hill Shale and Hekpoort Andesite
MB39	27.39796	-26.43289	1705.33	On Gatsrand up from Wadela circle to Savuka	114.00	Timeball Hill Shale
MB50	27.43093	-26.43560	1563.83	South-west (down gradient) of Mponeng waste dump	35.00	Timeball Hill Shale and Quartzite
MB58	27.42236	-26.44803	1516.85	Downstream of Mponeng (south) sewage works		Borehole locked
MB62	27.41227	-26.45065	1534.33	Downstream Mponeng Solid Waste Site at TSF Compartment		-

4.9.2.3 RELATIONSHIP BETWEEN THE WEATHERED / FRACTURED AQUIFER AND THE DOLOMITE AQUIFER

Evidence has shown that there is no connectivity between the weathered / fractured aquifer and the underlying dolomite aquifer. Even in compartments where the dolomite aquifer is dewatered the groundwater levels in the weathered / fractured aquifer remains unaffected. **Figure 48** illustrates the relationship between the fractured and dolomite aquifers and also shows that the degree of karstification. Based on the exploration borehole information, it appears that the dolomite that that is covered by Transvaal strata is less karstified and the dolomite aquifer is therefore not as well developed. The mines situated south of the "Gatsrant" are generally dry mines with limited groundwater inflow, whereas the mines north of the "Gatsrant" is plagued by high groundwater inflow volumes. This is, in part, attributed to the well-defined karstification in the northern dolomites.

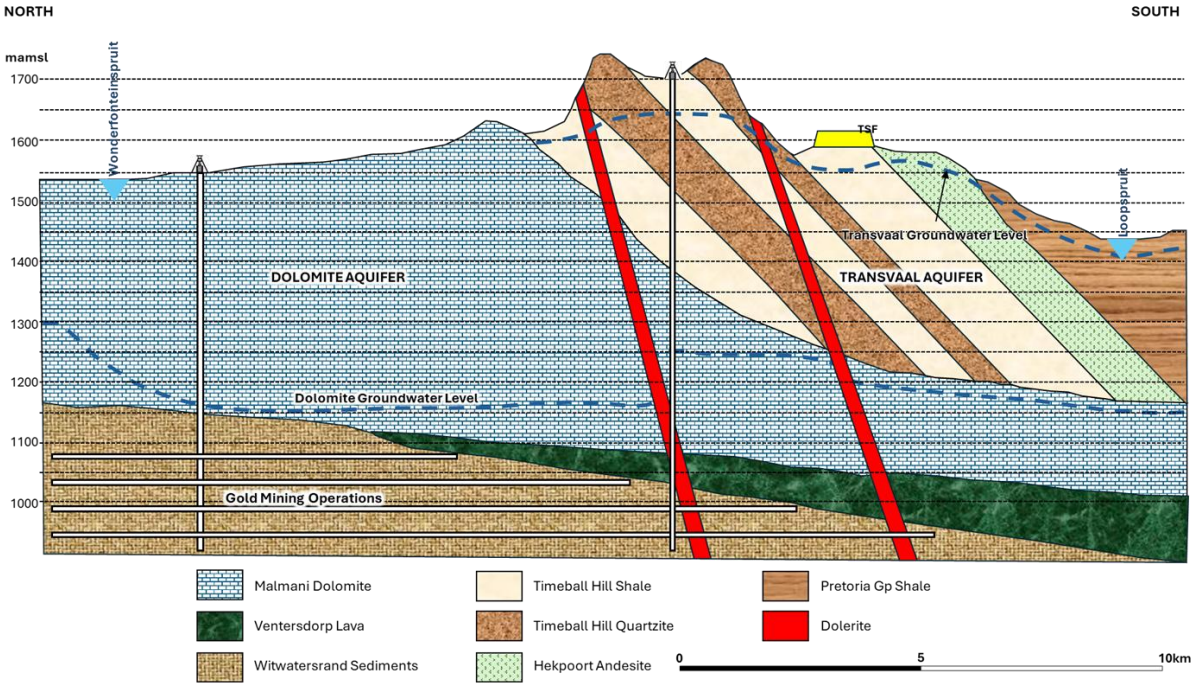


Figure 48: Graphical illustration of the aquifers in the study area (Van Biljon, 2018).

4.9.3 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.

Pump testing that was undertaken by GCS (2019) estimated the aquifer parameters in the weathered and fractured aquifer to be as follows (**Table 19**).

Table 19: Transmissivity and hydraulic conductivity values in the weathered and fractured aquifers (GCS, 2019)

ID	Blow Yield (litre/hour)	Transmissivity (m^2/day)	Hydraulic conductivity (m/day)		Aquifer
			Constant Discharge Test	Recovery Test	
MB10	23 000	-	12.9	6.08	Timeball Hill Shale and Quartzite
MB11	150	0.07	-	-	Shale
MB12	400	0.01	0.052	0.0303	Shale
MB13	1 190	0.7	0.1194	0.0363	Timeball Hill Shale and Quartzite
MB19	100	-	-	-	Shale
MB20	100 000	337	11.6	14.38	Shale (weathered / fractured)
MB21	1 600	2	-	-	Shale
MB22	3 600	13	0.5573	0.4645	Shale and andesitic lava
MB35	-	-	0.47	1.86	Timeball Hill Shale and Hekpoort Andesite
MB39	-	-	0.04	-	Timeball Hill Shale
MB50	Seepage	-	-	-	Timeball Hill Shale and Quartzite
MB51	Seepage	-	-	-	Timeball Hill Shale and Quartzite
MB58	3 000	-	-	-	Timeball Hill Shale and Quartzite

4.9.4 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:

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

According to Vegter (1995) the recharge in the fractured aquifer is 31 mm / annum with water occurring in the shallow weathered zone and water bearing fractures only. This is equal to approximately 4% of mean annual precipitation. The average rainfall in the area is approximately 646 mm / annum. The average chloride in rainfall for areas inland is approximately 1.0 mg/L and the harmonic mean of the chloride concentration values in groundwater samples obtained from the mining area is 25.88 mg/

$$R = \frac{1}{25.88} x\ 100\text{=}3.9\%$$

This value corresponds with Vegter's value.

4.9.5 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). Based on the assessment, a very good correlation (99%) between the topography and the groundwater level was identified, which suggests that groundwater flow will follow the topographical gradient. **Figure 49** depicts the groundwater level elevations, which as expected, mimics the surface contours. Groundwater flow is perpendicular to the groundwater contours and flows predominantly towards the south-west.

4.9.6 GROUNDWATER QUALITY

The mine routinely monitors the groundwater quality in the vicinity of the Mponeng Lower Compartment TSF. This data was made available and is used to assess the current impacts from the TSF.

Since there are no groundwater users within a 1km radius from the Mponeng Lower Compartment TSF, 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 guideline for livestock watering represents the target water quality specified in the guidelines. The target water quality guidelines were obtained from the Department of Water Affairs and Forestry, 1996. South African Water Quality Guidelines (second edition). Volume 5: Agricultural Use: Livestock Watering. According to the guidelines (DWAF, 1996), the following constituents are of concern for livestock watering. The chemistry of the groundwater is presented in **Table 20**. Where either of the guidelines are exceeded, the values are highlighted in baby pink. With reference to **Table 20** the following is observed:

- Monitoring boreholes MB29 and MB50 in the plant area show an impact. This is, however, not applicable to the current investigation.
- Monitoring boreholes MB32 and MB35 show an impact from the up-gradient Mponeng TSF. This is in line with the expected groundwater flow paths.
- The groundwater flow is towards the Return Water Dams (RWD), but borehole BH35 shows that the impacted water passes underneath the RWD. The impact is therefore expected to flow into the Aquatic Dam, or it will form part of the baseflow of the Elandsfonteinspruit. The relatively good water quality in the Aquatic Dam suggests that the impacted groundwater forms part of the baseflow of the stream.

The distribution of the sulphate (SO_4) concentrations provides an aerial view of the impact areas, which is as expected along the eastern and south-eastern boundary of the TSF (**Figure 50**).

.

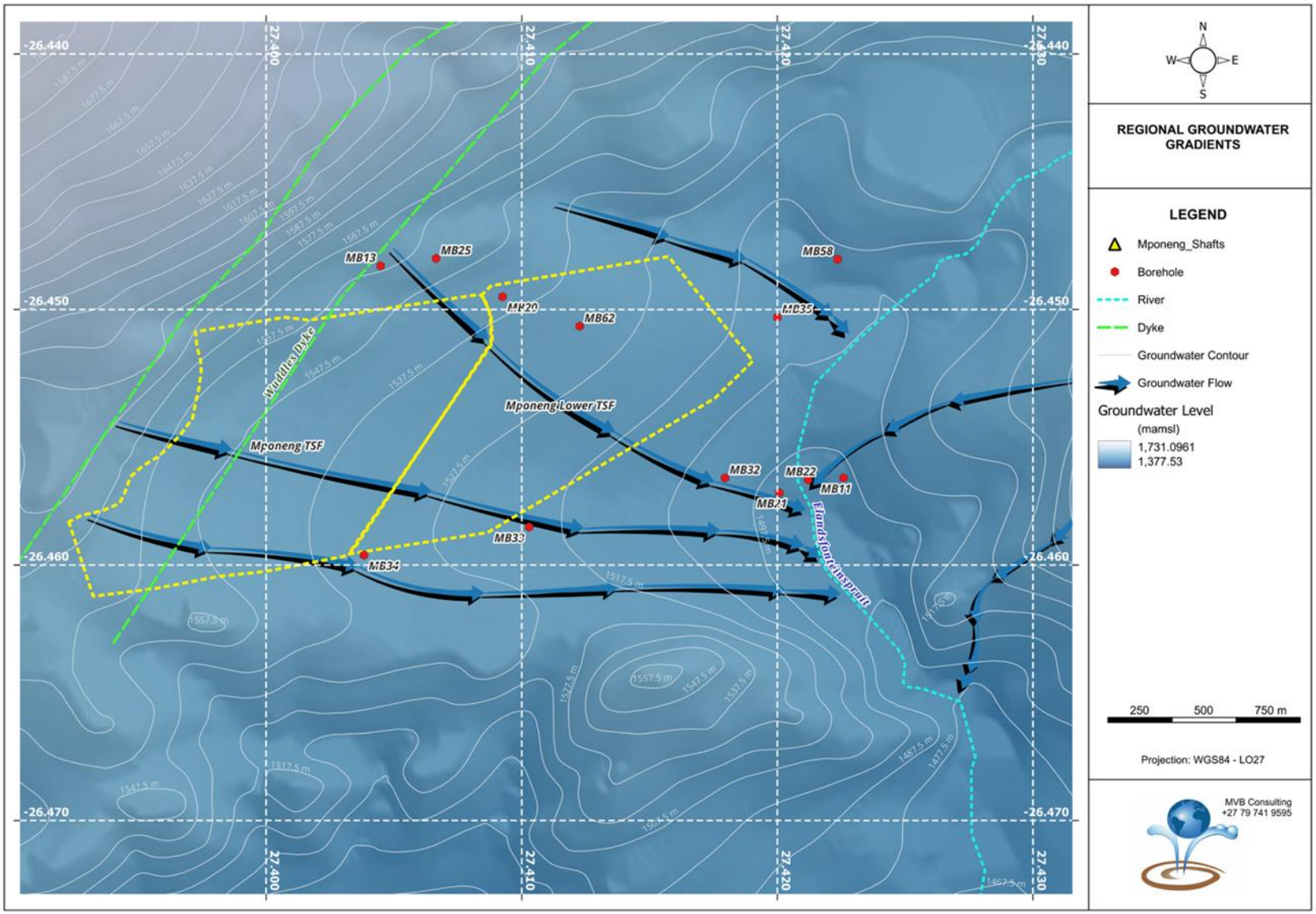


Figure 49: Regional groundwater gradient and borehole locations in relation to the TSF site (MvB Consulting, 2025).

Table 20: Groundwater chemistry (MvB Consulting, 2025).

Analysis in mg/L (unless specified otherwise)	SANS 241	DWAF	MB39	MB10	MB29	MB32	MB50	MB11	MB13	MB62	MB20	MB21	MB22	MB25	MB35
Electrical Conductivity (mS/m)	170	-	2.4	4	219	313	228	118	2.2	7.7	1.5	109	98.5	2.1	435
Hardness Total			7	10	391	837	500	466	7	18	7	399	363	9.5	1434
pH	<5 - >9.7	-	6.5	6.6	5.7	6.6	5.7	7.7	6.3	6.8	6	7.2	6.9	5.8	4.8
Suspended Solids at 105°C	-	-	26	<25	94	<25	257	236	<25	408	358	260	220	1455	59
Total Dissolved Solids at 180°C	1 200	1 000	<100	<100	1 476	2 176	1 499	814	<100	<100	<100	760	682	165	2 971
Alkalinity Total	-	-	<30	<30	<30	57	<30	232	<30	<30	<30	190	156	<30	<30
Ammonia	1.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Calcium	-	1 000	<2.0	2.4	99	201	118	96	<2.0	2.6	<2.0	92	78	2.1	409
Chloride	300	1 500	<5	5	366	571	402	187	<5	12	<5	206	191	<5	814
Fluoride	1.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium	-	500	<2.0	<2.0	35	80	50	54	<2.0	2.7	<2.0	41	41	<2.0	99.6
Nitrate & Nitrite	11	100	0.8	1.6	11	7.6	54	1.7	1.1	1.7	<0.5	1.2	<0.5	0.9	<0.5
Orthophosphate	-	-	<0.05	<0.05	<0.05	0.1	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sodium	200	2 000	2.1	3.9	267	351	250	34	2.1	6.8	<2.0	37	32	2.2	396
Sulphate	500	1 000	<5.0	<5.0	468	775	334	94	<5.0	<5.0	<5.0	41	33	<5.0	1 261
Zinc	5	0.02	<0.10	<0.10	0.12	<0.10	0.19	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1.1
Aluminium	0.3	5	<0.03	<0.03	0.04	<0.03	0.03	<0.03	<0.03	0.07	<0.03	<0.03	<0.03	<0.03	<0.03
Boron	2.4	5	<0.02	<0.02	0.08	0.05	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium	0.003	0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Copper	2	0.5	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cyanide Dissolved - CFA	0.2	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanide WAD - CFA	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron	2	10	0.05	<0.03	<0.03	0.03	<0.03	0.04	<0.03	0.09	3.5	0.7	4.5	<0.03	4.8
Lead	0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	0.4	10	<0.03	<0.03	1	0.22	0.2	0.23	0.18	0.04	0.26	1.6	2.4	0.091	4.2
Nickel	0.07	1	<0.03	<0.03	0.07	0.05	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	0.14
Uranium	0.03	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

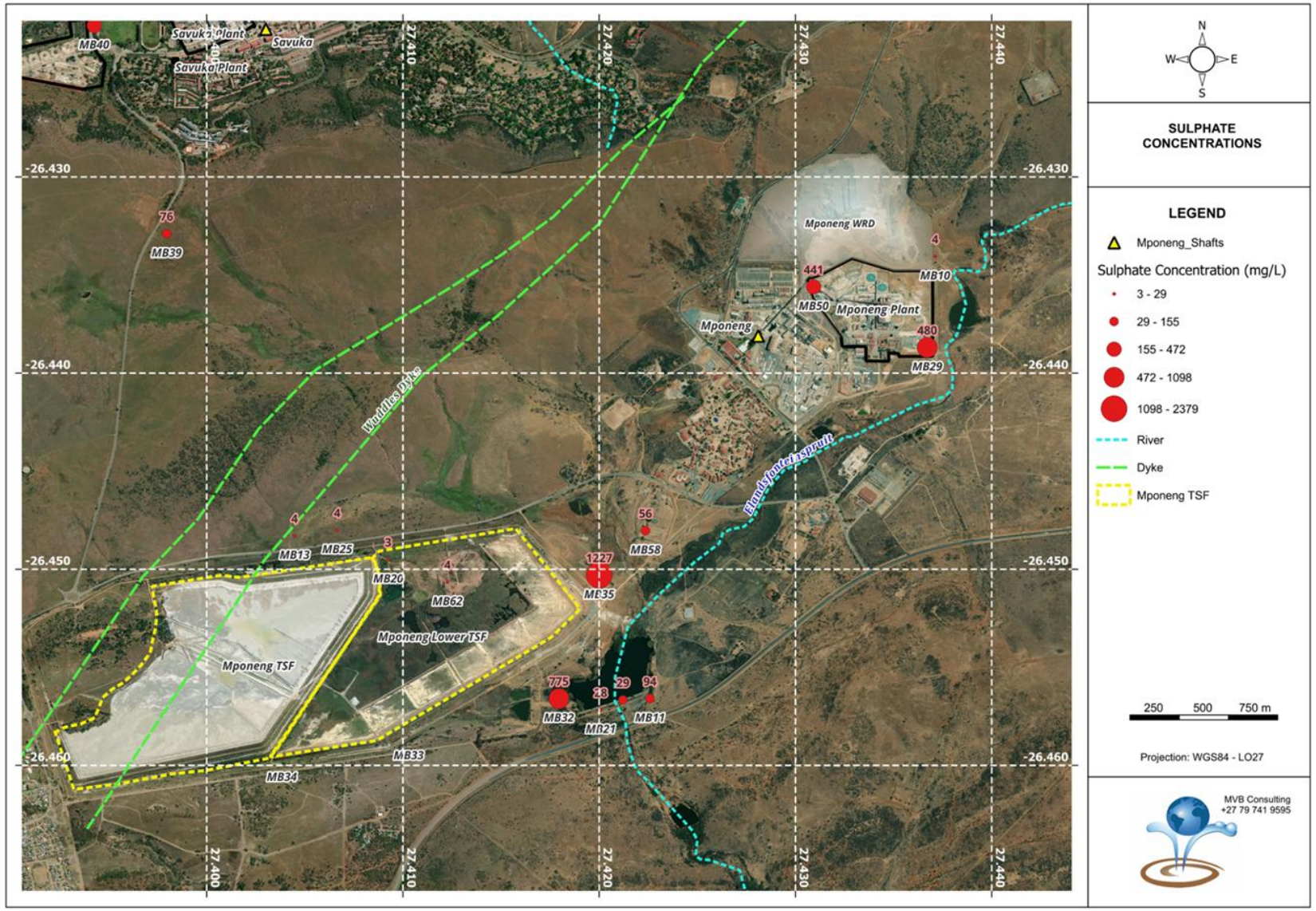


Figure 50: Sulphate concentration distribution in the groundwater monitoring boreholes (MvB Consulting, 2025).

4.9.7 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 21: Aquifer Classification (MvB Consulting, 2025)

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

4.10 SOCIO-ECONOMIC

The socio-economic baseline conditions relevant to the Project area are described in Equispectives (2015; 2020). The baseline socio-economic information was updated in 2022 through the 2022 South African Census (https://census.statssa.gov.za/#/province/7/2). The Draft Integrated Development Plan (IDP) for Merafong City 2025-26 best describes the socio-economic conditions for the Municipality (https://merafong.gov.za/wp-content/uploads/2025/04/Draft-IDP-Document-March-2025-2026.pdf). The Radiological Health Impact Assessment for Savuka TSF (Aquisim Consulting, 2025) provides a detailed summary of the conditions that serve as a basis for human behavioural conditions and their interaction with the environment (refer to https://www.eims.co.za/2025/06/25/1657-harmony-savuka-ba-wula/ for the report). The Savuka TSF Radiological Health Impact Assessment information provides input into the definition of receptor groups and their behaviour within the public exposure conditions.

4.10.1 MUNICIPAL PROFILE

According to the Draft Integrated Development Plan (IDP) for Merafong City 2025-26, Merafong City Local Municipality (MCLM) is a Category B municipality with an Executive Mayor Governance system. A Category B municipality, also known as a local municipality, is a type of local government in South Africa that shares executive and legislative authority with a Category C (district) municipality. These municipalities are the primary providers of local services, such as refuse removal, sewage, and water supply, operating within a broader district municipality framework for more regional functions like bulk water infrastructure and integrated development planning.

The Speaker is the Chairperson of Council and is responsible for overseeing the functioning of Council and its committees. The office of the Speaker is further responsible for the establishment and functioning of ward committees. The Chief Whip is responsible for ensuring compliance to the code of conduct by Councillors. MCLM covers an area of 1631.7km² and it comprises of twenty-eight (28) wards in terms of Section 18 (3) of the local government: Municipal Structures Act, 1998 (Act 117 of 1998) which constitutes 28 Ward Councillors and 24 Proportional Representative Councillors. MCLM is situated in the South-western part of Gauteng Province and form a part of West Rand District Municipality which consists of four local municipalities namely: Mogale City, Rand West Municipality and Merafong City. MCLM incorporates the following areas:

- Carletonville
- Khutsong
- Fochville
- Kokosi
- Greenspark
- Welverdiend
- Wedela
- Blybank
- Mining Towns

4.10.2 DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS

Population statistics are normally collected by way of a Census, however because Censuses are usually a huge logistical exercise, many Countries conduct a Census once every 5 to ten years. Between Censuses administrative data is collected by various agencies about population, events such as births, deaths and cross-border migration and these agencies are allowed to produce and use this data. It has been about 12 years since the 2011 Census has taken place, therefore the available data has become old and unreliable. In 2016 Statistics South Africa conducted a Community Survey to supplement the 2011 Census and the municipality has in the past used those figures complemented by data released by other sources such as Quantec Survey of 2017. The most recent Census was undertaken in 2022 and some of the results have been released by Statistics South Africa.

4.10.2.1 POPULATION DYNAMICS

The West Rand population increased by 21,6% from 821 191 in 2011 to 998 466 in 2022 whereas Merafong population increased by 14,2% from 2011 to 2022 rising from 197 520 to 225 476. The West Rand is the least populated District in Gauteng with 0,9 million (988 466) people while Merafong City is the least populated Municipality in West Rand with 225 476 people. The research also shows that in most Wards, the majority of the population belongs to the Black population group. In Ward 12 more than half of the population belonged to the White population group, while in Ward 14 just over a third of the population belonged to the White population group. Ward 12 includes Deelkraal as well as Welverdiend (which is located outside the 5 km radius). Ward 14 includes West Wits Village, a portion of Fochville, the Numba Wani Residence and the Mohaleshoek Informal Settlement. At 85,5% the Black African population group constitutes the largest proportion of West Rand's population, followed by White (10,3%) and Coloured (2,8%). At 89,4% the Black African population group constitutes the largest proportion of Merafong's population, followed by White (8,8%) and Coloured (1,3%). Refer to **Figure 51** for the population by race dynamics.

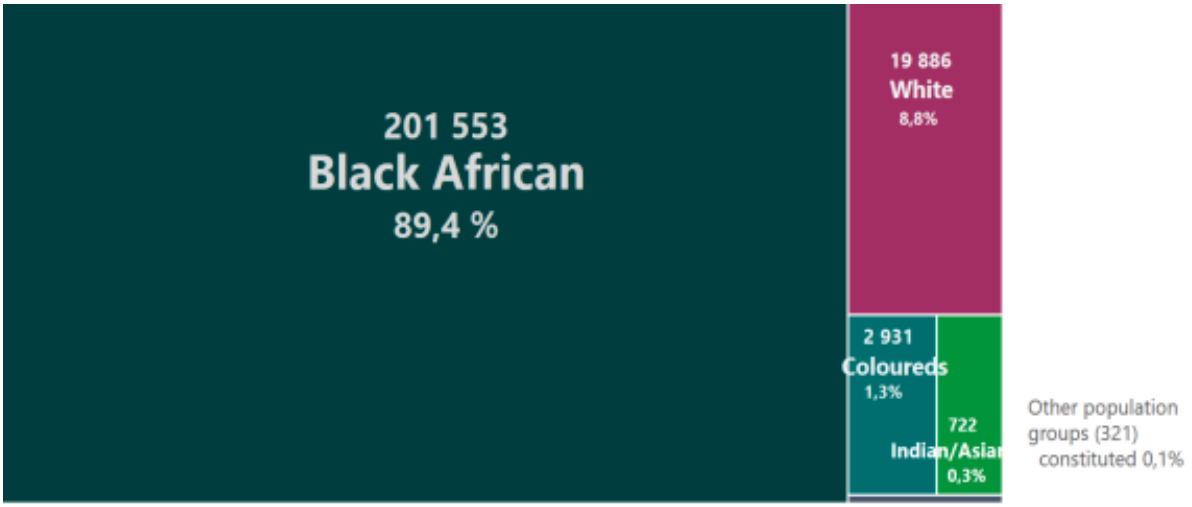


Figure 51: Merafong population groups (Statssa, Census 2022)

4.10.2.2 HOUSING DYNAMICS

Gauteng Households increased from 2,1 million in 1996 to 5,3 million in 2022. There were about 357 thousand households in West Rand 2022 with 77 599 thousand households located within Merafong City in 2022. The number of households in Merafong City increased by 16.5% from 66 624 in 2011. West Rand's average household size slightly decreased from 3,1 in 2011 to 2,8 in 2022 while the average household size in Merafong City also decreased slightly by 0.1 between 2011 and 2022. Households that resided in formal dwellings increased by 13,6 percentage points from 74,9% in 1996 to 88,5% in 2022 in Gauteng. There were more households that resided in formal dwellings in Merafong City in 2022 as compared to other municipalities in West Rand. Households that resided in formal dwellings increased from 60,4% in 1996 to 91,6% in 2022 in Merafong City.

4.10.2.3 COMMUNITY TYPES

Communities can be classified as belonging to one of the following groups (Equispectives, 2020):

a. Formal Residential Structure Communities

A formal dwelling can be described as "A structure built according to approved plans, i.e., house on a separate stand, flat or apartment, townhouse, a room in a backyard or rooms or flatlet elsewhere" (Statistics South Africa, 2012). In some areas, there may be a formal as well as an informal dwelling on a stand, creating a community with mixed dwelling types.

b. Informal Residential Structure Communities

An informal dwelling can be described as “A makeshift structure not approved by a local authority and not intended as a permanent dwelling. Typically built with found materials (corrugated iron, cardboard, plastic, etc.) and is contrasted with formal dwelling and traditional dwelling” (Statistics South Africa, 2012).

c. Commercial Agricultural Communities

Commercial agriculture includes farms where the farmer earns a livelihood from agriculture, such as crop, livestock, or game farming. Areas with smallholdings are categorised according to their character. If the residents of the smallholdings practise agriculture, they are grouped with commercial agriculture; if they just reside in the area or have a business on the smallholding not related to agriculture, the area is classified as formal residential.

d. Small-scale Subsistence Farming

Small-scale subsistence farming can be described as food gardening taking place on a large scale on a piece of land that is not in someone’s backyard. The land is usually cultivated by different members of the community, and they may belong to a formalised group. Food gardens in the backyard of an organisation, like a school or crèche, would also be grouped in this category. Keeping livestock in the community or on the outskirts of the community would form part of this group.

Agricultural projects conducted as part of a Social and Labour Plan of a mine can contain characteristics of both commercial agriculture and subsistence farming. To classify these projects, the following guideline is used: if the projects have reached a stage where it is sustainable and function with minimal to no input from the mine, they are classified as commercial agriculture. However, if the mine is still heavily involved, it is classified as small-scale subsistence farming, as the Project has not yet proved its sustainability.

Figure 52 shows a 5 km radius around the Project surface infrastructure, as well as the potentially sensitive receptors within a 5 km radius. The following residential areas were identified in 2015 near the Project:

a. AngloGold Ashanti residences (now part of GCTI operations)

The West Wits (GCTI) Operations had four residences for employees in 2015, namely Ntshonalanga, Matabong, Ekhayalihle and Numba Wani, which were converted to single rooms or family quarters. The family quarters were at Ekhayalihle and could host up to 25 people who became paraplegic after injuries on duty. Matabong housed employees from the TauTona mine, while Ntshonalanga housed employees who worked at the Savuka mine, which was integrated with the TauTona mine. Numba Wani hosted employees from the Mponeng mine. The operations also had facilities for visiting wives.

b. The TauTona and Savuka mines were placed in orderly closure in 2017, and as such, the only residence where the activity is expected is the Numba Wani residence. The Merafong City Local Municipality (2019/2020) has indicated that Mponeng has a good locality relative to the N12 that could be exploited once mine closure looms, and that there is possibly good potential for non-residential uses.

c. West Wits Village

In 2015, the West Wits Village housed employees of AngloGold Ashanti. The 2019/2020 IDP of the Merafong City Local Municipality indicates that township establishment is underway. The municipality is looking into the feasibility of a Mining Industrial Park as part of the second phase of Mining Phakisa implementation. The re-use potential of the area is considered good, with the possibility of developing into a significant node

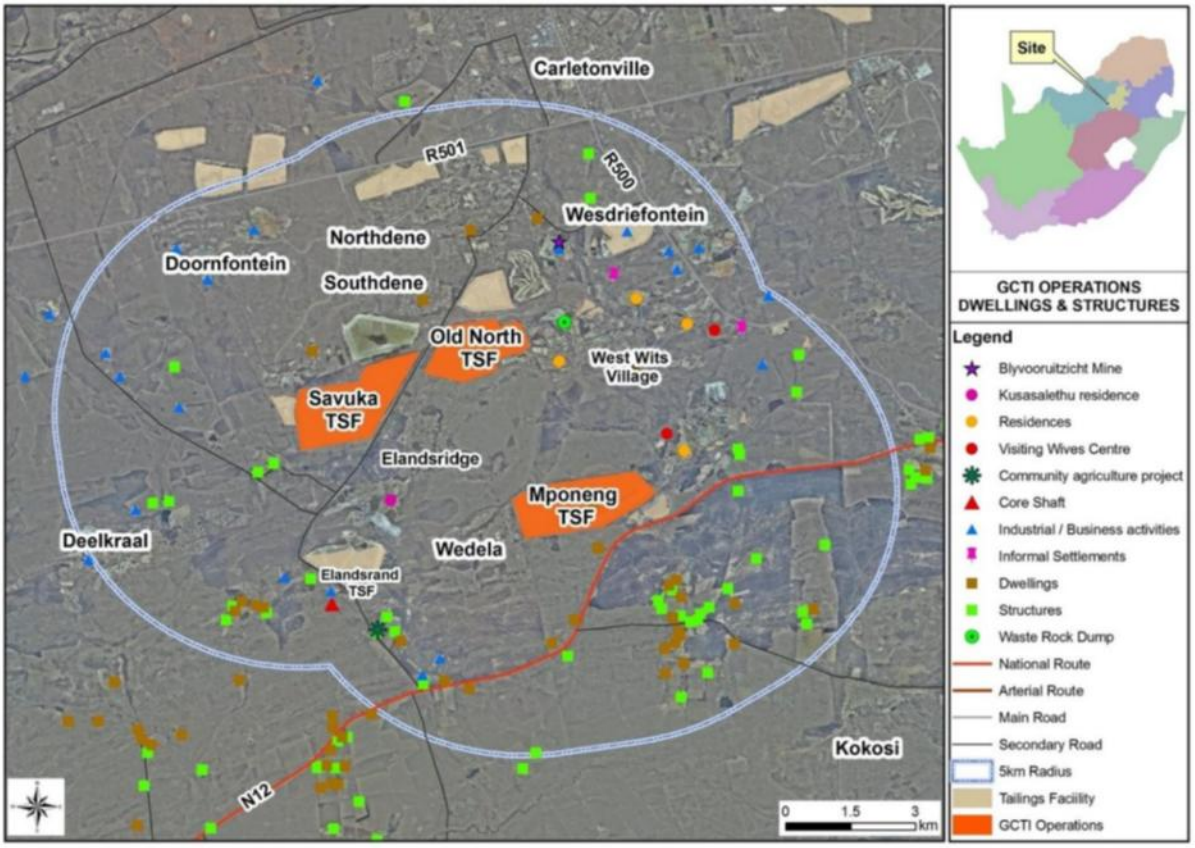


Figure 52: Map indicating the study Project Baseline Social and Land Use Assessment (Equispectives, 2020).

d. Deelkraal Estate

Deelkraal Estate used to be a mining village, but was in private ownership in 2015, with the owners being in the process of having the estate declared as a township. In the 2019/2020 IDP document of the Merafong City Local Municipality, Deelkraal is still indicated as a mining village with limited supportive land uses and limited economic potential. Although most residences are in fair condition, the municipality anticipates that the market for rental or buying in Deelkraal to collapse within the next few years due to new rental options in Carletonville and Fochville, as well as the mineshaft closure at Kusasalethu mine. The municipality will not take over services in the area and anticipates that Deelkraal will be demolished and that the area will be rehabilitated.

e. Elandsridge

Elandsridge/Elandsrand is a mining village where employees of Harmony's Kusasalethu mine reside. The Merafong City Local Municipality (2019/2020 IDP) has indicated that the Kusasalethu mine is expected to close within a few years, and if it does open again, it would be operated through mechanisation and automation. The municipality would not take over services, and the residential viability is regarded as low due to the lack of a new economic foundation, few facilities and the isolated location. It is anticipated that the area will be demolished and rehabilitated, possibly for agriculture or renewable energy.

f. Wedela

Wedela is situated between Harmony's Kusasalethu Operations and the Mponeng tailings storage facility. It was established in 1978 and granted municipal status in January 1990. Wedela is mostly a formal settlement, but there is an informal settlement on the edge of Wedela, and many houses have backyard shacks. It is currently located close to mining operations that will not be sustained indefinitely.

g. Mohaleshoek Informal Settlement

This informal settlement is located on private land adjacent to the R500, between the TauTona and Mponeng mines. Many residents are rumoured to be illegal immigrants. The Merafong City Local Municipality (IDP 2019/2020) has indicated that the informal settlements located at Blyvooruitzicht and Western Deep Levels can be accommodated at the West Wits township, either through subsidised housing or a CRU (Community Residential Units) project. The CRU programme aims to facilitate the provision of secure, stable rental tenure for lower-income individuals (www.gov.za).

h. Farming Community

The farming community consists of farms and smallholdings that are located in the Deelkraal area as well as adjacent to the Mponeng mine. Farming activities consist of crop farming, livestock, game breeding and hunting. Some of the farms offer tourist activities. Some farms have workers residing on the farm, while the workers from other farms do not reside on the farm, but somewhere else in the vicinity.

i. Residential areas around the Blyvooruitzicht mine

In 2015 people living in the area around the Blyvooruitzicht mine that was put in provisional liquidation in August 2013 lived in dire socio-economic conditions. The Merafong City Local Municipality (2019/2020 IDP) has indicated that the mine's gold mining component has been revived recently. According to the municipality, the village has significant potential to be integrated into Carletonville although buildings and infrastructure have been stripped and vandalised. The lawlessness that marked the area in 2015, seems to have been resolved by the new mine owner. There are dolomitic constraints in the area and the Housing Development Agency is conducting a feasibility study on the potential of reviving the village

Figure 52 also shows the location of dwellings and structures relative to the Project that are not located in a town or a village. The number of dwelling groups has remained more or less the same, as observed through aerial photography. At some of the dwelling clusters, new buildings have been observed. **Table 22** presents the breakdown for households according to geo types as per Census 2011.

Table 22: Breakdown of households according to geo types (source: Census 2011; Equispectives, 2020)

Geo Type	City	Mining Wards				Mixed Wards			
	Merafong Local Municipality	Ward 5	Ward 11	Ward 14	Ward 27	Ward 12	Ward 20	Ward 22	Ward 23
Urban Area	68,199	2,431	3,586	4,575	3,827	1,475	3,234	2,040	2,402
Traditional Area	0	0	0	0	0	0	0	0	0
Farm Area	2,207	0	0	75	0	68	0	0	0
Total	70,406	2,431	3,586	4,650	3,827	1,543	3,234	2,040	2,402

It can be concluded that the land use near the Project is dominated by open grassland, agricultural (cultivated cropland), mining and residential land use conditions. Equispectives (2020) divided communities into those living in formal structures, communities living in informal structures, commercial agricultural communities, and small-scale subsistence farming communities.

4.10.2.4 SOCIO-ECONOMIC CONDITIONS

Gauteng is the economic hub of the country, with over 35% of the economic activity taking place in the province. However, Gauteng continues to bear the brunt of high poverty, inequality, and unemployment levels. At the centre of the development of the Growing Gauteng Together 2030 (GGT2030) strategy, which is the provincial expression of the National Development Plan (NDP), the provincial government aims to address the challenges

noted above. The GGT2030 goal is to reduce poverty to about 16 per cent of the total population by 2030 from 25.3 per cent in 2019. The plan also aims to reduce income inequality levels (as measured by the Gini coefficient) to 62 per cent in Gauteng. Since the dawn of democracy, significant progress has been made to reduce the high levels of poverty and inequality. However, the deterioration in economic performance in recent years due to domestic and external factors has regressed some of the progress made, with levels of inequality being more prevalent within population groups.

Table 23 shows different measures of poverty for the West Rand district and the local regions. In 2020, over 50 per cent of the districts were living below the UBPL. With economic activity in negative territory in the district before the pandemic and the unemployment rate at its highest level, these did not favour the initiatives targeted at reducing poverty in the district. The Upper-Bound Poverty Line (UBPL) was the highest in Rand West City at 54.2% in 2020, followed by Merafong City at 53.1%. Refer to **Table 23** for the poverty and inequality trends.

Table 23: Selected Poverty Indicators (source: Draft IDP Merafong City 2025-26).

Regions	2010	2012	2014	2016	2018	2020
Food Poverty Line (ZAR 624)						
West Rand	16,7%	14,8%	16,0%	19,2%	21,0%	24,3%
Mogale City	16,9%	14,6%	15,7%	18,7%	20,6%	24,0%
Merafong City	15,0%	14,0%	15,2%	18,6%	20,3%	23,2%
Rand West City	17,6%	15,6%	16,9%	20,2%	22,0%	25,3%
Lower Poverty Line (ZAR 890)						
West Rand	28,6%	26,4%	28,1%	31,5%	33,9%	37,6%
Mogale City	28,8%	26,1%	27,6%	30,7%	33,1%	36,9%
Merafong City	26,4%	25,3%	27,1%	31,1%	33,5%	36,9%
Rand West City	30,0%	27,6%	29,4%	32,9%	35,2%	38,9%
Upper Poverty Line (ZAR1 335)						
West Rand	45,0%	42,7%	44,0%	46,6%	49,0%	52,7%
Mogale City	44,5%	41,7%	42,9%	45,2%	47,6%	51,4%
Merafong City	43,8%	42,7%	44,0%	47,2%	49,5%	53,1%
Rand West City	46,7%	44,1%	45,5%	48,3%	50,6%	54,2%
Poverty Gap Rate						
West Rand	31,4%	30,4%	30,4%	30,7%	31,1%	31,8%
Mogale City	31,4%	30,4%	30,5%	30,8%	31,1%	31,8%
Merafong City	31,5%	30,4%	30,5%	30,9%	31,2%	32,0%
Rand West City	31,2%	30,2%	30,3%	30,6%	31,0%	31,7%

Based on the income inequality as measured by the Gini coefficient for the West Rand district and its local regions, over the period of 2012 to 2020, not much change or movement happened in all the regions, as the increases in later years were marginal. However, the numbers have maintained a level just above 0.6. Much of the inequality is in Mogale City, the region with relatively high activity in the whole district. The Gini coefficient in the region increased from 0.642 in 2012 to 0.644 in 2020.

The better-than-expected recovery in the first half of 2021 improved business activity in municipalities, amid a strong rebound in global demand and higher commodity prices. Going forward, the recovery in economic activity is dependent on various factors, including effective vaccination rollout and sustained provision of energy to all the sectors of the economy. Similarly, in the West Rand, like other regions, economic output has declined for several years, with negative growth rates going back to the start of the review period. The decline in the mining activity of the district over the years has resulted in reduced total output. Mining accounted for 31% of the West Rand's economic output in 1996; it shrunk to an estimated 19.5% by 2021. However, the sector still accounts for the second highest share of economic activity in the region (refer to **Figure 53**).

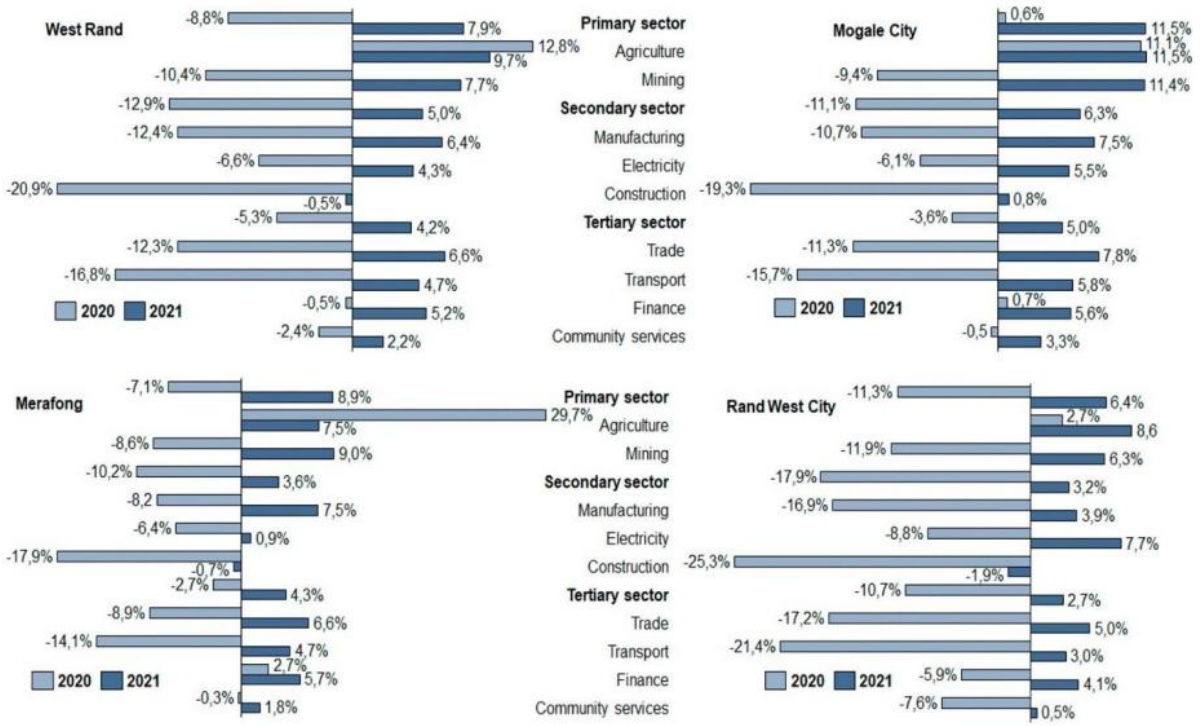


Figure 53: Sector Output Growth (IHS Markit, 2022; Draft IDP Merafong City 2025-26).

The district has also seen the highest contractions in the construction sector, recording a decline of 20.9 per cent in 2020 before a relative improvement however, still negative at 0.5 per cent. In Mogale City, construction decreased by 19.3 per cent, while it declined by 25.2 per cent in Rand West city and by 17.9 per cent in Merafong in the same period. The restriction of mobility of people and the halt of existing and planned projects affected the sector across regions. The agriculture sector has recorded growth for 2020 and is expected to record positive growth for 2021. Mining activity in the district region grew by 7.7 per cent, following a decrease of 10.4 per cent in 2020.

4.10.2.5 SERVICE DELIVERY

All Municipalities in West Rand had more than 90% of households having access to electricity for lighting in 2022. Merafong City had an increase from 82,8% in 2011 to 98,1% in 2022. West Rand District had the third highest (76,7%) proportion of households with access to piped water inside dwelling. Merafong City had the highest (81,9%) proportion of households with access to piped water inside the dwelling. While households using flush toilets only increased by 4,3 percentage points between 2011 and 2022 in Gauteng, households using flush toilets increased by 10 percentage points between 2011 and 2022 in West Rand. Households in Merafong City (94,1%) had the highest access to flush toilets than other municipalities. Approximately 84,3% of households in West Rand had their refuse removed by a local authority once a week. Refuse removal by local authority at least once a week increased from 77,7% in 1996 to 84,3% in 2022 in West Rand. Merafong City had the lowest percentage (81.9%) of refuse removal by local authority at least once a week as compared to other municipalities. Households with no access to internet declined by 40 percentage points, from 53,6% in 2011 to only 13,6% in 2022 in Gauteng Province.

5 ANALYSIS AND CHARACTERISATION OF THE ACTIVITY

This section provides a detailed breakdown to understand the project components, purpose, and context.

5.1 SITE DELINEATION FOR CHARACTERISATION

In order to effectively manage and assess the water use, waste generation, and associated environmental impacts at the Mponeng Operations, the site has been delineated into functionally and environmentally distinct zones. These delineated zones reflect the spatial distribution of operational activities, legacy infrastructure, and environmental risk profiles, and they serve as the framework for monitoring, risk analysis, and management planning. This delineation approach aligns with guidance provided in the Department of Water and Sanitation's IWWMP Guideline (2010) and ensures that characterisation efforts are focused and site-specific.

The following section provides an overview of the water and waste-related practices observed in each of the abovementioned areas as received from the client.

5.1.1 FUNCTIONAL ZONES

The operational footprint is divided into the primary zones for characterisation (refer to **Table 24** and **Figure 54**).

Table 24: Functional Zones (Gomelelo, 2025).

Zone	Description	Primary Activities
Zone A – Mponeng Shaft & Gold Plant	Active mining and processing infrastructure	Underground mining, ore hoisting, crushing, CIP processing, return water recovery
Zone B – Mponeng TSF and RWD (Applicable Zone)	Mponeng TSF and RWD	Slurry deposition, return water management, and stormwater control (currently limited to Upper Compartment)
Zone C – Savuka Shaft and TSF	Decommissioned mining area with legacy infrastructure	Historical TSF and Waste Rock Dump (WRD), seepage management, rehabilitation and monitoring
Zone D – Old North TSFs (No. 5 and 7)	Historical tailings deposition area	Active, legacy contamination risk, ecological monitoring and RSIP zone
Zone E – Waste Rock Dumps	Active and legacy WRDs at Mponeng and Savuka	Rock disposal, seepage zones, stormwater diversion
Zone F – Water Management Infrastructure	Return dams, pollution control dams, trenches	Water storage, containment, reuse and monitoring of discharges
Zone G – Sewage Works and Irrigation Zones	Northern and Southern STWs, nursery	Wastewater treatment, purified effluent reuse, vegetation maintenance
Zone H – Buffer and Community Interface	Site boundaries near communities and watercourses	Risk receptors, sensitive areas, downstream water quality impacts

5.1.2 GROUND AND SURFACE WATER DELINEATION

In addition to functional zoning, the site has been subdivided for hydrogeological characterisation, using:

- Borehole clusters around WRDs, TSFs, and sewage works (e.g., MB08, MB46, MB27, MB42);
- Surface water monitoring points (e.g., NBD, Trench 1, Wonderfonteinspruit tributaries); and
- Plume modelling domains from the 2024 Groundwater Flow and Plume Model.

These delineations are essential for:

- Identifying seepage plumes and migration pathways;
- Prioritising remediation or passive treatment interventions; and
- Evaluating compliance with WUL discharge and quality limits.

5.1.3 MPONENG TAILINGS STORAGE FACILITY (TSF) – CHARACTERISATION AND CONTROLS

The Mponeng TSF is the designated facility for the deposition of tailings generated from gold processing at the Mponeng Gold Plant. It is a high-risk containment structure from both a geotechnical and environmental perspective and forms a critical part of the site's return water recovery and dust control systems.

The TSF receives tailings slurry via overhead pipeline from the gold plant. Return water drains toward the Mponeng Return Water Dam (RWD) for reuse. The TSF is regularly managed in accordance with the site's EMPr, WUL, and RSIP, focusing on containment integrity, dust suppression, and seepage control. The site has implemented multiple complementary dust control strategies on the TSF:

- Long-range sprayer system: Installed along the TSF perimeter to mitigate dust uplift from exposed tailings beaches and aid in lowering RWD levels by spraying return water onto the TSF surface.
- Sprinkler irrigation system: Used to wet central portions of the TSF where tailings are most exposed during deposition pauses. Helps maintain surface moisture content and prevent dust generation.
- Wind barrier system: Installed in areas where sprinkler systems cannot be used, due to elevation, pipe layout, or access constraints. Barriers help disrupt wind flow across the surface and reduce the lift of fine tailings particles.
- Slope vegetation: Outer embankments of the TSF have been vegetated with grass species for erosion control and sediment retention. This natural barrier also contributes to visual screening and reduces dust along the TSF toe.

Table 25 provide a summary of the environmental risk and control measures at Mponeng TSF

Table 25: Environmental Risks and Management (Gomelelo, 2025).

Environmental Aspect	Risk	Control Measures
Dust generation from dry tailings beaches	Air quality and nuisance complaints	Sprinklers, long-range sprayers, wind barriers, surface wetting
Erosion of embankments	Sediment transport, slope instability	Vegetated outer slopes, runoff control
Seepage from tailings body	Groundwater contamination (e.g. SO_4^{2-}, U)	Toe drains, monitoring boreholes (MB27, MB35), RWD recovery
Over-deposition or freeboard exceedance	TSF stability risk	Dam safety risk assessment, Deposition monitoring, water level control, daily inspections
Seepage	Potential for sulphate and TDS migration into groundwater (unlined dam)	Regular groundwater monitoring (e.g., MB27, MB35); RSIP flags for potential seepage mitigation
Water quality	Return water contains elevated salts and process residues	Regular monitoring and reporting to ensure reuse quality is within operational tolerance and WUL parameters.

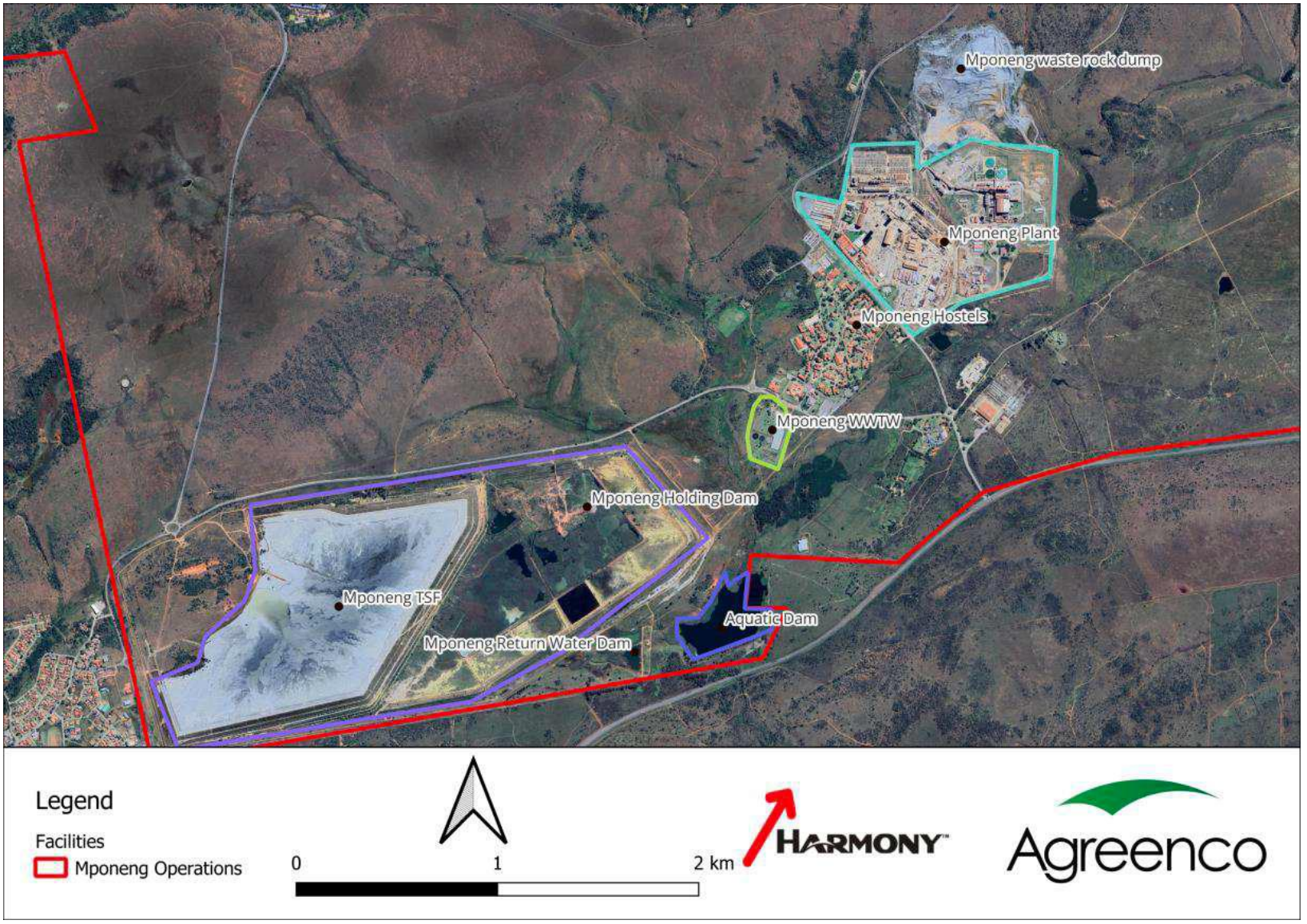


Figure 54: Mponeng Area Layout (Agreenco 2023)

5.2 WATER AND WASTE MANAGEMENT

5.2.1 WATER BALANCE

Eco Elementum (Pty) Ltd, undertook a Pre-Feasibility Study for the re-commissioning of the existing Mponeng Lower Compartment TSF. A component of the Pre-Feasibility Study was undertaking a water balance report. A dynamic water balance is required to ensure that the sizing of the proposed components of the site-wide dirty water management is adequate, and to ensure that the mine complies with the requirements as contained in the NWA, Regulation no 7 of 1999 (GN 704. According to the Department of Water Affairs and Forestry's (currently known as the Department of Water and Sanitation) Best Practice Guideline (2006, p.1), the water and salt balance models are undertaken to determine the following:

- To assist with the storage requirements and to ensure that dirty water containment facilities are still compliant to contain all dirty water inflows and to prevent any chance of the system spilling more than once in 50 years.
- To provide the required information to aid in the development and implementation of water management strategies.
- To assist in the decision-making process for water management by simulating and analysing various water management options prior to implementation.
- To identify and quantify excessive water consumption or waste locations, as well as pollution sources. When the balances are utilized as an auditing and assessment tool, seepage and leakage spots can also be found and quantified.

A dynamic water balance is fundamental to optimise water management and minimising raw water usage on the mine. Dynamic water balances enable instantaneous examination of the changing situation of a mining operation. They also allow the investigation of different rainfall scenarios, such as drought conditions, process changes or new developments, which are critical to the planning process. The purpose of the water balance is to demonstrate that a TSF will be able to manage all water in its operational area, including rainfall, through the different phases of the operational period. Dynamic water balances are thus an important operational and regulatory tool for water and pollution control as well as an essential part of life-cycle analysis for all current and future activities at the mine.

The water balance is, therefore, utilised as a management tool, for example, in simulating the effect of additional water management measures or the effect of expansion projects on the water management system. Assessment of the water balance will reveal the areas of concern for water management at the mine as well as non-compliance with the requirements of Regulation GN 704, dated 1999. The proposed recommencement of deposition of tailings on the Mponeng Lower Compartment TSF, will require exemptions from GN704 as indicated in **Section 3.3**.

The formulation of the water balance model was done to determine if the dirty water management systems are sized adequately to accommodate all dirty water inflows without the existing facilities spilling more than once in 50 years. The model was designed to provide the necessary data to assist in the decision-making process for water management, as well as to determine and quantify excessive water consumption or waste locations, including pollution sources. Additionally, the water balance model was conducted to ensure that the mine complies with the requirements as contained in the NWA, Regulation no. 7 of 1999 (GN 704).

The water balance model is a continuous stochastic model formulated using the GoldSim simulation software package. **Figure 55** illustrates the interface, as well as an overview of the main elements used in the GoldSim Software for Moneng.

Figure 55: Goldsim Interface for Mponeng Water Balance Model (Eco Elementum, 2025).

The water balance model include / incorporate the following focus areas:

- Tailings Storage Facilities (TSFs).
- Return Water Dam (RWD).
- Wash Plant.
- Dirty runoff areas (TSF and Side Walls).

The RWD volume probability results following the 250 realisations over a 20-year period from the GoldSim model can be seen in **Figure 56**. The RWD has a design capacity of 327,000 m^3 and the total mean average daily volume of dirty water contained in the RWD during the simulation period is approximately 137,783 m^3 (Roughly 42% of the dam's design capacity). Referring to the figure below, the RWD reaches a maximum capacity of 327,000 m^3 on one occasion during a simulated storm event (98th Percentile – 1:50 Year Probability). Given the RWD's proposed maximum capacity of 327 000 m^3, it is clear that the RWD does not spill more than once throughout the simulation (hence it is adequately sized and operated in line with the proposed operational philosophy).

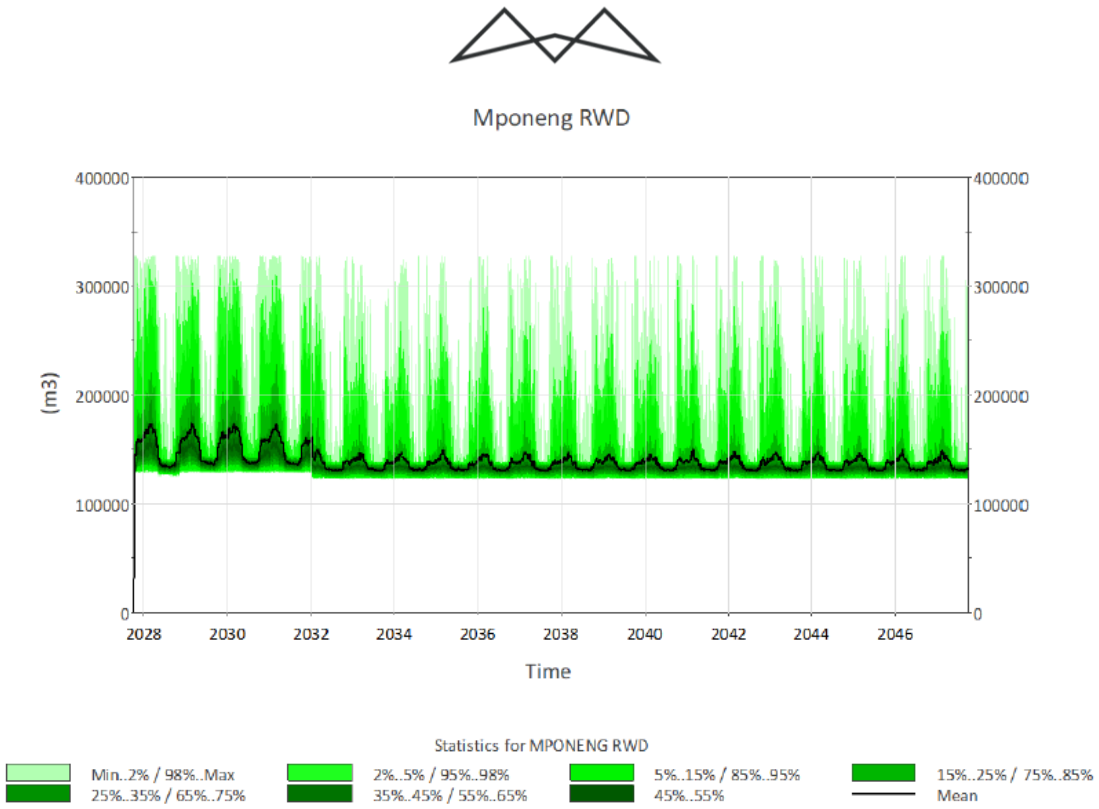


Figure 56: Volume Probabilities for the Mponeng RWD (Eco Elementum, 2025).

The following is a high-level summary of the simulation results for the Mponeng Section for the proposed operations (pre-feasibility phase) on site:

- The total proposed capacity for dirty water containment at Mponeng TSF operations is 327,000 m^3 (Mponeng RWD).
- The total mean average daily volume of dirty water contained in the RWD is approximately 137,783 m^3.
- The total 98th percentile (1:50-year) daily volume of dirty water contained in the South RWD is approximately 186,990 m^3.
- The total mean average daily volume of water in the tailings transferred from the Mponeng Plant and deposited on the Upper Mponeng TSF is approximately 1,569.2 m^3/day.
- The total mean average daily volume of water entrained (interstitial storage) at the Upper Mponeng TSF is approximately 390.1 m^3/day.
- The total mean average daily volume of water returned from the Upper Mponeng TSF to the Lower Mponeng TSF is approximately 1,598.5 m^3/day.
- The total mean average daily volume of water in the tailings transferred from the Savuka Plant and deposited on the Lower Mponeng TSF is approximately 11,908.5 m^3/day.
- The total mean average daily volume of water entrained (interstitial storage) at the Lower Mponeng TSF is approximately 4,620.0 m^3/day.
- The total mean average daily volume of water returned from the Lower Mponeng TSF to the RWD is approximately 9,275.4 m^3/day.
- The total mean average daily volume of water transferred from the RWD to the Mponeng Plant is approximately 6,157.2 m^3/day.

- The total mean average daily volume of water transferred from the RWD to the Savuka Plant is approximately 3,033.4 m^3/day.
- The total mean average daily volume of water transferred from the RWD and utilised to control excessive dust on the TSFs is approximately 559.5 m^3/day.

The average daily water balance for the Mponeng Lower TSF Compartment Pre-feasibility phase is shown in **Figure 57** below, and the annual water balance volumes are provided in **Table 26**.

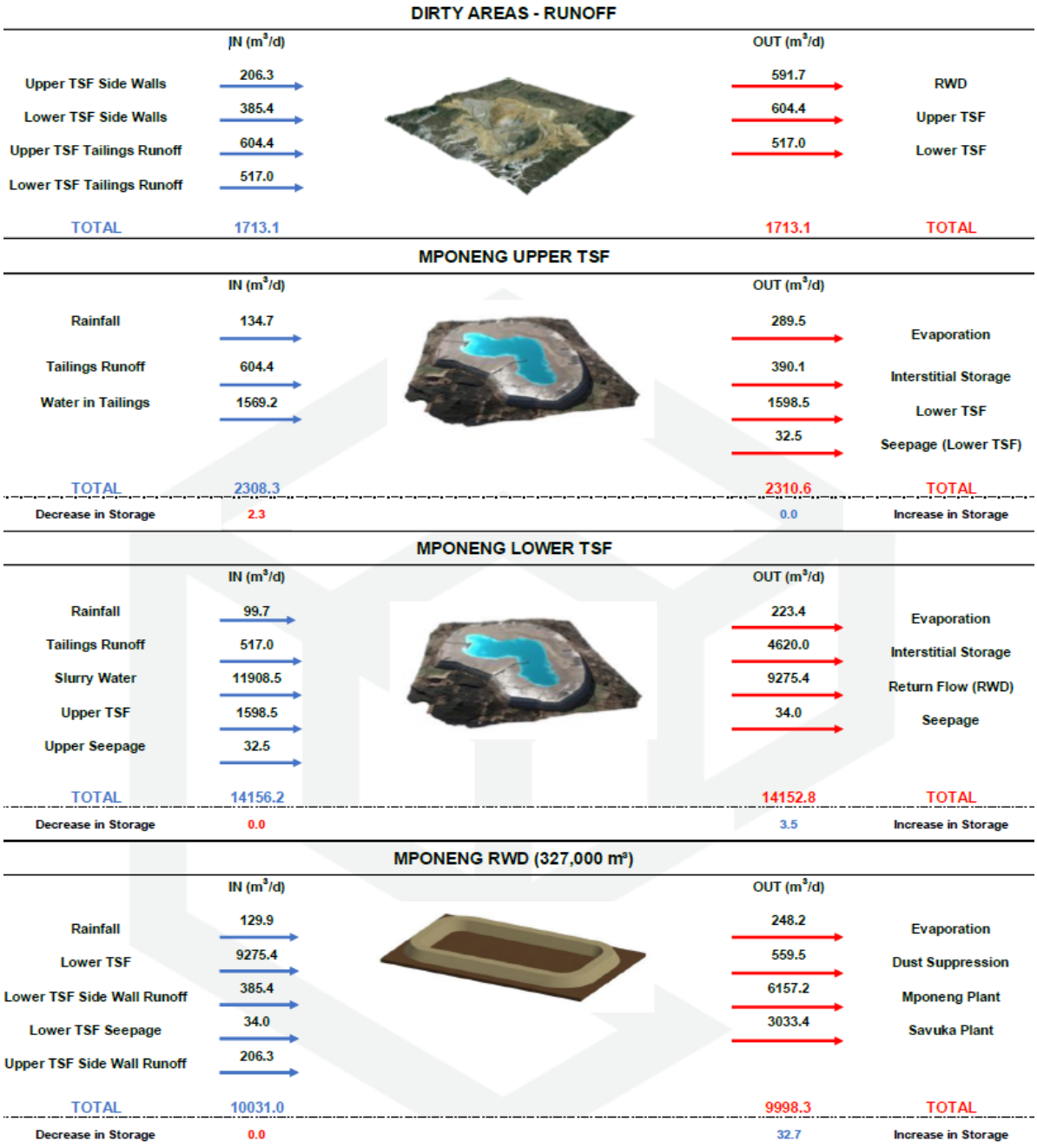


Figure 57: Water Balance Simulation – Daily Average Flows (Eco Elementum, 2025).

Table 26: Water Balance Simulation – Annual Average Flows (Eco Elementum, 2025).

MPONENG LOWER TSF COMPARTMENT WATER BALANCE 2025						
WATER BALANCE FLOW DIAGRAM (m³/annum)						
Facility Name	Water In		Water Out		Balance	Comment
	Water Stream	Quantity	Water Stream	Quantity		
DIRTY AREAS - RUNOFF	Upper TSF Side Walls	75 294	RWD	215 957		
	Lower TSF Side Walls	140 663	Upper TSF	220 617		
	Upper TSF Tailings Runoff	220 617	Lower TSF	188 721		
	Lower TSF Tailings Runoff	188 721				
	Total	625 295	Total	625 295	0.00	Balanced
MPONENG UPPER TSF	Rainfall	49 158	Evaporation	105 676		
	Tailings Runoff	220 617	Interstitial Storage	142 368		
	Water in Tailings	572 746	Lower TSF	583 453		
	Decrease in Storage	831	Seepage (Lower TSF)	11 854		
	Total	843 351	Total	843 351	0.00	Balanced
MPONENG LOWER TSF	Rainfall	36 399	Evaporation	81 532		
	Tailings Runoff	188 721	Interstitial Storage	1 686 285		
	Slurry Water	4 346 594	Return Flow (RWD)	3 385 537		
	Upper TSF	583 453	Seepage	12 401		
	Upper Seepage	11 854	Increase in Storage	1 265		
	Total	5 167 021	Total	5 167 021	0.00	Balanced
MPONENG RWD (327,000 m³)	Rainfall	47 430	Evaporation	90 605		
	Lower TSF	3 385 537	Dust Suppression	204 219		
	Lower TSF Side Wall Runoff	140 663	Mponeng Plant	2 247 367		
	Lower TSF Seepage	12 401	Savuka Plant	1 107 196		
	Upper TSF Side Wall Runoff	75 294	Increase in Storage	11 939		
	Total	3 661 326	Total	3 661 326	0.00	Balanced

Following the findings and the results of the water balance model, it is clear that:

- Excess water in the RWD is at risk of overflowing into the downstream environment when both the Upper and Lower TSFs are operational, with the potential to degrade the surface and groundwater qualities of surrounding areas. It is critical that water from Mponeng is sent to the Savuka Operations to ensure that the proposed RWD is adequately sized to accommodate all the dirty water inflows; and
- The total proposed capacity for dirty water containment at the Mponeng TSF operations (pre-feasibility) is approximately 327,000 m^3, and this capacity is sufficient to contain all dirty water inflows without the dam spilling more than once in 50 years.

The table below summarises the average flows for the Mponeng TSF Operations for the pre-feasibility study.

Table 27: Mponeng TSF Water Balance Summary (Mℓ/day) – Average Flows (Eco Elementum, 2025).

Source	Destination	Rate (Mℓ/day)
Upper TSF	Lower TSF	1.60
Lower TSF	RWD	9.28
RWD	Savuka Plant	3.03
RWD	Mponeng Plant	6.16
RWD	Dust Suppression	0.56
Upper and Lower TSF	Interstitial Storage	5.01
Savuka Plant	Water in Tailings (Lower TSF)	11.91
Mponeng TSF	Water in Tailings (Upper TSF)	1.57

Following the findings and the results of the overall update, the following is recommended to the client to ensure an accurate water balance model with a high confidence level:

- Monitor rainfall data in daily rainfall increments;
- Accurately monitor flow meter data between the various dirty water flow streams to ensure an accurate water balance model;
- Verify / Calibrate flow meters to ensure correct figures are recorded; and
- Record the levels of the RWD on site in appropriate intervals to aid with the calibration of the water balance model, ensuring more accurate results.

5.2.2 WASTE MANAGEMENT

Golden Core Trade and Invest has an extensive waste management operational procedure (ISO14001:2015/8.1/00/2023 AI MPO (0- 7)) that has been developed and implemented at Mponeng Operations. The procedure lists all the waste streams, which can also be found in Section 2.5.2 of this report, specifically focusing on hazardous waste streams. The following table (**Table 28**) lists certain hazardous waste streams that are generated on-site. It should be noted that the procedure contains countless waste streams; refer to the procedure for all the waste streams.

Table 28: Waste Management Practices for Various Waste Streams (Gomelelo, 2025).

Waste Management Activity	Waste type	Inclusions	Requirement	Frequency	Responsible Person(s)
Handling and storage	Hydrocarbon waste	Oil, grease and lubricant waste, petrol, diesel and oil contaminated material	Where degreasers are used, collect any residue, where possible and manage it as contaminated hydrocarbon waste.	As and when required	Foreman/ Responsible Waste Personnel
			Requirements for hydrocarbon waste storage area(s): Must be concreted, bunded and well-ventilated. The bund wall must be able to contain 110% of the total volume of the biggest container stored. Must have signage indicating the storage of hydrocarbon waste, the capacity of the storage area and PPE requirements. A Safety Data Sheet (SDS) for each material must be available in or close to the oil store. If SDSs are not stored in the storage area, indicate where SDSs are located. The hydrocarbon waste store bund must have either a sump or an outlet valve to remove any spillages or rainwater. The outlet valve must always be locked/closed. The bund's integrity must not be compromised, e.g., impervious, with no cracks or holes. Storage areas must be located to enable container handling/pick up and transporting.		
			Hydrocarbon waste containers must be closed and labelled.	Ongoing	Foreman
			Hydrocarbon waste must be separated and preferably labelled according to types to facilitate recycling, e.g. lubricating oils, transformer oils, greases, degreasing fluid, rags, hydrocarbon-contaminated soil, and contaminated spill clean-up material.	As and when required	Foreman / Responsible Waste Control Personnel
			Good quality, non-corroded waste containers must be used and kept closed.	Ongoing	Foreman / Responsible Waste Control Personnel
			Contact the Central Salvage Yard for the collection of full containers.	As and when required	Foreman / Responsible Waste Control Personnel
Transport and disposal			Any spillage of hydrocarbon waste on site must be cleaned up.	As and when required	Foreman / Responsible Waste Control Personnel

Waste Management Activity	Waste type	Inclusions	Requirement	Frequency	Responsible Person(s)
	Hydrocarbon waste	Oil, grease and lubricant waste, petrol, diesel and oil contaminated material	Should spillage occur outside Business Unit boundaries, the transporter must notify the generator of the waste.	As and when required	Foreman / Responsible Waste Control Personnel
			The Business Unit must keep the waybills for all waste sent to the Central Salvage Yard.	As and when required	Foreman / Responsible Waste Control Personnel
Waste Records	Hydrocarbon waste	Oil, grease and lubricant waste, petrol, diesel and oil contaminated material	If the waste is disposed of via the Central/Salvage Yard, the Central/BU Salvage Yard must keep Safe Disposal Certificates and Waste Manifest records.	As and when required	Foreman / Responsible Waste Control Personnel
Handling and storage	Chemical Waste	Chemical waste containers, expired chemicals, diluted chemical solutions, etc.	Old, used or contaminated chemicals must be stored in sealable/lidded containers within designated storage areas.	As and when required	Foreman / Responsible Waste Control Personnel
			Where necessary empty chemical containers (if not returned to suppliers) must be punched/holed and stored in a designated waste skip/mantle.	As and when required	Foreman / Responsible Waste Control Personnel
			A chemical spill kit should be in close proximity to potential spillage areas.	Ongoing	Foreman / Responsible Waste Control Personnel
			Requirements for chemical waste storage area(s): Must be concreted, bunded and well-ventilated. The bund wall must be able to contain 110% of the total volume of the biggest container stored. Must have signage indicating the storage of chemical waste, the capacity of the storage area and PPE requirements. A Safety Data Sheet (SDS) for each material must be available in or close to the oil store. If SDSs are not stored in the storage area, indicate where SDSs are located. The chemical waste store bund must have either a sump or an outlet valve to remove any spillages or rainwater. The outlet valve must always be closed. The bund's integrity must not be compromised, e.g. impervious, with no cracks or holes. Storage areas must be located to enable container handling/pick up and transporting.	As and when required	Foreman / Responsible Waste Control Personnel
Transport and disposal	Chemical Waste	Chemical waste containers, expired	Contact the Central/BU Salvage Yard for the collection of full containers.	As and when required	Foreman / Responsible Waste Control Personnel
			Spillage of chemical waste on site must be cleaned up.	As and when required	Foreman / Responsible

Waste Management Activity	Waste type	Inclusions	Requirement	Frequency	Responsible Person(s)
		chemicals, diluted chemical solutions, etc.			Waste Control Personnel
			Should spillage occur outside Business Unit boundaries, the transporter must notify the generator of the waste.	As and when required	Foreman / Responsible Waste Control Personnel
			The Business Unit must keep the waybills for all waste sent to the Central Salvage Yard.	As and when required	Foreman / Responsible Waste Control Personnel
			If the waste is disposed of via the Central Salvage Yard, the Central Salvage Yard must keep Safe Disposal Certificates and Waste Manifest records.	As and when required	Foreman / Responsible Waste Control Personnel
			Where necessary, chemical waste generated should be neutralized prior to disposal	As and when required	Foreman / Responsible Waste Control Personnel
Waste Records	Dry sludge, Sewage Waste	Sewage Plant Inlet / Temporary toilets	Records digester pH levels to be kept by the site agent.	As and when required	Site agent
			Records of volumes of sludge are to be kept by the site agent/foreman.	As and when required	Site agent
			Mine Services to complete waste manifest for the screenings/detritus/waste, depending on the classification of these.	As and when required	Site agent
			Mine Services to request a safe disposal certificate from the external service provider.	As and when required	Site agent

5.3 OPERATIONAL MANAGEMENT

Procedures are in place at the Mponeng TSF, to deal with potential polluting incidents (ISO 14001:4.1, 7.4.2 – 7.4.3/MHO/00/2018 and Harmony Risk Matrix – October 2019). The incident classification criteria are presented in **Table 29** below.

Table 29: Harmony incident classification criteria (Harmony Risk Matrix – October 2019).

Severity Level	Mitigation Costs	Environmental Impact	Reputational Impact	Legal Impact
5	>R10 000 000	Irreversible damage on habitat or ecosystem	International condemnation	Potential director liability
4	<R10 000 000	Significant impact on habitat or ecosystem	National and international concern – NGO involvement	Very significant fines or prosecutions
3	<R5 000 000	Longer-term impacts & ecosystem compromised	Adverse media attention – locally/nationally	Breach of legislation and likely consequences from regulator
2	<R1 000 000	Moderate short-term effects but not affecting the eco-system function	Unresolved local complaints and possible local media attention	Minor breach of legislation
1	<R500 000	Localised affected area of low impact	Local complaints	No major breaches of legislation

Incidents classified as Level 3 and above are reported to DWS within 24 hours, initially via telephone, followed by a formal email or letter within five days of occurrence. The notifications sent to DWS contain the following information:

- Date and time of the incident.
- Description of the incident.
- Source of pollution.
- Risks/impact to safety, health, property or environment resulting from the incident.
- Remedial action taken or to be taken by the person in control, to remedy the effects of the incident and to prevent similar incidents in the future.

Formal incident investigations are undertaken by the relevant manager and the actions based on the investigations are uploaded to the business unit's Action Management System. A follow up action plan is submitted to DWS within 14 days of the incident occurring, which indicates the following:

- Measures taken to correct the impact of the incident.
- Measures taken to correct further impacts from the incident.
- Measures taken to prevent the reoccurrence of a similar incident.

An environmental incident that has been classified as Level 1 or 2 is reported internally. A formal incident investigation is not undertaken for these incidents, unless the same incident has repeatedly occurred three or more times within three months.

5.3.1 ORGANISATIONAL STRUCTURE

The organisational structure of Golden Core Trade and Invest for Mponeng Operations is presented in **Figure 17** (**Section 2.11**). The environmental management commitments in the Environmental Management Plan (EMP) focus on the critical environmental impacts based on Golden Core Trade and Incest's strategic environmental plans and the recommendations made in technical studies and evaluations. Commitments have been classified into two tiers, namely (Harmony, 2020):

1. General Environmental Management Commitments – based on the Golden Core Trade and Invest values, policy, corporate standards and strategic plans; and
2. Specific Environmental Management Commitments – commitments related to specific environmental aspects of the operations.

The below sections include a discussion of resources and competencies, as well as the internal and external communication processes that are implemented by the Applicant.

5.3.2 RESOURCES AND COMPETENCE

The environmental management commitments in the Environmental Management Plan (EMP) focus on the critical environmental impacts based on Golden Core Trade and Invest's strategic environmental plans and the recommendations made in technical studies and evaluations. Commitments have been classified into two tiers, namely (Harmony, 2020):

- General Environmental Management Commitments – based on the Golden Core Trade and Invest values, policy, corporate standards and strategic plans; and
- Specific Environmental Management Commitments – commitments related to specific environmental aspects of the operations.

The environmental management resources and systems at the Mponeng TSF will include:

- Infrastructure and equipment e.g., liner system (RWD and TSF if required), pipelines etc.;
- An environmental management system (EMS);
- Personnel including environmental officers, site engineers, and appointed external contractors and consultants;
- The inclusion of environmental training for all new staff;
- The promotion of environmental awareness amongst employees and contractors;
- Annual environmental auditing and reporting;
- Registers including an incident register;
- Maintenance of a complaints register, clearly stating actions taken on specified dates.

The Environmental Officers will be supported by the site engineers in the implementation of the WUL once issued.

5.3.3 SKILLS DEVELOPMENT, EDUCATION AND TRAINING

Competence training and awareness are addressed in procedure Competence, Training and Awareness, which describes the environmental training and awareness process applicable to the Environmental

Management Systems (EMS) of the South Africa Region Surface Operations, enabling persons performing tasks to be aware of:

- The importance of conformity with the Environmental Policy and Procedures;
- The requirements of the EMS
- The significant environmental aspects and related actual or potential impacts associated with their work and the benefits of improved environmental performance;
- Their roles and responsibilities in achieving conformity with the requirements of the environmental management system; and
- The potential consequences of departure from specific procedures.

Excluded from the procedure's scope are the Golden Core Trade and Invest human resources and training processes, which remain applicable during new appointments/placements, where newly appointees get job and business unit-specific induction and training.

Based on the 2024 / 2025 Mponeng IWWMP Annual Update (Gomelelo, 2025), competence, training and awareness will be addressed through the following revenues – Induction, Awareness, Capability and Competency training and assessments. The Training Department will capture training on its EDUCOS/Training Matrix System (example), which the Training Department maintains. The training needs identification process followed at Golden Core Trade and Invest is depicted in **Table 30** and the typical environmental competence and awareness methods in **Table 31**.

Table 30: Training Needs (Harmony, 2020 & Gomelelo, 2025)

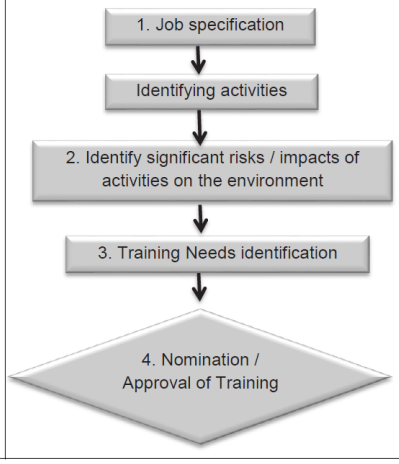
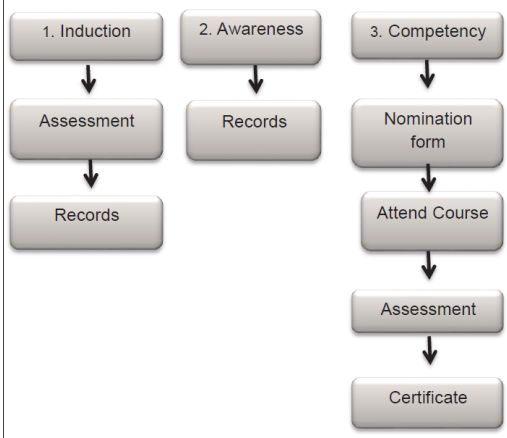
	Process	Notes	Responsibility/Who	When
Training Needs Identification		1. Identifying risks/ aspects/impacts from activities for all designation 2. Determine the potential risk from the identified activities (also use to identify training). Refer to Aspects Registers 3. Consider designations and their environmental training requirements / Identify training needs 4. Nomination and approval through Human Resource / Training Officer and / or Line Manager	1. Environmental Management 2. Environmental Management 3. Environmental Management 4. Nominated candidate/ Training Officer/ Relevant Line Manager	Annually

Table 31: Typical environmental Competence and Awareness Methods (Harmony, 2020 & Gomelelo, 2025)

	Process	Notes	Responsibility/Who	When
Typical Environmental competence and Awareness Methods		1. Induction • New appointments, contractors, ex-leave personnel • Language and literacy level considered during induction • Review Induction material annually 2. Awareness • Environmental Policy, Quarterly topics on the notice boards and discussed at e.g. Production or Green area meetings (or other) • Significant aspects and impacts 3. Competency • Formal training e.g. tertiary institutions or service providers • Experience • Responding to emergency situations, • Performing internal audits and • Performing compliance evaluations	1. Training Officer (consult Environmental Department to update awareness material) 2. Training Officer / Environmental Department 3. Line Managers / service providers (environmental officers can be consulted and used on request); External Service Provider (s)	As and when required

5.3.4 INTERNAL AND EXTERNAL COMMUNICATION

5.3.4.1 INTERNAL COMMUNICATION

Based on the 2024 / 2025 Mponeng IWWMP Annual Update (Gomelelo, 2025), water targets are reported on a monthly basis by the Environmental Management Department of Harmony Gold Limited. The results from the monitoring and comparison of actual water use to the targets are included in monthly water reports, which are distributed to all the responsible environmental personnel.

Annual surface and groundwater monitoring reports are compiled for all business units to assess their impacts on the natural water resources. The monitoring reports are communicated to the business units by the Environmental Management Department.

Environmental improvements, monthly inspection findings and incidents are included in monthly environmental management reports, which are distributed to all responsible environmental personnel. The internal communication process for environmental issues is presented in **Table 32** below.

5.3.4.2 EXTERNAL COMMUNICATION

The reporting of incidents that have the potential to cause or have caused water pollution or pollution to the environment, health risks are undertaken. Records of all incidents and system malfunctions which may result in the pollution of the water resources are reported to DWS. The incidents are recorded by the individual business units and a summary report of all incidents is compiled and submitted to the Environmental Management Department on a monthly basis. The external communication process for environmental issues is presented in **Table 33** below.

Table 32: Internal communication procedure (ISO 14001:2015/7.4/00/2024 MPO (0-7)

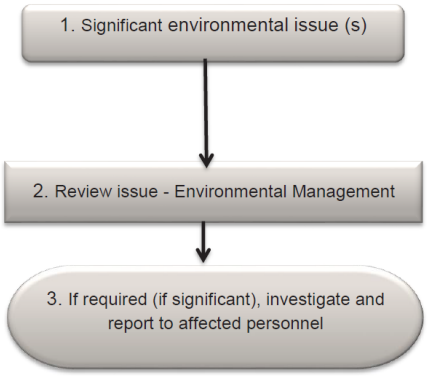
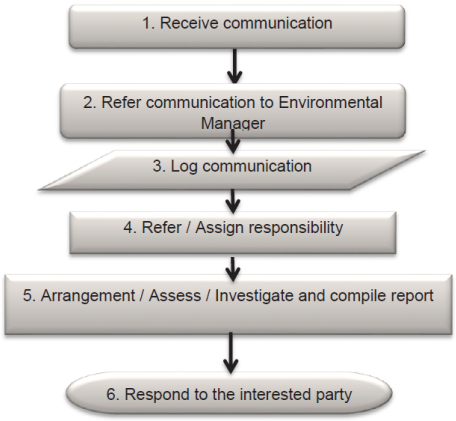
	Internal Communication Process	Notes	Responsibility/Who	When
Internal Communication	**Internal Communication** 	1. Significant environmental issues are communicated through: • Quarterly or Monthly environmental topics/reports (environmental awareness, on notice boards) • Environmental Policy/EMS Procedures, Aspects • Legislation Notification or Changes • Roles and Responsibilities, KPI's • SHE Related Meetings • Management Meetings • Contractual obligations with interested parties e.g. contractors etc. 2. Review issue 3. If significant, investigate/report back to the affected personnel (e.g. via e-mail, section meetings)	1. Environmental Management 2. Environmental Management 3. Environmental Management	As and when required

Table 33: External communication process (ISO 14001:2015/7.4/00/2024 MPO (0-7)

	External Communication Process	Notes	Responsibility/Who	When
External Communication	**External Communication (excludes complaints)** 	1. Received communication on e.g. needs, expectations, etc. from interested parties e.g. Government Departments, Non-Governmental Organisations, etc. at e.g. Meetings, Forums, Community Events, EIA/ EMP Projects, etc. 2. Refer to Environmental Manager 3. Log communication details in External Communication Log 4. Refer/assign responsibility to relevant Environmental Manager in consultation with Senior Management 5. Investigate and determine opportunities for improvement, if required 6. Respond and/or report to interested Party in one or all the following methods: • Compile Letter or Report • Approve Letter or Report • Distribute letter/ report and or follow up in a forum to interested Party (where required)	1. Environmental Management 2. Environmental Management 3. Environmental Management (Environmental Library) 4. Environmental Management 5. Environmental Management / Operational Environmental Meeting MANCOM 6. Environmental Management	As and when required

5.3.5 AWARENESS RAISING

Mponeng Operations promotes environmental awareness across all levels of the workforce to encourage proactive behaviour, legal compliance, and alignment with the site's Environmental Management System (EMS). Awareness-raising initiatives are conducted in accordance with the Competence and Awareness Procedure (Ref: ISO14001:2015/7.3/00/2024 MPO (0-6)) and the Communication and Complaints Procedure (Ref: ISO14001:2015/7.4/00/2024 MPO (0-5)). The environmental training and awareness process applicable to the EMS incorporates the following:

- The importance of complying with the Environmental Policy and Procedures.
- The requirements of the Environmental Management System (EMS);
- Significant environmental aspects and the associates actual or potential impacts, and the benefits of improved environmental performance;

- The roles and responsibilities in achieving compliance with the requirements of the EMS;
- The potential consequences from not following specific procedures.

Newly appointed employees receive job and business unit specific induction and training based on the Harmony human resources and training processes. Competence, training and awareness are addressed through the induction, awareness, capability and competency training and assessments.

5.4 MONITORING AND CONTROL

Surface and groundwater monitoring is conducted as part of the existing operations and include areas associated with the activities included in this WULA. The following monitoring is undertaken as part of the existing operations.

5.4.1 SURFACE WATER

Surface water monitoring is a fundamental component of the environmental management system at the Mponeng Operations. The purpose of this monitoring is to assess the impact of mining activities on nearby surface water bodies, detect contamination early, and ensure compliance with Water Use Licence (WUL) conditions and other regulatory obligations. Monitoring also provides essential data for evaluating the effectiveness of stormwater management infrastructure and identifying potential discharge risks.

The operations fall within the C23E and C23J quaternary catchments, which form part of the Upper Vaal Water Management Area (WMA 8). Several non-perennial tributaries of the Wonderfonteinspruit and Elandsfonteinspruit drain the site, with downstream users dependent on water quality for domestic, agricultural, and ecological purposes.

Surface water monitoring is conducted monthly at designated sampling points, including:

- The North Boundary Dam (NBD), which receives runoff and seepage from surrounding infrastructure and catchment areas, including stormwater trenches and incident-related flows;
- Savuka Trench and downstream collection points near the Old North TSF and WRD;
- Other locations identified based on proximity to infrastructure, hydrological connectivity, or historical contamination risk.

The general objectives of surface water monitoring entail the following:

- To demonstrate legal compliance;
- To assess the impact of the mining operations on the surface water resources (if any);
- To detect operational spillages and early signs of deterioration of the surface water resource for the mine and upstream users; and
- To inform mitigation measures as necessary.

The Mponeng Operations WUL (Licence No: 08/C23E/AFGJCEI/12157 File No: 27/212/C523/12/1), dated 27 September 2022, lists several requirements in terms of surface water monitoring. The hydrologist recommended that this monitoring programme be maintained and no additions or amendments to the current programme is required.

5.4.2 GROUNDWATER

Groundwater monitoring at the Mponeng Operations is a key environmental control measure aimed at identifying subsurface contamination trends, tracking the movement of historical plumes, and ensuring compliance with the site's Water Use Licence (WUL). The programme provides essential data for assessing

seepage impacts from tailings facilities, return water dams (RWDs), waste rock dumps (WRDs), and sewage-related infrastructure.

A network of monitoring boreholes is maintained across the Mponeng, Savuka, and Tau Tona sites. These include shallow and deep installations located:

- Adjacent to the Mponeng TSF and WRD (e.g., MB27, MB35);
- Along the Savuka TSF and Old North Complex (e.g., MB08, MB46, MB42, MB36);
- Near the salvage yard and WWTW (e.g., MB58); and
- Around legacy voids and WRDs at Tau Tona (e.g., MB49, MB56).

Sampling is conducted quarterly, with parameters analysed including pH, electrical conductivity (EC), sulphate, nitrate, ammonia, total dissolved solids (TDS), and selected metals such as manganese and uranium. Water levels are also recorded to track aquifer responses to rainfall and abstraction.

Monitoring results from 2023–2024 indicate that groundwater quality is generally impacted in areas downgradient of historical and active waste facilities. Notable exceedances of EC (>180 mS/m) and sulphate (>800 mg/L) have been consistently recorded in boreholes such as MB08 (Savuka TSF), MB46 (Old North Complex), and MB27 (Mponeng WRD). These boreholes are located in zones previously identified as high-risk seepage areas.

Groundwater water monitoring aims to assess the impact that the mine might have on the groundwater resources, ensure early intervention, and implement mitigation measures as necessary. The Best Practice Guidelines developed by the DWS (2006) state that most environmental management actions require data, and groundwater monitoring objectives are as follows:

- Assessment of compliance with set standards and legislation, such as WULs, EMPrs, etc.;
- Monitor water quality to demonstrate that the mining operations do not impact the receiving water resources;
- Compare groundwater quality in terms of groundwater's physical and chemical characteristics with baseline values to identify possible trends and/or changes in quality. Tracking contaminants of potential concern (CoPC) indicative of pollution and developing onsite environmental and water management plans to facilitate decision-making;
- To investigate possible groundwater contamination, which serves as an early warning system to allow remedial measures and subsequent actions to be taken; and
- Develop an understanding of changes in source chemistry that could affect groundwater receptors.

The Mponeng Operations WUL (Licence No: 08/C23E/AFGJCEI/12157 File No: 27/212/C523/12/1), dated 27 September 2022, list several requirements in terms of surface water monitoring. The geohydrologist recommended that this monitoring programme be maintained in additions to the following amendments: The exiting monitoring network is comprehensive and sufficient to quantify the impact from the RWD and the TSF. The boreholes are generally close to the TSF, referred to as source boreholes. It is important to drill monitoring boreholes further from the contaminant sources to be able to quantify plume migration, as well as close to the property boundary or receptors. These boreholes are referred to as compliance boreholes (refer to **Figure 58**).

The following is recommended in terms of monitoring:

- Groundwater levels.
- Groundwater quality.
- Data should be stored electronically in an acceptable database.

- On the completion of every sampling run a monitoring report should be written.
- Any changes in the groundwater levels and quality should be flagged and explained in the report.
- A compliance report can be submitted to DWS once a year, if required.
- A comprehensive bi-annual analysis of the dedicated monitoring boreholes.
- Groundwater levels should be monitored monthly in the dedicated groundwater monitoring boreholes.
- Rainfall should be monitored daily.
- Samples should be submitted to a SANAS accredited laboratory. The following recommended parameters to be analysed for include:
    - pH.
    - Electrical Conductivity.
    - Total Dissolved Solids.
    - Total Alkalinity.
    - Anions and Cations (Ca, Mg, Na, K, NO3, NH4, Cl, SO4, F, Fe, Mn, Al, Cr).

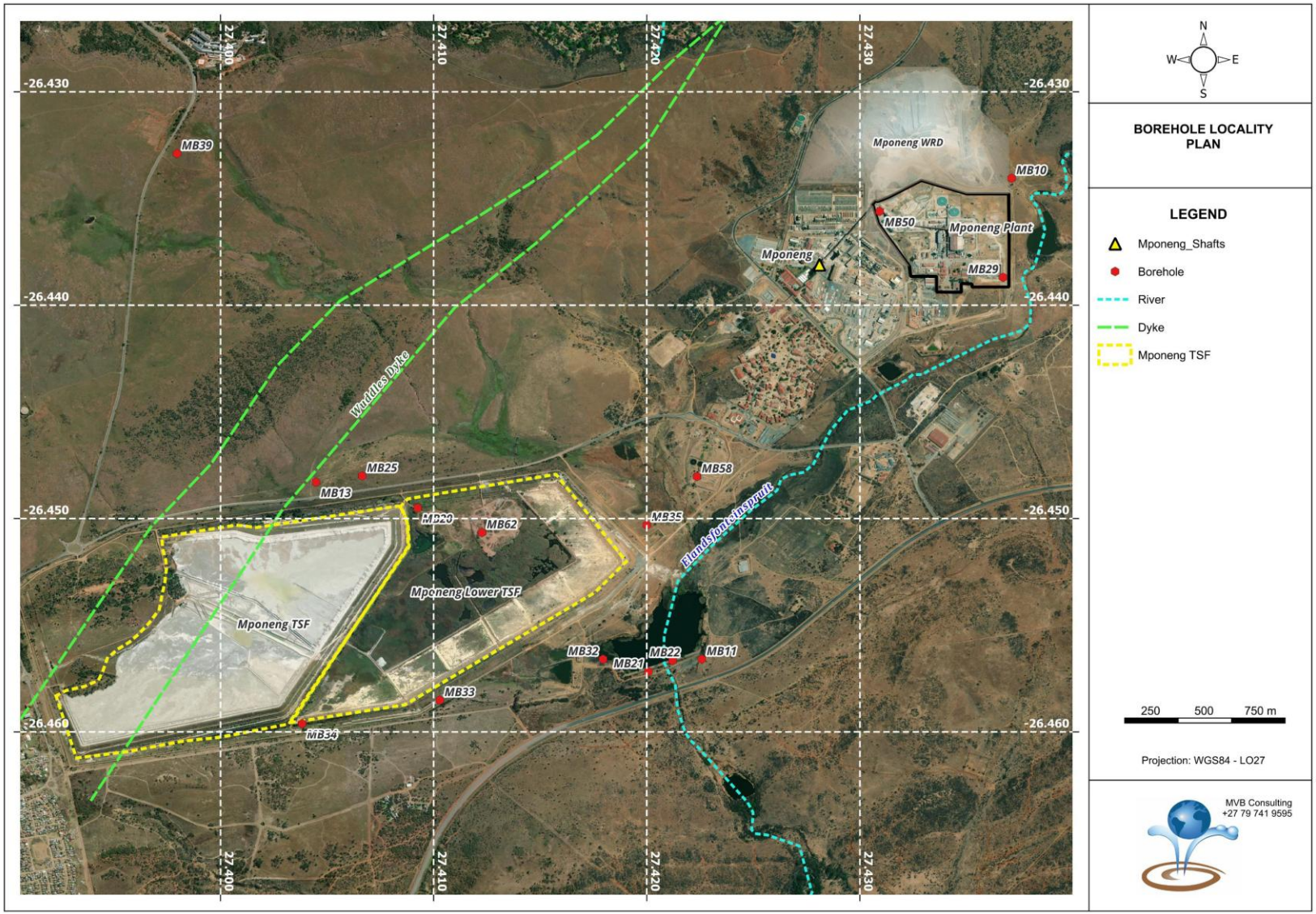


Figure 58: Mponeng groundwater monitoring network (MvB Consulting, 2025).

5.4.3 BIOMONITORING

A biomonitoring plan aims to monitor any changes to the aquatic environment and associated biota at identified sites associated with the mine. Generic objectives for biomonitoring are as follows:

- To characterise the biotic integrity of aquatic ecosystems;
- To assess the extent of the effects in terms of ecological indicators;
- To compare results to detect environmental trends in biotic integrity;
- To identify potential impacts and recommend suitable mitigation measures; and
- To identify sensitive or unique aquatic habitats which could suffer irreplaceable loss.

The Mponeng Operations WUL (Licence No: 08/C23E/AFGJCEI/12157 File No: 27/212/C523/12/1), dated 27 September 2022, list several requirements in terms of biomonitoring. The wetland specialist recommended that this monitoring programme be reviewed and updated to include the watercourse and wetlands identified near Mponeng TSF.

5.4.4 WASTE MONITORING

Waste monitoring at the Mponeng Operations is conducted to ensure compliance with the National Environmental Management: Waste Act (Act 59 of 2008), relevant Norms and Standards for the Storage and Assessment of Waste, and the site-specific Environmental Management Programme (EMPr). The monitoring programme supports proper classification, handling, and disposal of waste, while also ensuring that hazardous waste streams are not mismanaged or released into the surrounding environment.

Waste monitoring is carried out across all operational zones—including Mponeng and Tau Tona—and focuses on both mineral waste (e.g., tailings and waste rock) and non-mineral waste (e.g., general, recyclable, and hazardous materials). The programme includes routine inspections, recordkeeping through a waste manifest system, and periodic (monthly) reporting on waste volumes generated, stored, and disposed of. At the Mponeng Operations, different individuals are responsible for different waste stream monitoring. The current monitoring system should be continued. This application will not require any changs to the waste monitoring programme at Mponeng.

5.5 ENVIRONMENTAL IMPACT ASSESSMENT

This section will discuss the methodology and detailed impacts identified during the EIA process. The methodology used in assigning and assessing risk factors is also shown below.

5.6 IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The approach may be altered or substituted on a case-by-case basis if the specific aspect being assessed requires such- such instances require prior EIMS Project Manager approval. The broad approach to the significance rating methodology is to determine the significance (S) of an environmental risk or impact by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relating this to the probability/ likelihood (P) of the impact occurring. The S is determined for the pre- and post-mitigation scenario. 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 S to determine the overall final significance rating (FS). The impact assessment will be applied to all identified alternatives.

5.6.1 DETERMINATION OF ENVIRONMENTAL RISK

The final significance (FS) of an impact or risk is determined by applying a prioritisation factor (PF) to the post-mitigation environmental significance. The significance 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:

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 34** below.

Table 34: 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. Highly localised, limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).
Duration	1	Immediate (<1 year, quickly reversible)
	2	Short term (1-5 years, less than project lifespan)
	3	Medium term (6-15 years)
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).
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, or affected environmental components are already degraded)

	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)
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 very 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 35**. It is noted that both environmental risks as well as environmental impacts should be identified and assessed. Environmental Risk can be regarded as the potential for something harmful to happen to the environment, and in many instances is not regarded as something that is expected to occur during normal operations or events (e.g. unplanned fuel or oil spills at a construction site). Probability and likelihood are key determinants or variables of environmental risk. Environmental Impact can be regarded as the actual effect or change that happens to the environment because of an activity and is typically an effect that is expected from normal operations or events (e.g. vegetation clearance from site development results in loss of species of concern). Typically, the probability of an unmitigated environmental impact is regarded as highly likely or certain (management and mitigation measures would ideally aim to reduce this likelihood where possible). In summary, environmental risk is about what could happen, while environmental impact is about what does happen

Table 35: Probability Scoring / Likelihood Scoring

Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).
	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).

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

$$S = C \, x \, P$$

Table 36: Determination of Significance

Consequence	5- Very High[2]	**5**	10	15	20	25
	4- High	4	8	12	16	20
	3- Medium	3	6	9	12	15
	2- Low	2	4	6	8	10
	1- Very low	1	2	3	4	5
		1- Improbable	2- Low	3- Medium/ Possible	4- High/ Probable	5- Highly likely/ Definite
	Probability					

The outcome of the significance assessment will result in a range of scores, ranging from 1 through to 25. These significance scores are then grouped into respective classes as described in **Table 37**.

Table 37: Significance Scores

S Score	Description
≤4.25	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
>4,25, ≤8.5	Low-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>8.5, ≤13.75	High-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>13.75	High (i.e. where the impact will have a significant environmental risk/ reward).

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

5.6.2 IMPACT PRIORITISATION

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

i. Cumulative impacts; and

ii. 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 impacts' post-mitigation significance (post-mitigation). This prioritisation factor does not aim to detract from the

[2] In the event that an impact or risk has very high or catastrophic consequences, but the likelihood/ probability is low, then the resultant significance would be Low-medium. This does in certain instances detract from the relative important of this impact or risk and must consequently be flagged for further specific consideration, management, mitigation, or contingency planning.

significance 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 post-mitigation significance based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 38: 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 38**. 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 39**).

Table 39: Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance (FS), the PF is multiplied by the post-mitigation significance scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high 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 higher significance).

Table 40: Final Environmental Significance Rating

Significance Rating	Description
<-25	**Very High (Impacts in this class are extremely significant and pose a very high environmental risk. In certain instances these may represent a fatal flaw. They are likely to have a major influence on the decision and may be difficult or impossible to mitigate. Offset's may be necessary.**
<-13.75 to -25	High negative (These impacts are significant and must be carefully considered in the decision-making process. They have a high environmental risk or impact and require extensive mitigation measures).
-8.5 to -13.75	Medium-High negative (i.e. Impacts in this class are more substantial and could have a significant environmental risk. They may influence the decision to develop in the area and require more robust mitigation measures).
<-4.25 to <-8.5	Medium- Low negative (i.e. These impacts are slightly more significant than low impacts but still do not pose a major environmental risk. They might require some mitigation measures but are generally manageable).
-1 to -4.25	Low negative (i.e. Impacts in this class are minor and unlikely to have a significant environmental risk. They do not influence the decision to develop in the area and are typically easily mitigated.
0	No impact
1 to 4.25	Low positive
>4.25 to <8.5	Medium-Low positive
8.5 to 13.75	Medium-High positive
>13.75	High positive

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.

5.6.3 IMPACTS IDENTIFIED AND IMPACT ASSESSMENT

This Section presents the potential impacts that have been identified during the EIA Process. 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 IWWMP 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 WUL and EIA consultation processes. These potential impacts identified by the EAP and the appointed specialists will take into consideration of other potential impacts identified by the public. **Table 41** provides the list of preliminary potential impacts identified. Without proper mitigation measures, the proposed 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 may 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. The assessment matrix relating to water and waste impacts can be seen in **Appendix 5**.

Table 41: Identified potential 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, return water dam, pipeline bridge, pipeline culvert, TSF stabilization, access roads Planned placement of infrastructure Decommissioning of landfill and removal of waste material Stabilization of Landfill / TSF material Topsoil stripping for pipelines and access roads	○ Surface water contamination	○ Temporary disturbance of wildlife	○ Employment opportunities	○ Disturbance / destruction of archaeological sites or historic structures ○ Disturbance/ destruction of fossils
Human resources management (Planning)	Employment/recruitment I&AP consultations Environmental awareness training 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.). ○ Health and safety aspects related to radiation and health as well as TSF stability ○ 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 surface and sub-surface dirty water systems Temporary sewage and sanitation Establishment of waste area and upgrade of RWD Construction of bridge and culvert General site management	○ Erosion due to storm water runoff ○ Impact due to topsoil stripping ○ Surface water contamination ○ Ground water contamination ○ Cone of depression ○ 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.). ○ Health and safety aspects related to radiation and health as well as TSF stability ○ 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
Deposition at TSF (Operation)	Deposition of tailings Maintenance and management of stormwater system Water management	○ Cone of depression ○ Impacts on surface water quality due to leachate ○ Impacts on groundwater quality due to leachate ○ 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.) ○ Health and safety aspects related to radiation and health as well as TSF 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.) ○ Visual and dust	
Maintenance (Post closure)	Initiate maintenance and aftercare program	○ Surface and groundwater quality	○ Alien and invasive species	○ Visual ○ Site security and access control ○ Health and safety aspects related to radiation and health as well as TSF stability	

5.7 DESCRIPTION AND ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

This section describes each identified environmental impact in the context of the activity and associated aspect and provides reasons why specific ranking / rating of the component attributes of the impact assessment are given.

5.7.1 RADIATION AND HEALTH

The main objective of the radiological public safety assessment was to assess the potential impact on members of the public that may occur during the operational phase of the Projects, with due consideration of the impact that may occur during the post-closure phase. How members of the public are exposed to ionising radiation induced by the Projects may be different depending on the operational conditions and the specific point in time (either present or future).

Sources of radiation exposure to members of the public associated with mining and mineral processing facilities are often advertently induced. Although the key elements responsible for radiation exposure are naturally occurring radionuclides, human-induced conditions and activities may enhance concentrations of naturally occurring radionuclides in the accessible environment. Alternatively, the potential for human exposure to naturally occurring radionuclides in products, by-products, residues, and other wastes may be enhanced by moving these radionuclides from inaccessible locations to locations where humans can be subject to radiation exposure.

To pose a radiological risk to members of the public and the environment, the naturally occurring radionuclides must first be released from the sources of radiation exposure into the environment. As used here, sources refer to any entity that contains radioactivity and has the potential to release radioactivity into the environment. Release mechanisms can be generalised into the following natural and human-induced conditions:

- The release of radionuclides through natural conditions:
    - Solid release (e.g., windblown dust);
    - Water-mediated release (e.g., leaching through tailings storage facility); and
    - Gas-mediated release (e.g., radon gas exhalation).
- Direct gamma radiation; and
- Controlled or uncontrolled releases of radionuclides as solids or liquids into the environment.

Controlled releases are human induced as part of the normal operating conditions, while uncontrolled releases are associated with accidents and incidents that are outside the scope of normal operating conditions (e.g., excessive water erosion, pipeline bursts, releases from storage dams overflowing their capacity, or the breaking of dam walls).

A distinction can be made between primary and secondary sources of radiation exposure. The primary sources are associated with physical features or entities at a mining and mineral processing operation, with the potential of naturally occurring radionuclides to be released into the environment. Examples of primary sources that are generally associated with mining and mineral processing operations include:

- Tailings Storage Facilities (TSFs), Waste Rock Dumps (WRDs) or any other stockpile facility used to store waste or other residue material on the surface, from which naturally occurring radionuclides may be dispersed in solid (dust), liquid (seepage), or gaseous (radon gas) form;
- Open pits that developed following open cast mining to extract rock or minerals from the orebody, from which naturally occurring radionuclides may be dispersed in solid (dust), liquid (seepage), or gaseous (radon gas) form;
- Mineral processing activities, where radioactive gasses and dust may be released from the commination (e.g., crushing, milling, and screening) and beneficiation of ore containing radionuclides;

- Water management facilities (e.g., return water dams, process control dams, and evaporation ponds), used to manage excess water generated through mining, mineral processing, and residue disposal activities, and where water may be released to the environment;
- Materials handling activities (e.g., the transfer of material containing naturally occurring radionuclides from one point or facility to another), during which radioactive dust may be released to the environment; and
- Mine ventilation shafts increase airflow in underground workings, where gasses and dust generated underground may be released with the outflowing air.

Radioactivity released from the primary sources into the environment may accumulate in the physical compartments of the environmental system (e.g., groundwater, surface water bodies, surface soils, sediments, etc.), potentially resulting in what can be termed secondary sources of radiation exposure. The following serve as examples of secondary radiation sources:

- Continuous deposition and accumulation of naturally occurring radionuclides associated with airborne dust or contaminated irrigation water on surface soils, resulting in the development of a secondary source at the soil surface;
- Continuous deposition of naturally occurring radionuclides associated with airborne dust in a surface water body, resulting in the development of a secondary source in the sediments and surface water body;
- Uncontrolled release of contaminated mine residue (e.g., tailings material) through surface water erosion of existing TSFs or other stockpile facilities;
- Uncontrolled release (e.g., spillage) of contaminated mine residue (e.g., tailings material) or water on surface soils from pipelines or storage dams, resulting in the development of a secondary source at the soil surface; or
- Uncontrolled release (e.g., spillage) of contaminated mine residue (e.g., tailings material) or water in a surface water body from pipelines or storage dams (as appropriate), resulting in the development of a secondary source in the sediments and surface water body.

Members of the public may potentially be subject to radiation exposure from both primary and secondary sources at a mining and mineral processing operation, with expected differences in modes and duration of exposure.

5.7.1.1 OPERATIONAL PHASE IMPACTS

The radiological impact assessment for the operational phase considers the potential contribution through all three environmental pathways (i.e., surface water, groundwater and atmospheric). However, due to the slow-moving nature of any radionuclide contaminant plume that originates from the facilities through the groundwater system, the potential radiological impact through the groundwater pathway will only occur during the post-closure phase.

5.7.1.2 POST-CLOSURE PHASE IMPACTS

Before the actual closure of the proposed Mponeng Lower Compartment TSF and as part of the anticipated licensing conditions and requirements, a decommissioning and closure plan will be prepared for submission to the regulatory authorities. Amongst others, this plan will define in detail all the activities that will be performed and how the associated radiological impact during the decommissioning and closure phase will be managed.

Considering that a decommissioning plan of the proposed TSF is not available at present but will be defined and implemented, the following activities were identified that may result in a radiological impact on the receptors during the post-closure phase:

- Implementation of the decommissioning plan: implementation of the NNR-approved decommissioning plan will result in a positive impact in the sense that surface infrastructure that contained or that is

contaminated with radionuclides is demolished, decontaminated (to the extent possible) and removed from the site and compliance with clearance criteria has been demonstrated. Generally, this would involve performing a gamma radiation survey supplemented with full-spectrum radio analysis of soil samples performed at the infrastructure sites, followed by appropriate rehabilitation and clean-up operations for conditional or unconditional clearance from the regulatory authority. However, in this case for the TSF that would remain at the surface during the post-closure period, the level of clean-up that can be performed is limited to areas outside the TSF footprint area that may have become contaminated during or because of operational activities. These areas outside the TSF footprint can still be rehabilitated and cleaned-up for conditional or unconditional clearance.

- From the commissioning of a TSF, radionuclides contained in the tailings material leach from the TSF to the underlying strata. The rate of leaching is controlled by complex geochemical and hydrological processes but generally is a slow process. Once in the underlying strata, migration of these radionuclides is equally slow along the groundwater flow path. Abstraction of groundwater for personal or agricultural purposes may result in a radiological impact on receptors through direct ingestion of water or the ingestion of crops and animal products as secondary pathways. The radiological impact along the groundwater pathway only manifests itself during the post-closure period hundreds to thousands of years after closure. Radionuclides will leach from the TSF into the underlying aquifer, after which they will migrate in the general groundwater flow direction. Abstraction and use of the contaminated water contribute to the total effective dose through the ingestion and possible external radiation exposure routes.

Table 42: Radiation and Health Impact Assessment (AquiSim Consulting, 2026).

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
Exhalation and dispersion of radon gas to the atmosphere during the redeposition of tailings	Operation	Medium-Low Negative	Low Negative	Low Negative
Implementation of the NNR-approved decommissioning plan (AQ4)	Decommissioning, Closure and Post-Closure	High Positive	Medium Positive	High Positive
Leaching and migration of radionuclides from the TSF during the post-closure phase (GW1)	Post-Closure	Medium-Low Negative	Medium-Low Negative	Medium-Low Negative
Potential cumulative/ confounding effects	The cumulative radiological impact associated with a mining operation can be considered at different levels. Firstly, the radiological safety assessment process considers the cumulative contributions from all relevant exposure pathways, including surface water, groundwater, and the atmosphere, as appropriate. This means that the radiological impact assessment includes the cumulative impact of the exposure pathways, as appropriate and justified. Secondly, the radiological safety assessment process considers the cumulative contributions from all relevant exposure routes for each pathway. These include radon gas inhalation, dust inhalation, external gamma radiation (groundshine and cloudshine), and ingestion of soil, water, crops, and animal products, as appropriate and justified for each public exposure condition. This means that the radiological impact assessment includes the cumulative impact of the exposure routes, as appropriate and justified.			

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
	Thirdly, the radiological safety assessment process considers the cumulative contribution from all relevant sources of radiation exposure associated with the redepositioning of tailings at the lower Mponeng TSF, including those from existing TSFs in the area. This means that the radiological impact assessment includes the cumulative impact of these sources, as appropriate and justified. Finally, at the regional scale, the assessment context accounts for cumulative impacts from all contributing operations (or practices) in the area, which may increase the total effective dose to members of the public. This is important because the public dose limit of 1,000 µSv.year-1 is derived from all contributing sources and operations. However, as stated in Section 2.3.4.5, the scope of the assessment was limited to the Project. It did not make provision for a regional assessment to evaluate cumulative effects from all contributing operations.			
Mitigation Measures				
The total effective dose from windblown dust and radon gas released from the remaining facilities is well below regulatory compliance criteria (dose constraints), indicating that, from a compliance perspective, no additional management or mitigation measures are required. The management objective is first to ensure that radiation exposure is below the regulatory compliance criteria (i.e., the dose constraint) and, secondly, to optimise radiation protection by applying the ALARA principle. From a dose-optimisation perspective, the following mitigation measures can be implemented. These measures, which are in line with the measures proposed in the air quality impact assessment (Airshed, 2026), will contribute to a reduction in the total effective dose if applied for the duration of the operational period: • Develop an air quality management plan for the redepositioning of tailings at the lower Mponeng TSF, including air quality monitoring to ensure compliance at upwind and downwind locations; and • Vegetation of exposed areas of the TSF and wind barriers to reduce wind erosion and/or the application of dust suppressants. Based on the outcome of the baseline site characterisation and the outcome of the radiological public impact and safety assessment, the following is recommended as an extension of the baseline site characterisation programme of the project: • Perform gamma radiation and dose-rate surveys on a grid covering all potentially affected areas. • Perform an airborne radon gas survey in the area using RGMs on a campaign basis. • Collect surface water, groundwater and sediment samples on an upstream and downstream basis that is representative of the area for full-spectrum radioanalysis of the U-238, U-235 and Th-232 decay chains. • Collect soil samples at selected locations that correspond to potentially hot-spot areas identified during the gamma radiation survey for full-spectrum radioanalysis of the U-238, U-235, and Th-232 decay chains. The proposed radiological monitoring programme for the area includes recommendations for monitoring surface water, groundwater, sediment, environmental radon, and dust fallout, including the frequency and type of analyses. Most proposed monitoring points coincide with the environmental pathways monitoring programme (e.g., soil, surface water, and groundwater).				

5.7.2 IMPACTS ON GROUNDWATER (GW)

The Hydrogeological Report (MvB, 2025) considered four scenarios as outlined in the model objectives:

1. No mitigation measures.
2. A liner between the existing lower compartment and the proposed new tailings deposition.
3. Plume containment through scavenger wells.
4. Plume containment through tree plantations.

It is assumed that all mitigation measures start at the end of 2025 and is 100% effective on commencement. A comparison between the different scenarios, showing its effectiveness, is presented in **Table 43**.

5.7.2.1 SCENARIO 1 – NO MITIGATION

In this scenario, the lower compartment TSF will be raised to a total of 60m, and no mitigation measures are implemented. The 2060 result is presented in **Figure 59** and plume movement is in a south easterly direction towards the Elandsfontein Spruit.

5.7.2.2 SCENARIO 2 – CLASS C TSF LINER

Gold tailings are generally classified as Type 3 waste under the NEMWA Regulations 2013, necessitating a Class C containment barrier. This single composite barrier system includes underdrainage, a base preparation layer, a 300mm thick compacted clay liner (CCL), a 1.5mm thick geomembrane, a dual-purpose ballast and protection layer at least 100mm thick, and an above-liner drainage system. The barrier's effectiveness depends significantly on design specifications and Construction Quality Assurance (CQA). The presence and extent of wrinkles affect containment performance, with an anticipated seepage rate of approximately 140 litres per hectare per day.

The 140 litres per hectare per day translate to approximately 5 mm/a which is significantly lower than the seepage rates specified for the TSF source term. The Class C containment barrier can reduce the contaminant with 95% when installed correctly. The scenario result is presented in **Figure 60** and a significant attenuation of the high concentration SO_4 is achieved. Having said that, the plume footprint in 2060 does not differ much from the alternative barrier system scenario.

5.7.2.3 SCENARIO 3 – ALTERNATIVE BARRIER SYSTEM WITH SCAVENGER WELLS

The results for the scenario where alternative barrier system is installed, but scavenger wells are introduced as a mitigation measure is presented in **Figure 61**. This scenario features 9 scavenger wells positioned along the southern and eastern side of the TSF to intercept the plume. All nine wells are operating at 2 L/s and are continuously running. This option is successful in containing the contamination, but the footprint area is not much smaller than the no-liner option.

5.7.2.4 SCENARIO 4 – ALTERNATIVE BARRIER SYSTEM WITH TREE PLANTATIONS

In this scenario 44 hectares is planted with trees and each hectare has roughly 1300 trees with an optimal water use of 5 l/d per tree. It was further assumed that the maximum root depth is 8m, so when the water level drops below the root depth, evapotranspiration is terminated. The result of this scenario is presented in **Figure 62**. The plume is somewhat reduced on the eastern side, when compared to the alternative barrier system scenario which is considered the baseline for comparison. A significant reduction in the plume extent is visible in the southwest corner of the TSF.

Table 43: Comparison of the effectiveness of each remedial option (2060) (MvB, 2025).

Remedial Option	600 mg/L SO_4 Impact Area (m^2)	Improvement ($m^{2)}$
Current Impact Area	2 049 823	-
Do-Nothing Scenario after 35 Years	2 843 514	-
Lower Compartment TSF (Lined)	1 720 106	1 123 408 (39.5%)
Scavenger Boreholes	2 638 597	204 917 (7.2 %)
Evapotranspiration (Phytoremediation)	1 767 158	1 076 356 (37.9%)

It is evident that lining the Mponeng Lower Compartment TSF is the best option. The benefit is, however, minimal when comparing it to the phytoremediation option, which is a much more cost-effective option. This option is therefore recommended as a suitable management option.

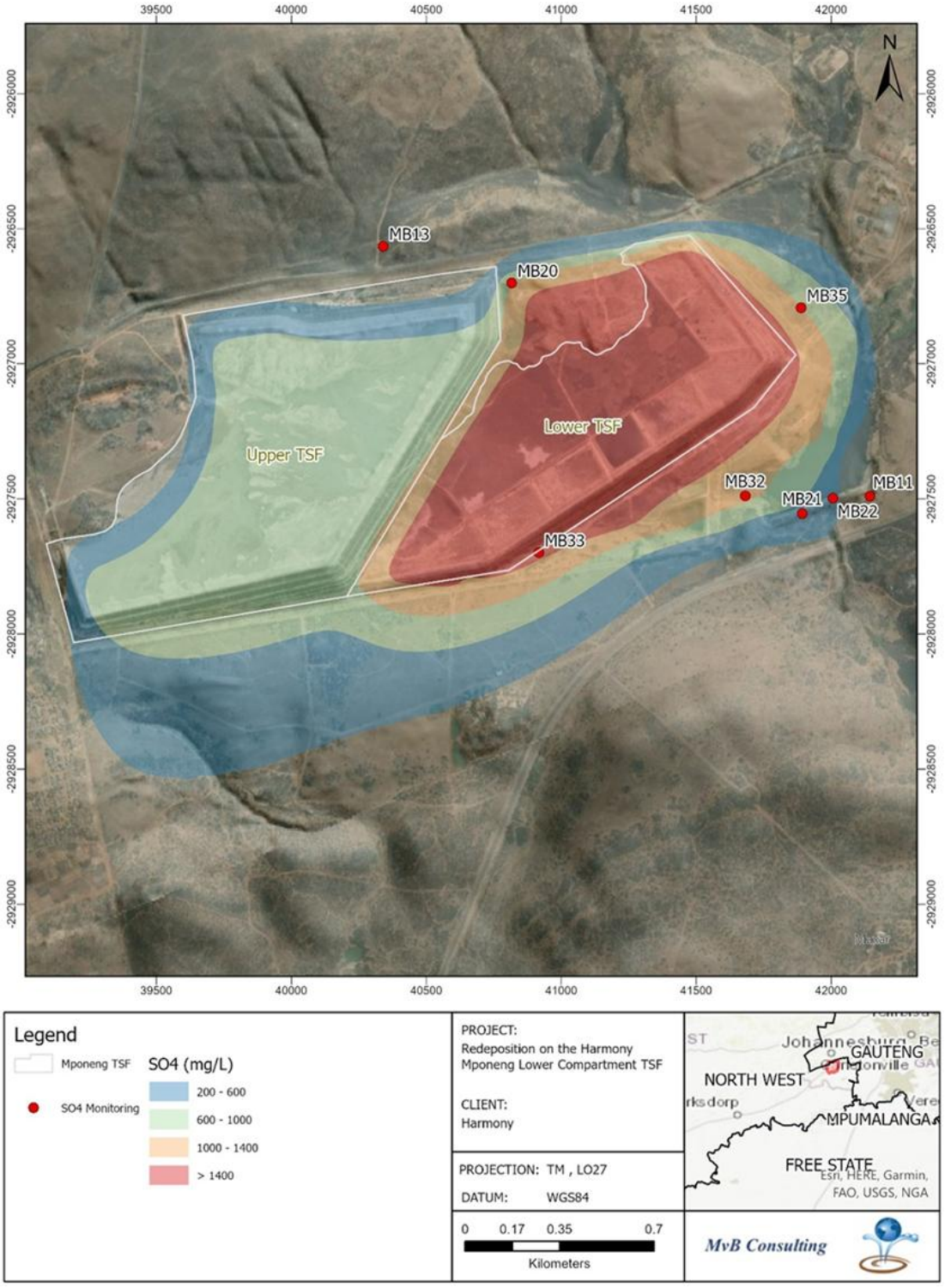


Figure 59: Plume migration by 2060 for Scenario 1 – No Mitigation (MvB, 2025).

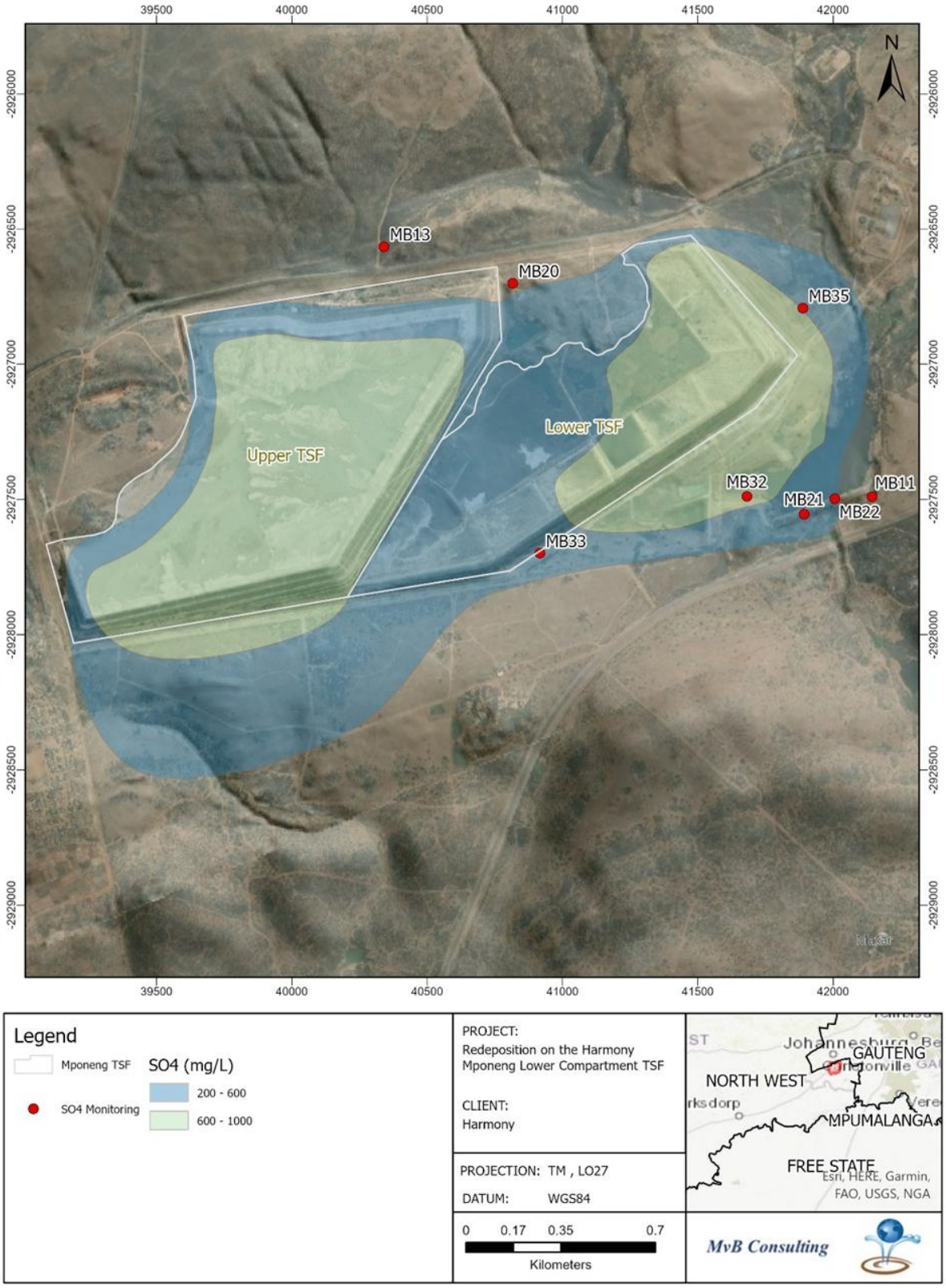


Figure 60: Plume migration by 2060 for Scenario 2 – Liner installation (MvB, 2025).

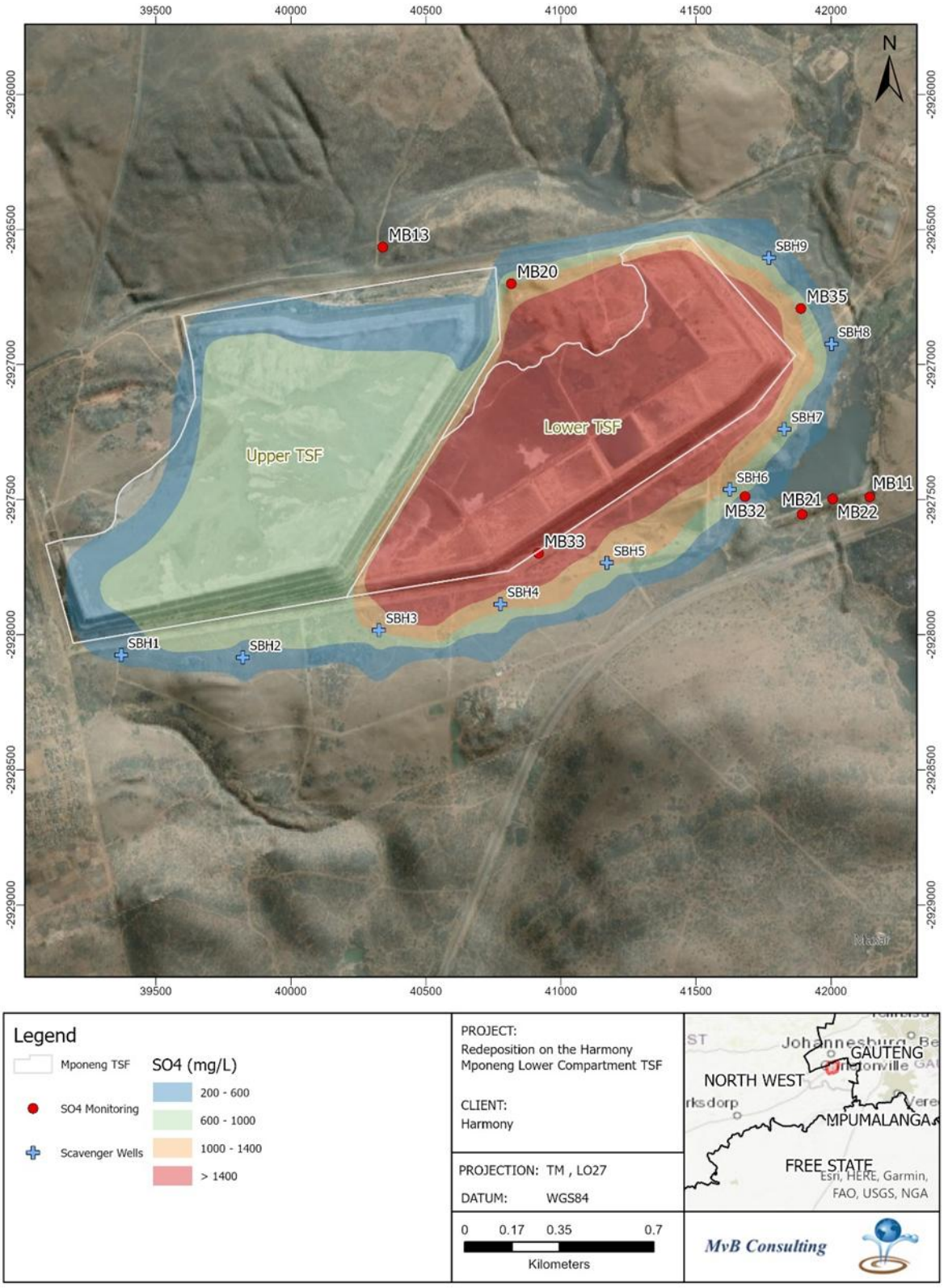


Figure 61: Plume migration by 2060 for Scenario 3 – alternative barrier system with scavenger wells (MvB, 2025).

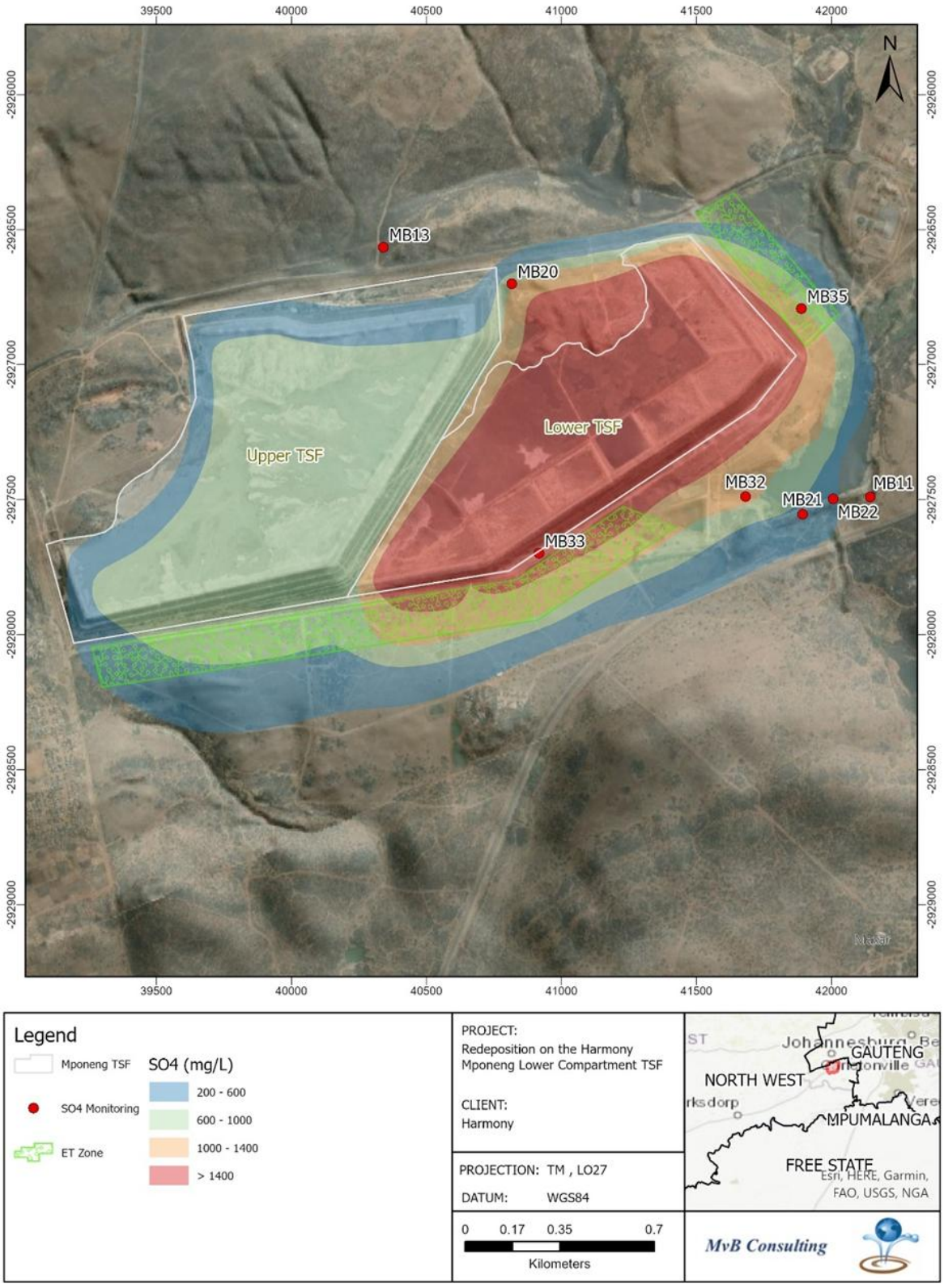


Figure 62: Plume migration by 2060 for Scenario 4 – alternative barrier system installed with evapotranspiration measures (MvB, 2025).

The geohydrological impact assessment for the Mponeng Lower Compartment TSF is presented in **Table 44**.

Table 44: Mponeng Lower Compartment TSF groundwater impact assessment table (2060) (MvB, 2025).

Scenario	IMPACT DESCRIPTION	Phase	Pre-Mitigation	Post Mitigation	Final score
1	Groundwater contamination from MLC TSF (Unlined)	Operation	High Negative	High Negative	High Negative
2	Groundwater contamination from MLC TSF (Lined)	Operation	High Negative	Medium Negative	Medium Negative
3	Groundwater contamination from MLC TSF (Scavenger BH's)	Operation	High Negative	Medium Negative	Medium Negative
4	Groundwater contamination from MLC TSF (Phyto-Remediation)	Operation	High Negative	Medium Negative	Medium Negative
1	Groundwater contamination from MLC TSF (Unlined)	Decommissioning	High Negative	High Negative	High Negative
2	Groundwater contamination from MLC TSF (Lined)	Decommissioning	High Negative	Medium Negative	Medium Negative
3	Groundwater contamination from MLC TSF (Scavenger BH's)	Decommissioning	High Negative	Medium Negative	Medium Negative
4	Groundwater contamination from MLC TSF (Phyto-Remediation)	Decommissioning	High Negative	Medium Negative	Medium Negative

It is important to note that a numerical groundwater model is a representation of the real system. It is therefore at most an approximation, and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes.

To investigate the behaviour of aquifer systems in time and space, it is necessary to employ a mathematical model. MODFLOW, a modular three-dimensional finite difference groundwater flow model was chosen as the model code to be used. It is an internationally accepted modelling package, which calculates the solution of the groundwater flow equation using the finite difference approach.

The numerical model was used to simulate the effectiveness of the following management options:

- No liner.
- Lining of the Mponeng Lower Compartment TSF.
- Implementation of interception (scavenger) boreholes on the down-gradient side of the TSF.
- Implementation of phyto-remediation on the down-gradient side of the TSF.

The primary risk that this proposed project poses is the seepage of contaminants into the aquifer, and the migration of these contaminants into down-gradient receptors (Elandsfontein Spruit).

The following mitigation measures were included in the assessment:

- For the scenario 1, the “do-nothing” option, the Mponeng Lower Compartment TSF remains unlined. The only mitigation is the rehabilitation and decommissioning of the TSF during the closure (decommissioning) phase.
- For scenario 2, the Mponeng Lower Compartment TSF will be lined. This option will change the risk from High Negative to Low Negative during the operational and closure phases. This option has the best rating.
- For scenario 3, the drilling of scavenger boreholes were considered. This option will change the risk from High Negative to Low Negative during the operational and closure phases. This option has the lowest rating due to the maintenance requirements for scavenger boreholes.
- For scenario 4, the Mponeng Lower Compartment TSF will remain unlined, but the proposed phyto-remediation will be fully functional. This option will change the risk from High Negative to Low Negative during the operational and closure phases. This option has lower rating than a liner, but a better rating than the scavenger boreholes and is the recommended long-term management option.

Based on the study, it is evident that lining the Mponeng Lower Compartment TSF is the best option. The benefit is, however, minimal when comparing it to the phytoremediation option, which is a much more cost-effective option. It is evident from the assessment that the phyto-remediation is effective, and it is recommended that this option be considered. The installation of a alternative barrier system and / or scavenger boreholes may improve the rehabilitation of the groundwater, but it is considered unnecessary as the phyto-remediation is effective on its own.

5.7.3 IMPACTS ON SURFACE WATER / WETLANDS

This section presents the identified surface water features as per the Aquatics and Wetlands Impact Assessment undertaken by The Biodiversity Company (TBC) (2026).

5.7.3.1 CURRENT IMPACTS TO FRESHWATER BIODIVERSITY

The assessed wetlands exhibit impacts at local scale. These impacts result from present and historical land use relating to agricultural practice, impoundments, access roads and to a large degree, mining activities which have transformed the wetland habitats and have altered their natural hydrological regime and vegetation composition. The list below refers to the present-day local impacts observed within the assessed wetland areas:

- Wetland disturbance from other mining practises, development of dams, urban build-up and traffic;
- Altered hydrological inputs resulting from changes to the surrounding landscape;
- Erosion induced from altered hydrodynamics in combination with the loss of wetland vegetation;
- Altered geomorphology from historical mining practises and development of dams within the wetlands; and
- Loss of wetland vegetation from continual disturbances, historical land use and the establishment of alien invasive flora species in some approaches of the wetlands).

5.7.3.2 POTENTIAL ANTICIPATED IMPACTS AND IMPACT ASSESSMENT

Table 45 illustrates the potential aspects expected to threaten the integrity of sensitive receptors during the proposed activities. The pre- and post- mitigation significance ratings have been calculated considering various parameters, these results are presented in the subsequent tables. It must be noted that the Risk and Impact assessments will mainly focus on the construction and operation of the proposed pipelines. Impacts resulting from the TSF are anticipated to be Low considering that it is an existing facility that will continue to be used, with that being mentioned, the main risks associated with the TSF may result from structural failure, dust pollution and toxicant seepage from unlined surfaces. Indirect impacts from the TSF are potential to the wetlands identified to be at risk, whereas direct impacts are expected from the pipelines and bridges for the wetlands. Emphasis was therefore placed on minimising impacts by means of mitigation.

The potential impacts on HGM 3 are mitigated by distance, while impacts on HGM 4 are mitigated by the presence of existing infrastructure.

Table 45: Summative results of the Impact Assessment conducted for the proposed project, along with the prescribed mitigation measures (TBC, 2026)

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Direct loss, disturbance and degradation of wetlands	Construction	Medium Negative	Low Negative	Low Negative
Mitigation • Minimise the construction footprint and restrict vegetation clearing to the designated construction area. • Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation. • Limit vehicle and machinery movement near the wetland to designated routes. • Limit all other activities in watercourse areas to those explicitly authorised.				
Alteration of surface topography (reshaping and compacting)	Construction	Medium Negative	Low Negative	Medium Negative
Mitigation • Restrict vehicle and machinery usage to designated paths. • Ensure that sediment and erosion controls are incorporated into the suggested stormwater management plan. • Limit construction where possible to the dry season, especially for activities that occur within the watercourse or its buffer area. • Ensure that any unplanned establishment of concentrated flow paths together with any denuded areas are appropriately rehabilitated and revegetated. • Ensure that soil stockpiles are located out of the watercourse, on flat terrain and is safe guarded against wind and rain erosion by bunding or temporary covering.				
Increased bare surfaces, runoff and potential for erosion	Construction	Medium Negative	Low Negative	Medium Negative
Mitigation • Maintain access roads to prevent erosion and sedimentation. • If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion. • Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge.				
Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Construction	Medium Negative	Low Negative	Low Negative
Mitigation • Monitor and manage invasive species in disturbed areas. • Minimise the construction footprint and restrict vegetation clearing to the designated construction area. Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation.				
Waste and pollutant spills	Construction	Medium Negative	Medium Negative	Medium Negative

Mitigation

- Restrict the use of machinery and vehicles within the watercourse and buffer unless for the use on existing roads.
- Ensure that all temporary sanitation structures are situated out of the watercourse and its buffer and that these facilities are regularly maintained and monitored for early detection of leaks.
- Ensure that no machinery of vehicles is allowed to park within the wetland or buffer.
- Ensure that all machinery and equipment is inspected and serviced regularly in a designated area situated out of the wetland and buffer areas.
- Ensure that contractors are equipped with spill kits to timeously respond to spillages.
- Ensure that all hydrocarbons, oils or other potentially hazardous substances are contained in a designated area which is located on flat terrain out of the watercourse and buffer and is safe guarded from leaking out of the designated area. Use spill containment systems like drip trays and barriers around machinery and storage areas.
- Implement spill prevention plans and provide training for workers on spill response procedures.

Increased sediment loads to downstream reaches	Construction	Medium Negative	Low Negative	Low Negative

Mitigation

- Maintain access roads to prevent erosion and sedimentation.
- If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion.
- Loose soils are particularly prone to loss due to wind or water. It is therefore preferable that construction takes place during the dry season, where possible, to reduce the erosion potential of the exposed surfaces.
- Practice good soil management across the construction footprint.
- Implement a suitable stormwater management plan for the construction and operation phases.
- Signs of erosion must be addressed immediately to prevent further erosion of the area to prevent head cut erosion from forming.
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching.
- The rehabilitation of watercourse banks must take place following construction. Key areas where erosion has occurred should be rehabilitated through bank reprofiling to gentler gradients and the revegetation of the marginal and riparian areas

Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste	Construction	Medium Negative	Low Negative	Medium Negative

Mitigation

- Prohibit mixing of chemicals or concrete within the watercourse. Store all fuels and chemical mixtures in a bunded / containment area, away from the watercourse.
- Regularly inspect and maintain bunded areas around fuel, chemical, and waste storage.
- Ensure all solid and hazardous waste is stored in designated, impermeable areas and regularly removed to licensed facilities.
- Prevent any waste dumping or littering near the wetland.
- Ensure all dirty water reports to a PCD (Pollution Control Dam).

- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be out of watercourses and in a designated area that is flat and bunded.
- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems.
- The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly.
- The stormwater management plan must aim to release only clean water in the environment.

Terrain alteration for pipeline and bridges	Construction	Medium Negative	Low Negative	Low Negative

Mitigation

- Maintain access roads to prevent erosion and sedimentation.
- If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion.
- Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge.

Final Landscaping and reshaping	Construction	Medium Negative	Low Negative	Low Negative

Activities relating to landscaping should be quick, along with a reduced machinery footprint.

Alteration of surface runoff and drainage	Operation	Medium Negative	Low Negative	Low Negative

Mitigation

- Install the pipeline above ground when crossing the watercourse, ensuring supports span the entire width wherever feasible.
- Limit all other activities in watercourse areas to those explicitly authorised.
- Design and implement an effective stormwater management plan.
- Re-vegetate denuded areas as soon as possible to increase surface roughness and promote infiltration.
- Regularly clear drains to prevent uncalled for accumulation of surface water and the establishment of concentrated flow paths out of the accumulation areas

Increased water inputs (clean) to downstream wetlands	Operation	High Negative	Low Negative	Medium Negative

Mitigation

- Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge.
- Perform regular maintenance and inspections of the pipelines and other water outlets to ensure their integrity and prevent increased volumes of water (with potential contaminates) from entering the watercourse.
- Develop and implement emergency response protocols for potential pipeline leaks and retention dam breakages.

Disruption of wetland soil profile, hydrological regime and increased sediment loads	Operation	Medium Negative	Low Negative	Low Negative

Mitigation

- Restrict unauthorised and unnecessary activities within the wetlands and their respective buffers. No laydown areas or storage of equipment and material should be allowed within the wetlands and only activities necessary for construction of the relevant infrastructure (within watercourses) must be permitted. Authorised activities within the watercourse must be overseen by an ECO or internal EO.
- Minimise the disturbance footprint of the development or the proposed infrastructure areas and avoid land clearing outside of these areas to prevent indirect impact to the wetlands.
- Clearly demarcate the construction footprint and restrict all activities to within the proposed infrastructure area.
- Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the making them aware of the overall site plan which should indicate sensitive areas, waste disposal areas and any other relevant project specifics.
- Limit vehicle and machinery movement near the wetland to designated routes.
- Maintain access roads to prevent erosion and sedimentation.

Degradation of wetland vegetation and proliferation of alien and invasive species	Operation	Medium Negative	Low Negative	Low Negative

Mitigation

- Monitor and manage invasive species in disturbed areas.
- Minimise the construction footprint and restrict vegetation clearing to the designated construction area. Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation.

Slurry and pollutant spills into water resources	Operation	High Negative	Medium Negative	High Negative

Mitigation

- Monitor and manage TSF carrying capacity.
- As far as practical rapidly deploy silt barriers, absorbent booms, and temporary gabion berms directly downstream of the breach to physically contain the slurry plume.
- Use pumps and temporary diversion channels to reroute clean upstream water away from the contaminated wetland flow path (if needed).
- As far as possible construct in-channel weirs and offline settling ponds or any other similar infrastructure / system within the wetland to slow water velocity and promote sedimentation.
- Conduct careful, phased mechanical removal of gross tailings deposits using low-ground-pressure machinery (removal will depend on the size, location and wetness/dryness of the slurry).
- Where possible, apply in-situ stabilization or install vertical hydraulic barriers for deeply mixed, contaminated substrates.
- Implement a dense network of continuous water quality monitoring to dynamically adjust treatment.
- Re-establish the natural wetland hydroperiod and morphology by restoring original topography and natural inlets/outlets.
- Replant remediated areas using indigenous, metal-tolerant wetland plant species for phyto-remediation and stabilization.

Water quality impairment	Operation	High Negative	Medium Negative	Medium Negative

Mitigation

- Prohibit mixing of chemicals or concrete within the watercourse. Store all fuels and chemical mixtures in a bunded area, away from the watercourse.

- Regularly inspect and maintain bunded / containment areas around fuel, chemical, and waste storage.
- Ensure all solid and hazardous waste is stored in designated, impermeable areas and regularly removed to licensed facilities.
- Prevent any waste dumping or littering near the wetland.
- Ensure all dirty water reports to a PCD (Pollution Control Dam).
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be out of watercourses and in a designated area that is flat and bunded.
- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems.
- The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly.
- The stormwater management plan must aim to release only clean water in the environment

5.7.3.3 FLOOD RISK ASSESSMENT

Flood risk is both an impact on the proposed recommencement of deposition on the Mponeng Lower Compartment TSF (flooding originating beyond the TSF) and on the environment (flooding originating from the TSFs) and includes:

- A TSF failure resulting in downstream flooding (flooding originating from the TSF);
- Flooding from the river systems to the north or south of the TSFs (flooding originating beyond the TSFs); and
- Surface water run-on towards the TSFs (flooding originating beyond the TSFs).

This risk is expected to be present during the construction, operational, decommissioning and rehab/closure phases (flooding originating beyond the TSFs) and during the operational, decommissioning and rehab/closure phases (flooding originating from the TSFs). The proposed recommencement of deposition will likely have minimal flood risk in relation to the increase height of the TSF, however, flood risk from the TSF may be increased due to increased TSF volume. A quantified assessment of flooding would need to consider the actual fluvial flood risk to the TSFs (from the adjacent river systems).

The consequence of flooding is potentially severe, however, flooding originating beyond the TSFs is expected to have been mitigated (to at least a degree) through the toe paddocks and associated bunding that hydraulically separates the TSFs from the adjacent environment. TSF failure (while highly unlikely to occur), has both flooding and pollutant implications.

It is important to note that the impact assessment will be revised through the detailed and site-specific floodline risk assessment anticipated in February / March 2026 and will be submitted to the competent authority as part of the final submission. It should also be noted that the potentially severe impact of flood risk is not adequately conveyed by the impact table below since the probability of extreme flooding is low, resulting in the impact appearing less significant than may be warranted.

Table 46: Preliminary flood risk assessment.

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
Erosion of Soils and Sedimentation of surface water features	Operation, Decommissioning, Rehabilitation and Closure and Post-closure	Medium Negative	Medium-Low Negative	Low Negative

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
Pollutants entering the surface water environment	Operation, Decommissioning, Rehabilitation and Closure and Post-closure	Medium Negative	Medium-Low Negative	Low Negative
Decrease in run-off	Operation, Decommissioning, Rehabilitation and Closure and Post-closure	Medium Negative	Medium-Low Negative	Low Negative
Flood Risk	Operation, Decommissioning, Rehabilitation and Closure and Post-closure	Medium Negative	Medium-Low Negative	Low Negative
Potential cumulative/ confounding effects	For the erosion of soils and contamination, the cumulative impact was rated as high: 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. For decrease in run-off and flood risk, the cumulative impact was rated Low: considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.			

Mitigation Measures

Erosion of Soils and Sedimentation of surface water features

The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed project:

- Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements).
- Monitor the TSFs to ensure areas of potential erosion are identified and managed appropriately.
- Rehabilitation should include topsoil replacement, re-vegetation and maintenance/aftercare for disturbed areas insofar as it should be developed for disturbed areas.
- Concurrent rehabilitation of the TSFs should ideally occur during the life of the TSFs. This would likely include cladding of TSFs side slopes and subsequent revegetation with final TSFs rehabilitation resulting in fully vegetated site.
- Additional guidance on erosion control is available in: Landcom Soils and Construction, Volume 1, 4th edition from 2004 (otherwise known as the Blue Book).

Pollutants entering the surface water environment)

The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed project:

- Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements).
- Develop the TSFs using sound engineering to limit the likelihood of a failure.
- Maintain and operate the TSFs/RWD to limit the potential for overfilling of the RWD that leads to a spill.
- Monitor the TSFs to identify any potential failures/slumps.

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance

- Keep activity within the managed dirty water footprint where possible.
- Store hydrocarbons off-site where possible, or otherwise implement hydrocarbon storage with adequate bunding or containment.
- Handle hydrocarbons carefully to limit spillage.
- Ensure vehicles are regularly serviced so that hydrocarbon leaks are limited.
- Use drip trays for stationary vehicles or otherwise park over areas suited to their storage (e.g. with an oil interceptor)
- Designate a single location for refuelling and maintenance where possible.
- Keep a spill kit on site to deal with any hydrocarbon leaks.
- Remove soil from the site which has been contaminated by hydrocarbon spillage.
- Undertake surface water monitoring to enable change detection related to contaminants originating from the site.

Decrease in run-off

The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed project:

- Limiting the time and area over which machinery operates will limit the compaction of soils on the site.
- Divert clean water run-on away from the site.

Flood Risk

The below mitigation is expected to already be part of the existing TSFs management.

- Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements).
- Ensure that flood protection of the TSFs is sufficient to manage flood risk from both adjacent river systems (north and south) and
- stormwater run-on.
- Develop the TSFs using sound engineering to limit the likelihood of a failure.
- Monitor the TSFs to identify any potential failures/slumps.

Monitoring

- Potential contaminants of concern that need to be monitored are expected to have already been identified based on the historical quarterly surface water quality monitoring that has been undertaken. The understanding of the mine's processes and the associated contaminants that might be released in the event of a failure in an aspect of the TSF's (e.g. toe paddock rupture or RWD overflow) is likewise expected to be clearly understood with monitoring reflecting this.
- Bi-annual monitoring reports should be produced to differentiate seasonal variations and general trends due to the mining activities, with a comparison of water samples to standards and guidelines set by the Department of Water and Sanitation (DWS) and an analysis of parameters over time so that trends can be established.

Impact	Phase	Pre-mitigation Impact	Post-mitigation Impact	Final Significance
• The recommended monitoring points are also provided in the specialist report and should be included in the monitoring programme.				

5.8 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.

5.8.1 PRE-CONSULTATION WITH THE COMPETENT AUTHORITY

A pre-application meeting with the competent authority (DWS) was requested by the EAP and was held on the 9th of October 2025. The purpose of the pre-consultation was to provide the authorities with background information of the proposed project, confirm NWA triggered listed activities, the process to be followed and details to be included in the WULA such as specialist studies.

5.8.2 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA, NWA 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. Refer to Appendix 9 for the public participation report and appendices.

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

The following authorities have been identified and notified, but not limited to:

- Merafong City Local Municipality;
- West Rand District Municipality;
- The Department of Mineral and Petroleum Resources;
- National Department of Forestry, Fisheries and Environment;
- National Department of Water and Sanitation;
- National Department of Rural Development and Land Reform;
- National Nuclear Regulator;
- Gauteng Department of Agriculture and Rural Development;
- Gauteng Department of Roads and Transport;
- Gauteng Department of Health;
- Gauteng Department of Community Safety;
- South African Resource Heritage Agency (SARHA);
- Agricultural Research Council; and
- South Africa Civil Aviation Authority

The following key stakeholders have been identified and notified of the proposed activity:

- Birdlife South Africa;
- Endangered Wildlife Trust;
- Eskom Holdings SOC Limited;
- Federation for a Sustainable Environment;
- Local Ward Councillors.
- Mining Affected Communities United in Action;
- Mining and Environmental Justice Community Network of South Africa
- South African National Roads Agency Ltd; and
- Wildlife and Environment Society of South Africa.

The following surrounding surface rights holders/landowners of the area under application have been identified as part of this application:

- Blyvooruitzicht Gold Mining Co Ltd;
- Anglogold Ashanti Ltd;
- Blywonder Trust (Pty) Ltd;
- Deelkraal Behuising Trust;
- Eskom Holdings SOC Ltd;

- Gauteng Provincial Government;
- Gold Fields Limited;
- Howden Group South Africa Limited;
- Jocapari Trust;
- Carleton Midas;
- Morgan Creek Sewerage Plants;
- Rand Water;
- Randfontein Estates Ltd (Care of Harmony Gold);
- Republic of South Africa;
- Welverdiend Township Development Company Ltd; and
- Other private individuals

5.8.4 INITIAL NOTIFICATION

The PPP commenced on the 15th of August 2025 with an initial notification and call to register on the project. The notification was given in the manner described in the sub-sections below.

5.8.4.1 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters (English, Afrikaans and Setswana), 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.

5.8.4.2 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 Carletonville Herald (in English, Afrikaans and Setswana) on the 21st of August 2025. The provincial Gazette was advertised on the 3rd of September 2025. The advertisements 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.

5.8.4.3 SITE NOTICE PLACEMENT

A1 Correx site notices in English, Afrikaans and Setswana were placed at 23 locations within the local project area on the 21st of August 2025. 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.

5.9 PUBLIC PARTICIPATION REVIEW OF THE IWWMP REPORT

I&APs have been provided with the opportunity to submit their comments during the public review period of the WULA IWWMP Report of the project for 60 days from date of notification of availability or report for public review and comments. The public has been notified regarding the availability of the report for review through newspaper advertisement, site notices, emails, sms's and registered mail (where applicable). The hardcopy of the report has been placed at Deelkraal Library and Carletonville Public Library while a softcopy version has been placed on the EIMS website (www.eims.co.za/public-participation). Comments / concerns should be submitted to EIMS the by no later than **29 April 2026.** The comments / concerns should be directed to EIMS at:

- Contact Person: Mbali Tshabalala
    - EIMS Reference Number: 1658
    - Postal Address: P.O. Box 2083; Pinegowrie; 2123
    - Telephone: (011) 789 7170
    - Fax: (086) 571 9047
    - E-mail: mponengtsf@eims.co.za

Comments raised during the public review will be addressed in a transparent manner and will be included in the Final IWWMP to be submitted to the Competent Authority. Comments raised to date (from the EIA process) have been addressed in a transparent manner and will be included in the Public Participation Report. **As this report is based on preliminary designs and does not strictly specify the final barrier option, I&APs can request the Final IWWMP for transparency into the final design. However, no comments will be considered on the Final IWWMP as all possible options are presented in this report for review and comment by I&APs**. To date, summary of comments received are as follows:

- Requests to register as I&AP;
- Requests for locality map and site kml files;
- Request for project reports; and
- Confirmation from stakeholders that they are not affected by the proposed project.
- Focus group meeting with Federation for a Sustainable Environment:
    - Request for indication on the responsible party for Closure and Rehabilitation.
    - Inquiry of site / location alternative assessment

- Inquiry on lining plans of the TSF and Return Water Dam
- Request for details of the spring and proposed diversion plans.
- Inquiry on the Risk Classification of the TSF.
- Inquiry on the risk measures for potential pipeline spillages.
- Request for presentation of the project to the local Catchment Management Forum.
- Emphasis on the Water Quality Monitoring.
- Inquiry on Dust Management Plan.

5.10 MATTERS REQUIRING ATTENTION / PROBLEM STATEMENT

The assessment of water and waste management systems at Mponeng, Savuka, and Tau Tona has revealed several key challenges that require immediate attention or long-term strategic planning. The overall environmental management framework is functional and many systems are in place, there remain aspects in infrastructure performance, environmental compliance, and closure readiness that must be addressed to ensure sustainability and legal alignment. Specific to this project, no audits for this project have yet occurred, as such this section is not applicable. No additional matters have been identified at this stage.

5.11 ASSESSMENT OF LEVEL AND CONFIDENCE OF INFORMATION

The preparation of this Integrated Water and Waste Management Plan (IWWMP) is based on a combination of primary field observations, historic and recent monitoring data, technical specialist reports, and site-specific risk assessments. This report is based on information that is currently available, further:

- The project scope and descriptions are based on project information provided by the client;
- The information presented in this report is based on the information available at the time of compilation of the report and of information gathered during site visits;
- It is assumed that all data and information supplied by the Specialist, Applicant or any of their staff or consultants is complete, valid, and true; and
- The description of the baseline environment has been obtained from registered and qualified specialists.

6 WATER AND WASTE MANAGEMENT

The following section describes water and waste aspects for the Mponeng TSF, as well as the related operational processes.

6.1 WATER AND WASTE MANAGEMENT PHILOSOPHY (PROCESS WATER, STORM WATER, GROUNDWATER, WASTE)

6.1.1 WATER MANAGEMENT PHILOSOPHY

The mine strives to align with the water quality management hierarchy advocated by DWS. This philosophy is applied to process-, storm- and groundwater (**Figure 63**).

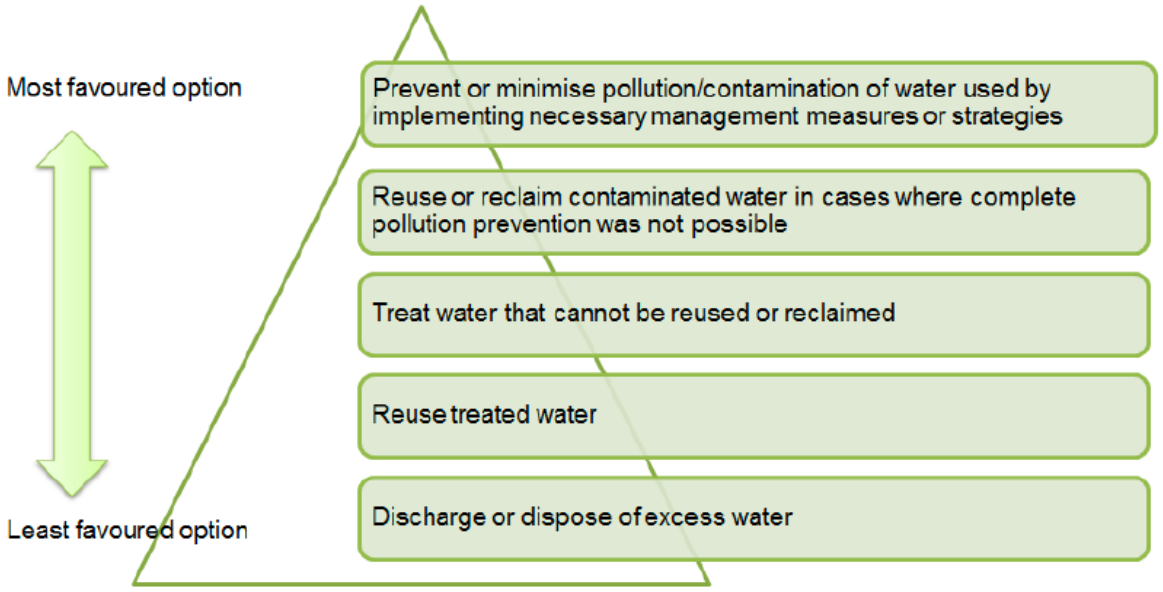


Figure 63: Water Quality Management Hierarchy (Gomelelo, 2025)

6.1.2 PROCESS WATER

The philosophy with respect to process water management during the operational phase is to conform to the following principles:

- Collect and contain all contaminated process water in adequately sized, lined containment facilities;
- Minimise the amount of process-affected water produced by continually investigating emerging technologies;
- Contain all process water to ensure zero discharge of process water to the environment;
- Re-use and recycle process water in the circuit;
- Treat and discharge excess mine water; and
- Develop a high-confidence process water balance to support water management

6.1.3 SURFACE AND STORMWATER

The following principles govern the philosophy for adequate stormwater management on site:

- To prevent contamination of clean water;
- To return clean water to the catchment;

- Contain all contaminated water for re-use and recycling;
- Ongoing monitoring and measurement of water quantity and quality to support the site-wide water balance and water management; and
- Re-establish surface drainage to the pre-operation conditions as practicable during the decommissioning and closure phase.

The philosophy of Harmony is to develop and implement site water management strategies to limit the negative impact on the surface water resource as far as possible. Harmony also aims to ensure compliance with the precautionary principle as indicated by the DWS. The water management measures proposed in this document aim to ensure activities are undertaken at the lowest possible impact to the environment.

6.1.4 GROUNDWATER

The following principles govern effective groundwater management:

- Water is a scarce and valuable resource and has to be considered and treated as such;
- Maintain infrastructure with good housekeeping on-site to prevent any spills and leaks that may seep into the groundwater;
- Implement ongoing monitoring of groundwater quality and levels to inform the detailed geochemical impact predictions and to validate groundwater models;
- Ensure that all potential groundwater impacts are identified and managed; and
- Long-term treatment of water to prevent pollution plume migration and maintain fitness for use.

Harmony recognises that water is a scarce and valuable resource. Contamination of a groundwater resource impairs the beneficial use of this resource for everyone. Harmony is committed to consult with specialists on a regular basis to determine the extent of the impact on the groundwater resource and to implement recommendations if required.

6.1.5 SENSITIVE LANDSCAPES (WETLANDS AND RIVER RIPARIAN AREAS)

Harmony recognises the importance of wetlands and riparian areas and the role that they play to the environment. Harmony is committed in keeping affected and clean water systems separate. Harmony is also committed to the continual monitoring of surface water resources both upstream and downstream of the Harmony Free state Operations.

6.1.6 WASTE

Golden Core Trade and Invest adopted the waste hierarchy according to Sections 16 and 21 of the National Environmental Management: Waste Act, 2008 (NEMWA), which stipulates that the holder of waste must, within the holder's power, take all reasonable measures to ideally avoid or reduce, re-use, recycle and recover waste. Effective waste management is the responsibility of all employees and aims to reduce, re-use and recycle waste wherever possible ensuring the implementation of the waste hierarchy (**Figure 64**). Key waste streams will be identified, characterised and classified and the collection, handling and disposal will be in accordance with the respective waste stream classification and legislation.

The philosophies for the management of the various waste streams on-site include:

- Implement waste separation at source;
- Maximise recycling and reuse of waste streams;
- Dispose of waste in authorised waste disposal facilities per classification, assessment and legal requirements;
- Implement ongoing waste monitoring to inform waste management; and
- Identification and rehabilitation of contaminated land (if necessary).

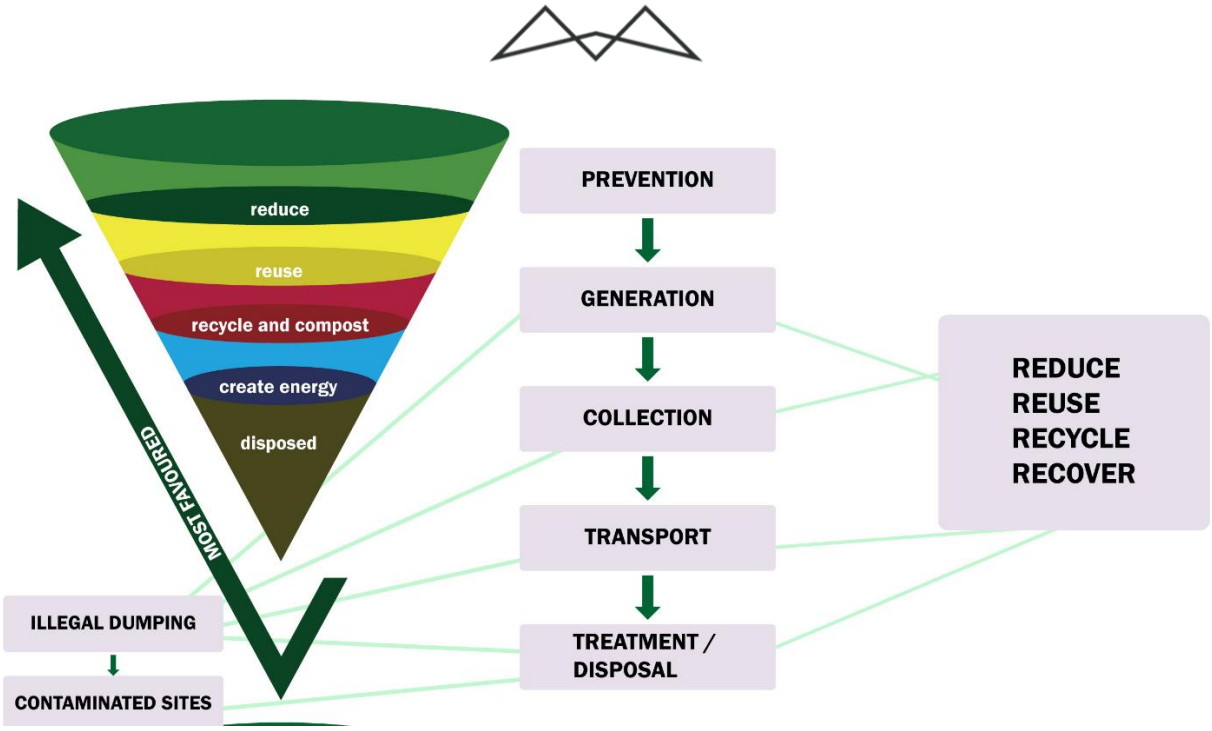


Figure 64: Waste Management Hierarchy (DEA 2020; https://www.dffe.gov.za/ep_focusareas_wow).

6.2 STRATEGIES (PROCESS WATER, STORM WATER, GROUNDWATER AND WASTE)

In order to give effect to the water and waste management philosophies formulated above, more specific strategies have been developed to support individual management actions.

6.2.1 PROCESS WATER

The strategies pertaining to the process water at Golden Core Trade and Invest are listed as follows:

- Ensure the surety of the supply of process water to the operation;
- Investigate and implement new technologies to reduce the use of process water during production;
- Maximise the reuse and recycling of dirty water (including contaminated stormwater) and minimise the intake of clean water;
- Support the implementation of a water management plan employing monitoring and measuring to maintain a high confidence, metered sitewide water balance; and
- Prevent the discharge of process water to the receiving environment by providing adequate storage capacity, maintenance of related infrastructure and provision of backup pumps.

No additional process water strategies are proposed for the water uses included in this application, over and above the mitigation measures proposed as part of the risk assessment conducted for this project.

6.2.2 STORMWATER

The strategies related to the management of stormwater at Golden Core Trade and Invest include the following:

- Collect and contain contaminated stormwater runoff to be reused and recycled as process water;
- Maintain effluent and stormwater management infrastructure in a functional state;
- Capture runoff in areas generating dirty stormwater in drains, which reports to a dedicated stormwater control dam or reservoir;
- Route clean stormwater runoff emanating from clean areas to the natural receiving environment and away from the dirty areas;

- Implementing sediment trapping measures; and
- Implement monitoring, measurement and reporting of water quantity and quality

No additional stormwater strategies are proposed for the water uses included in this application, over and above the mitigation measures proposed as part of the risk assessment conducted for this project

6.2.3 GROUNDWATER

The strategies related to the management of groundwater at Golden Core Trade and Invest include:

- Prevent the off-site migration of groundwater pollution plumes;
- Maintain fitness for the use of groundwater resources by other groundwater users; and
- Implement and/or maintain the integrity of waste or wastewater facility liners to prevent impacts on groundwater resources.

No additional groundwater strategies are proposed for the water uses included in this application, over and above the mitigation measures proposed as part of the risk assessment conducted for this project.

6.2.4 WASTE

The strategies related to the management of waste at Golden Core Trade and Invest are:

- Implement monitoring, measurement and reporting of waste generated in operation to facilitate effective waste management, including waste identification and classification;
- Adequate disposal of waste to prevent any future potential impacts on the environment;
- Dispose of waste generated at the operation, based on waste assessment, in accordance with legal requirements and current waste management guidelines; and
- Investigate improved technologies to reduce waste generated by reuse, recycling and/or recovering.

6.2.5 SENSITIVE LANDSCAPES

No additional sensitive landscape strategies are proposed for the water uses included in this application, over and above the mitigation measures proposed as part of the risk assessment conducted for this project.

6.3 PERFORMANCE OBJECTIVE / GOALS

The implementation of this IWWMP is guided by a series of clearly defined performance objectives and goals, aimed at ensuring legal compliance, reducing environmental risk, and promoting responsible resource use. These objectives are aligned with Harmony Gold's corporate environmental policy, Water Use Licence (WUL) conditions, the National Water Act (Act 36 of 1998), and best practice principles for sustainable mining operations. The performance goals are designed to:

- Address key risks identified through the site's environmental risk assessment;
- Guide prioritised actions for operational improvement and compliance;
- Establish measurable indicators for tracking environmental performance;
- Support progressive rehabilitation and closure readiness; and
- Promote the long-term protection of surface water, groundwater, air quality, and land resources.

The following key objectives have been identified for the Harmony Savuka TSF as stated in **Table 47**.

Table 47: Performance Objectives

Theme	Objectives
Surface Water	Clean and dirty water separation.
	Containment of dirty water run-off.
	Prevent capacity constraints through regular maintenance of process water dams and through effective operation of the dams (i.e., demand and supply management).
	Protect watercourses against erosion, especially at watercourse crossings.
Groundwater	Minimise impact on groundwater quality.
	Prevent impact on groundwater availability to neighbouring users.
	To minimise the extent of disturbance of the aquifer.
Process Water	Maximise the re-use of process water.
	An up-to-date water balances.
	Manage process water dams with 0.8 m freeboard.
Sensitive landscapes	Minimise impact on sensitive areas (Wetland area) as part of future activities.
Waste	Minimise waste generation
	Re-use and recycle waste as far as possible.

The successful implementation of the IWWMP relies not only on setting measurable objectives, but also on the execution of targeted operational, administrative, and technical measures to ensure continuous improvement and long-term sustainability. The measures outlined below are aimed at addressing identified environmental risks, improving infrastructure reliability, enhancing compliance, and reinforcing Harmony Gold's commitment to environmental management. Achievement of the objectives can be made certain by the following measures:

- Monitoring of water quality impacts within the catchment:
- The raw water intake (return water dam) is reduced by capturing of all contaminated water in the slimes and re-use the same water for the washing process, this includes groundwater seepage and direct rainfall into the TSF; and
- Environmental Management Plan Performance Assessment Audits to be undertaken to ensure the implementation of commitments made in the EMPr.

6.4 PROJECT ALTERNATIVES

In terms of GNR 267 (2017) which provides guidance for water use license applications and appeals regulations, it is outlined that an IWWMP requires an alternatives analysis for the project. This was also done as part of the EIA studies for the project as required by the NEMA.

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 48 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 EIA Regulations (2014) as amended as well as 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 48: 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 Mponeng Lower Compartment TSF. Based on project information, there is one proposed activity and no other activity alternative. **Therefore, this alternative is considered <u>not</u> feasible and 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. Based on the project description, there were other alternative TSF locations considered by the applicant. The high-level assessment identified the height extension of Savuka 7a and 7b and the recommencement of deposition on Mponeng Lower Compartment TSF as the viable options. However, due to the high-level nature of the alternative site screenings, minimal information is available for a detailed site alternative assessment. In addition, it must be noted that the Savuka 7a & 7b TSF height extension and Mponeng Lower Compartment TSF projects actually form part of the alternative deposition sites currently being assessed by the applicant. The EA for the height extension of Savuka 7a and 7b was undertaken in a parallel process to this Mponeng Lower Compartment TSF. **The location/property alternatives are being considered and are currently being assessed in separate processes for the West Wits Reclamation Project**. Available information is assessed / presented in this report.
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 alternatives and are considered feasible and will be discussed in this report as they are applicable to the Mponeng Lower Compartment TSF**.
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 considered not feasible 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 alternatives are considered not feasible to the project as there will be no significant impact variation due to scheduling**.
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, **these alternatives are considered not feasible to the project and will not be discussed further**.
Routing alternatives	Consideration of alternative routes generally applies to linear developments such as power lines, transport, and pipeline routes. There are two pipeline route alternatives assessed as part of this study. Therefore, **routing alternatives are feasible and applicable to this development and will be discussed further.**
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 layout with two pipeline routes has been proposed for the Mponeng Lower Compartment TSF. Based on this, **site layout alternatives are considered currently not feasible but may be applicable in a later phase of the project phase**.
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 are considered not feasible and will not be discussed further**.
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. Different 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. **It should be noted that the current designs are phase 2 engineering designs (preliminary), the final designs currently underway in the parallel**

	engineering investigation and assessment. **Design alternatives are considered feasible and will be slightly discussed in this report based on available information**.
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 further**.

As this application relates only to a TSF which is proposed on the disturbed footprint of a an existing TSF currently used as a holding dam and landfill, there are limited feasible and/or reasonable alternatives that can be considered, and which are described and motivated below.

6.4.1 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) Alternative barrier designed TSF

6.4.1.1 WALL CONSTRUCTION DESIGNS

6.4.1.1.1 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 65**). The downstream design was developed for areas with seismic activity and high rainfall or water collection.

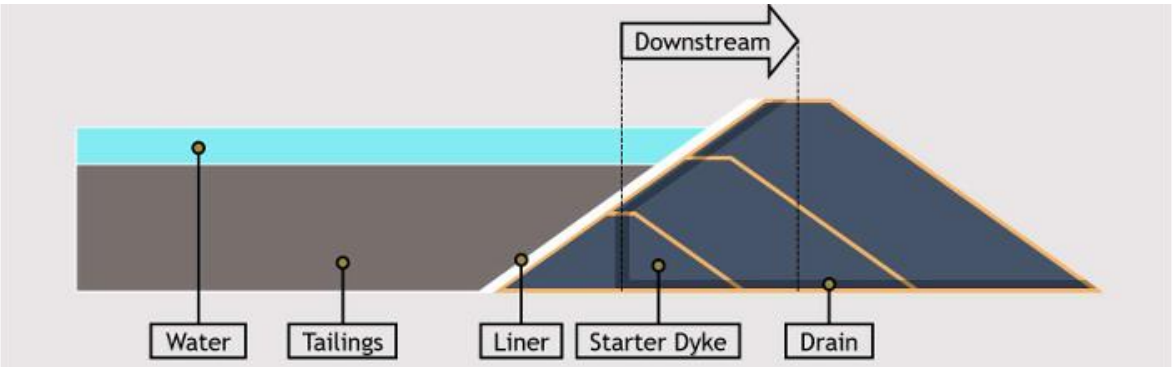


Figure 65: Downstream Tailing Storage Facility design (Yanama Gold, 2023)

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.

6.4.1.1.2 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 66**). These are suitable for facilities in areas of low rainfall and low seismic activity.

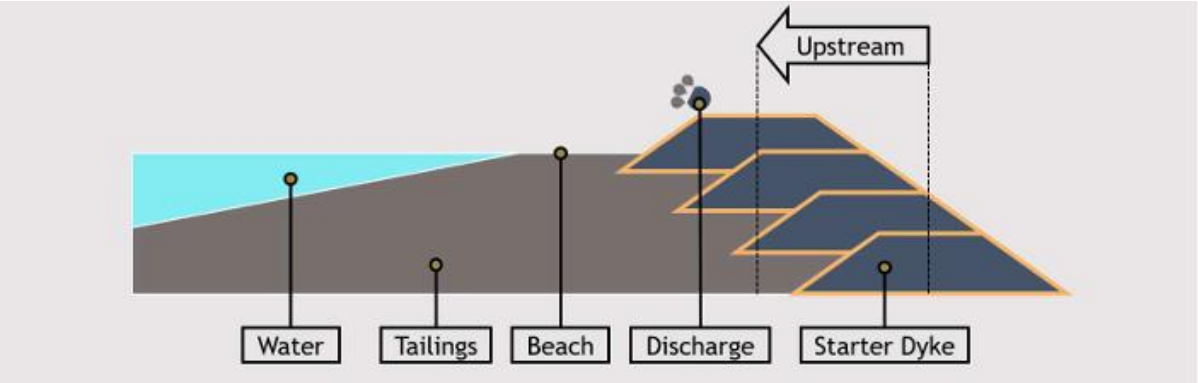


Figure 66: Upstream Tailing Storage Facility design (Yanama Gold, 2023)

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.

6.4.1.1.3 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 67**). Internal drainage can be incorporated to improve stability.

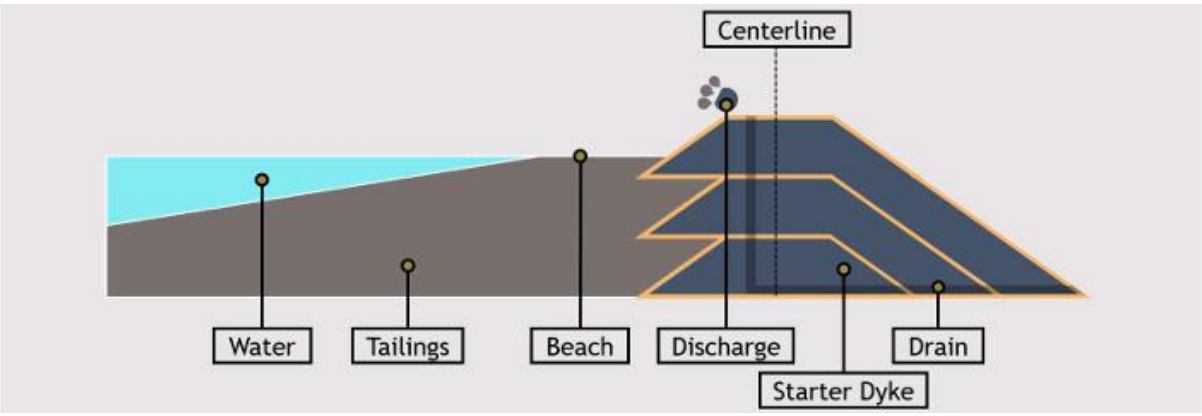


Figure 67: Centreline Tailing Storage Facility design (Yanama Gold, 2023)

A centreline 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.

6.4.1.1.4 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 68**). Dry stack tailings do not require the construction of a tailings dam, as these structures do not retain any slurry or water.

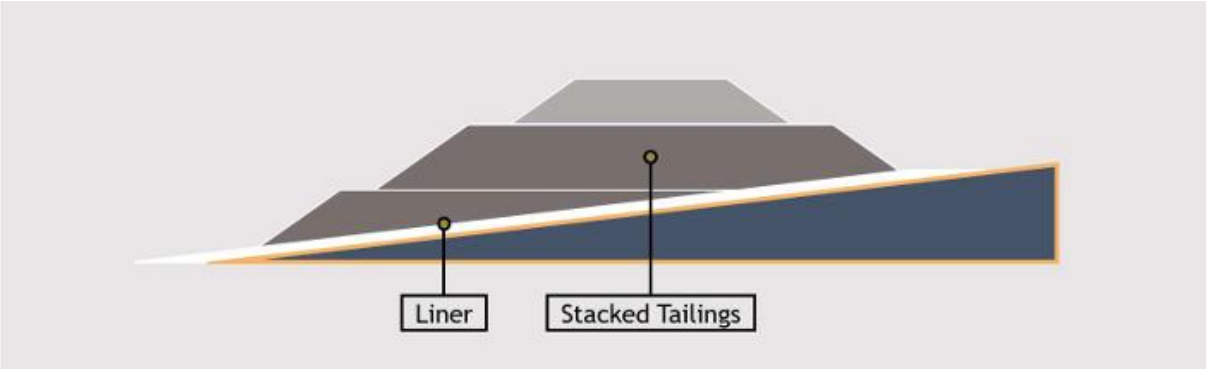


Figure 68: Filtered / Dry Stacking Tailing Storage Facility design (Yanama Gold, 2023)

The advantages and disadvantages of each of the TSF designs are indicated in **Table 49**.

Table 49: 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
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 49** above, Filtered Tailings / Dry-Stack Tailings appear to be the more favourable designs. Based on the Engineering Design Report (**Appendix 8**), the upstream construction with hydrocyclone deposition is proposed. There is no fatal flaw with the proposed designs and considering that the method was previously used for the existing tailings as well as being the commonly used deposition method in the area, the history, knowledge and track record can be motivated to the proposed redeposition. The engineering and implementation teams should ensure that necessary measures are in place to ensure structural integrity of the TSF during, and post closure is maintained in a safe manner

6.4.1.2 DESIGN LINING OPTIONS

6.4.1.2.1 UNLINED TAILINGS STORAGE FACILITY / RETURN WATER DAM

GCS Water & Environmental Consultants hydrogeological investigations for the Mponeng TSF in January 2019 and April 2025 to support designs for water management. The January 2019 report concluded that seepage rates are currently low—ranging from 12 to 20 mm/year—but are expected to increase moderately with the proposed elevation of the TSF. Seepage rates will remain fairly low for gold tailings, due the foundation geology (shales and andesites) and characteristics of the tailings material. Furthermore, most monitoring points show sulphate levels below 100 mg/L, with only two boreholes exceeding 500 mg/L. A calibrated groundwater model predicted a sulphate plume of 200-600mg/L remaining largely confined to the TSF and return water dam areas by the year 2060. However, the Aquatic Dam is already showing elevated sulphate levels, which could rise further if seepage is not effectively managed.

The Hydrogeological Assessment for The Proposed Tailings Redeposition on The Harmony Mponeng Lower Compartment Tailings Storage Facility undertaken by MvB Consulting (2025) found that groundwater occurrences in the study area are predominantly restricted to the weathered and fractured rock aquifer in the Transvaal Formations and Dolomitic and Karst Aquifers. Although the dolomite aquifer is the most prominent aquifer in the region, it does not play any role in the activities at the Mponeng Lower Compartment TSF. The dolomite is ±400m below surface at the Mponeng Lower Compartment TSF site. Evidence has shown that there is no connectivity between the weathered / fractured aquifer and the underlying dolomite aquifer. Even in compartments where the dolomite aquifer is dewatered the groundwater levels in the weathered / fractured aquifer remains unaffected. Groundwater recharge in the fractured aquifer is estimated at 31mm / annum with water occurring in the shallow weathered zone and water bearing fractures only. This is equal to approximately 4% of mean annual precipitation. The study found that the TSF is possibly impacting on the baseflow of the Elandsfonteinspruit. This stream is the only down-gradient receptor that may be directly impacted on by the current and proposed tailings deposition.

Both reports confirmed that the spring is a natural groundwater discharge point, distinguished by its ambient water quality and surface flow. However, the spring water currently mixes with contaminated TSF seepage in a downstream control dam, raising environmental concerns. The GCS Water and Environmental Consultants April 2025 report recommended three key mitigation strategies:

- Implementing a spring capture system to divert clean groundwater away from the TSF;
- Diverting clean stormwater runoff from the northern area to prevent it from entering the seepage control infrastructure;
- And installing a series of scavenger boreholes along the TSF's southern toe to intercept contaminated seepage caused by groundwater mounding.

These interventions aim to significantly reduce the environmental impact of the TSF during both operational and post-closure phases. The reports concludes that most test pits on the original ground level showed no seepage during the geotechnical investigation, except TP32, which may be influenced by the upper compartment's embankment. Moderate to strong seepage was observed at the base of the landfill site due to its permeable waste material, though downstream test pits showed no seepage, suggesting localized infiltration. Additionally, significant seepage was found at the southeast corner of the starter wall, potentially sourced from the lower compartment's catchment area or along bedrock lineations. In conclusion, the previous hydrogeological studies have indicated very low seepage rates beneath and around the facility, primarily due to the low permeability of the bedrock and the presence of artesian conditions. Additionally, tailings have already been deposited on the proposed footprint below the level that a liner can be safely installed. For these reasons, Golden Core Trade and Invest prefers an unlined facility. Only if the licence application for an unlined facility is unsuccessful will the lined option be pursued.

The MvB Baseline Hydrogeological Report developed a numerical groundwater flow and mass transport model. The groundwater model was used to simulate contaminant migration and the effectiveness of recommended management options. The latter includes, but not restricted to, the following:

- Lining of the proposed tailings facility.
- Cut-off trench on the down-gradient side of the TSF.
- Scavenger boreholes to intercept and contain the contaminant plume.
- Phyto-remediation.

The 2060 result is presented in Section 5.7.2 and plume movement is in a south easterly direction towards the Elandsfontein Spruit. Based on the current impact using the 600 mg/L SO_4 Impact Area (m^2) impact matrix, the TSF in its current condition with no additional deposition, it was modelled to have 2 049 823 m^2 per 600 mg/L SO_4 impact area whereas the additional deposition with alternative barrier system will have an impact area of 2 843 514 m^2, only 793 691 m^2 more impact, considered moderate by the specialist.

6.4.1.2.2 LINED TAILINGS STORAGE FACILITY OPTION / RETURN WATER DAM

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 Waste Act , specifically the norms and standards for disposal of waste to landfill. These are currently administered by the DFFE. 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.

The alternatives relate to the liner design for the TSF and the RWD. 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 necessary; 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 and/or RWD 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. 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. 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.

6.4.1.2.3 UNLINED TAILINGS STORAGE FACILITY WITH PHYTOREMEDIATION

Phytoremediation is a green, cost-effective technology that uses plants to remove, degrade, or stabilize contaminants from soil, water, or air. It works by plants absorbing pollutants through their roots, storing them in their tissues, converting them to less harmful substances, or releasing them as vapors. This process includes methods like phytoextraction (storing metals in plants) and rhizofiltration (using roots to filter pollutants from water). Phytoremediation is proposed as a cost-effective plant-based approach of environmental remediation that takes advantage of the ability of plants to concentrate elements and compounds from the environment and to detoxify various compounds without causing additional pollution. The concentrating effect results from the ability of certain plants called hyperaccumulators to bioaccumulate chemicals. The remediation effect is quite different. Toxic heavy metals cannot be degraded, but organic pollutants can be and are generally the major targets for phytoremediation. Phytoremediation is effective for a wide range of contaminants, including:

- Heavy Metals: such as arsenic, cadmium, and lead.

- Organic Compounds: including petroleum hydrocarbons, pesticides, and solvents.
- Radionuclides: radioactive elements found in contaminated soil and water.
- Landfill Leachates: liquids that seep from landfills.

Although attractive for its cost, phytoremediation has not been demonstrated to redress any significant environmental challenge to the extent that contaminated space has been reclaimed. The advantages and disadvantages of lined, unlined TSFs and unlined TSF with Phytoremediation are indicated in **Table 50**.

Table 50: Advantages and disadvantages Lined, Unlined TSF and Unlined TSF with Phytoremediation

Advantage	Disadvantage
Lined TSF	
According to the Geohydrological Model indicated in the Geohydrological Assessment Report (**Appendix 4**), lining the TSF will result in an impact of 1 720 106 m^2 per 600 mg/L SO_4 which is an improvement of 1 123 408 m^2 (39.5%) based on the current modelled impact of the existing TSF.	The lining of the Mponeng Lower Compartment TSF could affect the stability of the TSF as it is an existing facility which has been inactive for years. The installation of the liner could therefore affect the stability as it will be a liner on top of old tailings. Liners can be difficult to install especially on top of an existing TSF Facility which has been inactive for years.
A lining under a tailings also allows more water in the tailings system to be captured and returned to the plant for reuse.	Liners need to be properly installed for maximum pollution prevention.
A geomembrane liner, such as high-density polyethylene (HDPE), prevents leachate (polluted liquid) from seeping into the groundwater and surrounding soils	Requires artificial drainage systems and rigorous monitoring for stability and performance.
By containing contaminated liquids, liners protect both the environment and local water resources from pollution.	Prone to damage and localized leakage, necessitating strict quality control during installation.
Aligned with the current DWS requirement for the use of liners for the safe disposal of tailings.	The introduction of a liner can alter the interface between the tailings and the underlying materials, requiring new methods to assess and ensure the stability of the facility.
Unlined TSF	
According to the Geohydrological Model indicated in the Geohydrological Assessment Report (**Appendix 4**) the TSF in its current condition with no additional deposition, it was modelled to have 2 049 823 m^2 per 600 mg/L SO_4 impact area whereas the additional deposition with **no liner** will have an impact area of 2 843 514 m^2, only 793 691 m^2 more impact, considered moderate by the specialist.	No pollution prevention. May pose significant environmental risks due to potential seepage of toxic contaminants into groundwater and soil.
Unlined facilities require less initial investment as they don't involve the cost of lining materials or the	Water use inefficiency - No recycling of water. More water in the tailings system escapes and not returned to the plant for reuse.

Advantage	Disadvantage
increased complexity of a lined system, which can also make them easier to operate and maintain	
The absence of liners and associated complex systems simplifies the design and construction process, making them quicker to build and deploy.	Seepage through unlined facilities can lead to the contamination of aquifers and soil, affecting water sources for communities and ecosystems downstream of the mine site
The lining of the Mponeng Lower Compartment TSF could affect the stability of the TSF as it is an existing facility which has been inactive for years. The installation of the liner could therefore affect the stability as it will be a liner on top of old tailings. Therefore, an unlined facility will affect the stability of the TSF less as it will not separate the two layers (old and new) of tailings	Without a liner, there is a greater risk of uncontrolled leakage or, in the worst case, a complete failure of the facility, which could release vast quantities of toxic slurry and debris into the surrounding environment
Based on the pre-feasibility report, the Mponeng Lower Compartment TSF have already been deposited on the proposed footprint below the level that a liner can be safely installed. Therefore, an unlined TSF would be safer.	Closing and rehabilitating an unlined facility presents significant challenges, as long-term containment of potential contaminants in the natural environment is more difficult to achieve and can be very expensive.
Unlined TSF with Phytoremediation	
According to the Geohydrological Model indicated in the Geohydrological Assessment Report (**Appendix 4**) the TSF was modelled to have 1 767 158 m^2 per 600 mg/L SO_4 impact area with no liner but phytoremediation which is an improvement of 1 076 356 m^2 (37.9%), almost equivalent to installation of a liner.	Phytoremediation is limited to the surface area and depth occupied by the roots.
Phytoremediation can be as effective / equivalent to lined TSF.	With plant-based systems of remediation, it is not possible to completely prevent the leaching of contaminants into the groundwater (without the complete removal of the contaminated ground, which in itself does not resolve the problem of contamination).
It preserves the topsoil, maintaining the fertility of the soil. Increase soil health, yield, and plant phytochemicals.	
The use of plants also reduces erosion and metal leaching in the soil.	The survival of the plants is affected by the toxicity of the contaminated land and the general condition of the soil.
Dust and visual disruption are usually less than with alternative methods.	Some plants are too hard to cultivate or too slow growing to make them viable for phytoremediation despite their status as hyperacumulators.
The cost of the phytoremediation is lower than that of traditional processes both *in situ* and *ex situ*.	

Based on the advantages and disadvantages indicated in **Table 50** above, **Lined TSF's can be considered as favourable designs, however, the benefit is <u>minimal</u> when comparing it to the phytoremediation option, which is achieves similar environmental conditions for significantly lesser financial costs. This option is therefore recommended by the geohydrologist as a suitable management option.** The installation of a liner and / or scavenger boreholes may improve the rehabilitation of the groundwater, but it is considered unnecessary as the phytoremediation is effective on its own.

6.4.1.3 PIPELINE DESIGNS

In order to allow for slurry deposition on Mponeng Lower Compartment TSF from either of the operational plants, 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. 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 51**.

Table 51: Advantages and disadvantages Pipelines Design

Advantage	Disadvantage
Above-Ground 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 allows for quicker and effective repairs, reducing the amount of pollution	Easily accessible, there is also the concern of vandalism and the chance that damage may lead to leaks and impacts on the environment.
Above-ground pipelines have lesser environmental impacts as there are shallow distal excavations and no deep excavations or blasting requirements.	
Below-Ground Pipelines	
Security: Below-ground pipelines are less likely to be affected by weather phenomenon and/or vandalism.	Pipelines are more difficult and expensive to build and install.
Below-ground 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 51** above, **it is the EAPs opinion that above-ground pipelines are the more favourable designs**. Based on the project description, the proposed Mponeng Lower Compartment TSF will follow the above-ground pipelines design.

6.4.2 PROCESS ALTERNATIVES

6.4.2.1 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.

6.4.2.1.1 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 69 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 69 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 69: 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.

6.4.2.1.2 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 70 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 70 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 70: 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.

6.4.2.1.3 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 71**). 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 71: 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 **cyclone deposition has higher water recovery rates and is also preferred from a geotechnical perspective**.

i. Hydrocyclone

Golden Core Trade and Invest proposes to implement the hydrocyclone deposition method. The hydrocyclone is a widely used classifier in the mineral-processing industry. It is installed in close circuit between the grinding and conditioning paths for flotation of complex base metal ore. It consists of a cylindrical section at the top connected to a feed chamber for continuous inflow of pulp, which is then expelled through an overflow pipe. The unit continues downward as a conical vessel and opens at its apex to the underflow of coarse material (**Figure 8**). The feed is pumped under pressure through the tangential entry that imparts a spinning motion to the pulp. The separation mechanism works on this centrifugal force to accelerate the settling of particles. The velocity of slurry increases as it follows in a downward centrifugal path from the inlet area to the narrow apex end. The larger and denser particles migrate nearest to the wall of the cone. The finer/lighter particles migrate toward the center axis of the cone, reverse their axial direction, and follow a smaller diameter rotating path back toward the top. The oversized discharge fractions return to the mill for regrinding, while the undersized fractions move to the conditioning tank for flotation. Hydrocyclones perform at higher capacities relative to their size and can separate at finer sizes than other screening and classification equipment.

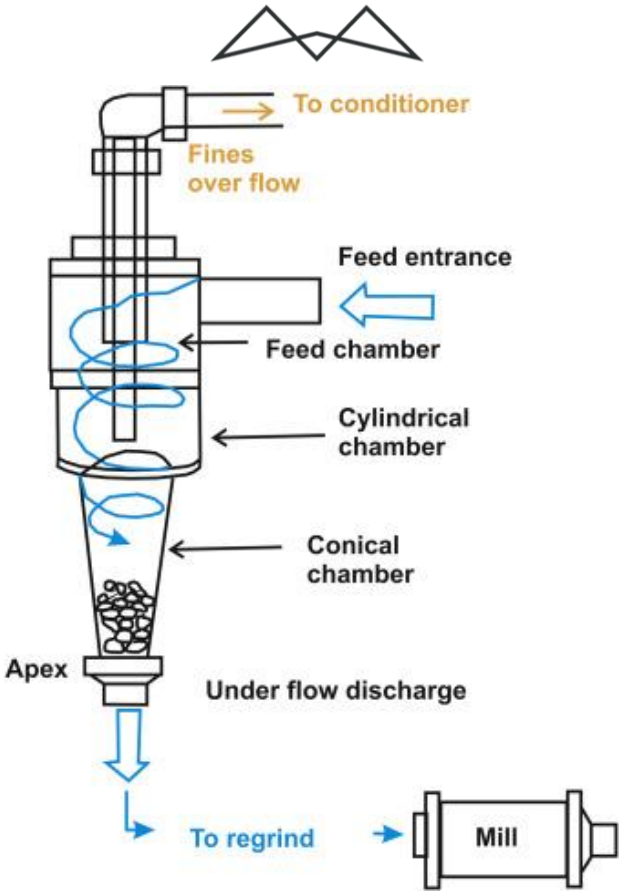


Figure 72: Sketch diagram showing the working principle of a hydrocyclone in close circuit classification (Haldar, 2018).

With no moving parts, hydrocyclones are inherently simple and robust, leading to lower initial investment and reduced maintenance needs. They can be compact and occupy less space, and multiple units can be arranged in parallel or series to handle large volumes. Hydrocyclones can process large volumes of material, making them efficient for high-capacity applications. They can operate at high temperatures and can handle both liquid mists and dry materials, depending on the application. However, a significant drawback is their high energy requirement due to the pressure drop across the unit, leading to high operating costs. Their efficiency drops significantly for very fine particles (under 5-10 micrometers) and can be poor at less-than-capacity flow. While simple, the abrasive nature of the slurry can cause wear and tear on the cyclone's materials over time. They are also unsuitable for processing sticky or adhering materials, which can clog the cyclone.

6.4.2.2 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

6.4.3 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 Savuka Plant to Mponeng Lower Compartment TSF which has two optional routes (refer to **Figure 73**).

- Savuka Plant to Mponeng Lower Compartment TSF pipeline route (proposed):
    - The proposed slurry and return water pipes extend from the south of Savuka Plant at starting point 26°25'24.95"S; 27°23'58.94"E, extending southwards, parallel to each other until reaching the northern extent of Mponeng TSF where they split. Thereafter, the slurry pipeline extends to west before connecting to Mponeng TSF while the return water pipeline extends east then south around the TSF to the return water dam.
    - The slurry pipeline is approximately 3.36km long extending from the Savuka Plant at 26°25'24.77"S; 27°23'58.84"E and ending at the Mponeng Lower Compartment TSF northern edge at 26°26'57.60"S; 27°24'31.59"E.
    - The return water pipeline is approximately 4.85km long extending from the Savuka Plant at 26°25'24.77"S; 27°23'58.84"E and ending at the Mponeng Lower Compartment TSF return water at 26°27'23.09"S; 27°25'0.37"E.
- Savuka Plant to Mponeng Lower Compartment TSF pipeline route alternative 1:
    - There alternative slurry and return water pipeline route extends to the east through Western Deep Levels then south along Mponeng Gold Mine before heading to the west where it connects to Mponeng.
    - The alternative slurry and return water pipelines route follow the same path. Both commence at the Savuka Plant at 26°25'24.77"S; 27°23'58.84"E and connect to the Mponeng Lower Compartment TSF on the southeastern section at 26°27'6.62"S; 27°25'10.61"E where the slurry pipeline ends while the return water pipeline extends slightly further to connect to the return water dam at 26°27'23.09"S; 27°25'0.37"E.. Subsequently, the alternative slurry pipeline is 6.73km long while the alternative return water pipeline is 7.4km long.

The 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. The advantages and disadvantages of each route are presented on **Table 52**.

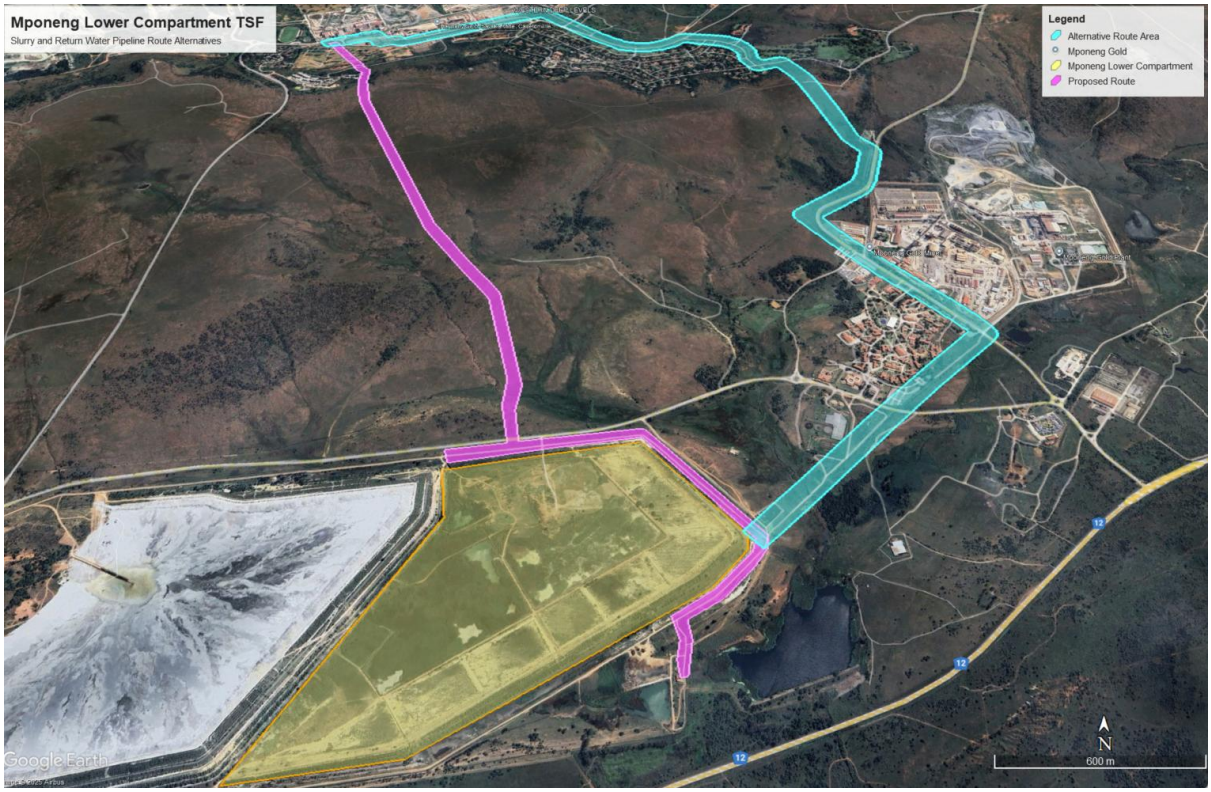


Figure 73: Aerial view of the pipeline route alternatives.

Table 52: Advantages and disadvantages of pipeline routes

Advantage	Disadvantage
Savuka Plant to Mponeng Lower Compartment TSF proposed pipeline route	
Shorter: slurry pipeline is approximately 3.36km and return water pipeline is approximately 4.85km long. Making it cheaper to install the pipes. However, it should be noted that the construction of the bridge and culvert may result in this option becoming more expensive	Requires new culvert for the road section and requires new pipe bridge for the channelled valley bottom wetland section
	Anticipated to have more construction related impacts on the watercourse (i.e., construction of the bridge and the culvert within the channelled valley bottom wetlands
As per the Heritage Impact Assessment, the preliminary proposed route intersected two archaeological sites: stonewalling (MPnr1) and stonewalling with possible kraals (MPnr2). Both of these sites are rated as having high significance and graded as Grade IIIA. However, as indicated in the EIA Report and in the Heritage Impact Assessment, the revised proposed route deviates around the identified heritage features. In addition, as indicated in the EIA Report and EMPr, a 15m buffer around the heritage features is to be adhered to during construction and operation of the project resulting in	As per the Heritage Impact Assessment, the preliminary proposed route intersected two archaeological sites: stonewalling (MPnr1) and stonewalling with possible kraals (MPnr2). Both of these sites are rated as having high significance and graded as Grade IIIA.

Advantage	Disadvantage
no direct impact on the heritage features, thus making the route viable.	
As per the Terrestrial Biodiversity Impact Assessment, several SCCs were found along the route which will be impacted upon without implementation of the mitigation measures. However, as indicated in the EIA Report and EMPr, a search and rescue (relocation) prior to the construction activities is required which will result in no direct impact on the species, thus making the route viable.	As per the Terrestrial Biodiversity Impact Assessment, several SCCs were found along the route which will be impacted upon without implementation of the mitigation measures.
Savuka Plant to Mponeng Lower Compartment TSF pipeline alternative route	
Along largely disturbed footprint, lesser environmental impacts. No deviations required.	Longer: the alternative slurry pipeline is 6.73km long while the alternative return water pipeline is 7.4km long. Making it more expensive to install the pipelines. However, it should be noted that this option does not include any construction of a bridge and culvert which may ultimately result in this option becoming less expensive
Largely follows existing pipelines with existing access and maintenance routes	As per the Terrestrial Biodiversity Impact Assessment, one SCCs was found along the route which will similarly to the proposed route, will be impacted upon without implementation of the mitigation measures. Therefore, this route would still require a search and rescue (relocation) for the SCC.
Appears not to require any additional crossing structures such as a bridge and/or a culvert	Based on the engineering assessment, this route would be significantly more expensive to construct and maintain, making it financially not viable.

Based on route analysis, **the proposed route is preferable provided the mitigation measures indicated in this report and the EMPr are adhered to**.

6.4.4 NO-GO ALTERNATIVE

The no go alternative would imply one of two scenarios; either continue deposition on the other nearby TSF which are already nearing their capacity or stop the operations. The first option would result in overburdening the Mponeng Upper Compartment TSF and/or Savuka TSFs. The aforementioned TSFs are already nearing their carrying capacity and would therefore make the TSFs unstable and unsafe and possibly breaking their walls. As indicated above, these facilities are approaching their final and approved height, and the current planned Life of Mine (LOM) for the West Wits Region exceed the available deposition capacity of these TSFs. The Savuka tailings facility has reached the end of its lifecycle and is undergoing a short-term extension of two years. Following this period, tailings from Savuka will need to be diverted to an alternative facility. The second option would mean once the Mponeng Upper Compartment and Savuka TSFs reach their carrying capacity and approved height, deposition would stop which would mean the mining activities would come to a halt. That would negatively affect the future viability of Harmony's West Wits mining operations and massive socio-economic impacts would emanate due to lack of deposition space. This would also negatively affect the company's financial closure and rehabilitation plans. Subsequently, the No-Go Alternative, 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 considered not feasible or reasonable** for this project

6.4.5 LOCATION / PROPERTY ALTERNATIVES

The proposed activity is to recommence deposition (extend the height of existing Mponeng Lower Compartment TSF) and it is therefore anticipated to have no additional extensive impact on the current location apart from new infrastructure such as pipelines, culvert and pipe bridge. Additional footprints on the same or surrounding property/ies that have been considered are described in the sections below. These are however, not assessed in the impact assessment, as they have been eliminated based on a desktop feasibility study. Reasons are provided below.

6.4.5.1 HEIGHT EXTENSION OF DEELKRAAL TSF

This scenario includes re-utilising the existing and dormant Deelkraal TSF (refer to **Figure 74**) by extending the height of the TSF. This TSF is located further away than the proposed alternative to the Savuka Plant and is not connected to the plant. In considering the environmental permitting requirements for the height extension of these TSFs, the following aspects need to be considered:

- The facility is dormant.
- It is assumed that the facility is at its final design height.
- It is assumed that new deposition pipelines will be required.
- The pipelines from Savuka Plant may cross, or be within 500 m of wetlands or watercourse.

This option would require additional infrastructure including *inter alia* pipelines from the TSF to the Savuka Plant to pump tailings to the TSF and these pipelines will have to cross water courses and or wetlands. Therefore, based on the nature of the activity and its potential environmental and economic impacts, this option has not been considered further.

6.4.5.2 OLD DRD TAILINGS STORAGE FACILITY

- This option proposes to re-deposit on the footprint of the Old DRD TSF (refer to **Figure 74**). The Old DRD TSF is located approximately 6km north-east of the Mponeng Lower Compartment TSF. This option would firstly require engagements with the owner of this footprint as Harmony is not the owner of the property. In addition, this option would also require additional infrastructure including *inter alia*, TSF and starter wall, solution trenches, Return Water Dam, pipelines and access roads. Therefore, based on the nature of the activity and its potential environmental and economic impacts, this option has not been considered further.
- It should be noted that there is also DRD Gold Mega Tailings Storage Facility, located approximately 20km to the southeast of the Mponeng Operations. This Mega TSF is designed to accept third party tailings on a toll disposal basis. It must be noted that Mega Dump site was considered, and Harmony had previously engaged Sibanye to acquire deposition space. However, Sibanye informed Harmony that their plans have changed and that they could no longer accommodate any Harmony tailings on the RTSF. Therefore, this option is not feasible and could not be assessed as an alternative.

6.4.5.3 OLD SAVUKA TAILINGS STORAGE FACILITY

This option proposes to re-deposit on the footprint of the Old Savuka TSF (refer to **Figure 74**). The Old Savuka TSF is located immediately north-east of the proposed alternative and TSF 5a & 5b. This option would require additional infrastructure including *inter alia*, TSF and starter wall, solution trenches (existing and extension of existing), Return Water Dam (existing), pipelines and access roads. In addition, the mine is currently reclaiming this footprint, which means that there would not be sufficient space available to start redepositing on this footprint for some time. Therefore, based on the nature of the activity and its potential environmental and economic impacts, this option has not been considered further.

6.4.5.4 SAVUKA VALLEY TAILINGS STORAGE FACILITY

This option proposes to deposit within the valley between the Savuka 5b TSF and the Savuka 7a TSF (refer to **Figure 74**). This option would require additional infrastructure and would not provide sufficient space for the required deposition. Therefore, this option has not been considered further.

6.4.5.5 HEIGHT EXTENSION OF SAVUKA 7A&7B TSFS

This scenario includes continuing to deposit tailings onto the existing and operation Savuka 7a & 7b TSFs (refer to **Figure 74**) by extending the height of the approved height of the TSFs. These TSFs is located the closest to the Savuka Plant and is connected to the plant. The TSFs are included in the 2014 EMPr amendment. The facility is further included in the current Water Use Licence (WUL). In considering the environmental permitting requirements for the height extension of these TSFs, the following aspects need to be considered:

- The facility is already operational and connected to the plant.
- It is mentioned in the EMPr as an active facility.
- No new infrastructure is required to keep the facility operating.
- The facility is licensed in the Water Use License.

This option would not require additional infrastructure and will therefore, not have additional impacts on the surrounding environmental, except for slight increases in existing impacts e.g. in air quality, mainly due to the increased height and duration of the operation of the TSFs. Therefore, based on the nature of the activity and its potential environmental and economic impacts, this option was considered and assessed through a separate Basic Assessment Process as an additional (not alternative) deposition site. However, the height extension of Savuka 7A and 7B is a temporary activity for the Savuka-Mponeng operations and additional deposition space will still be required. Subsequently, the Mponeng Lower Compart TSF has been identified as potential suitable deposition space.

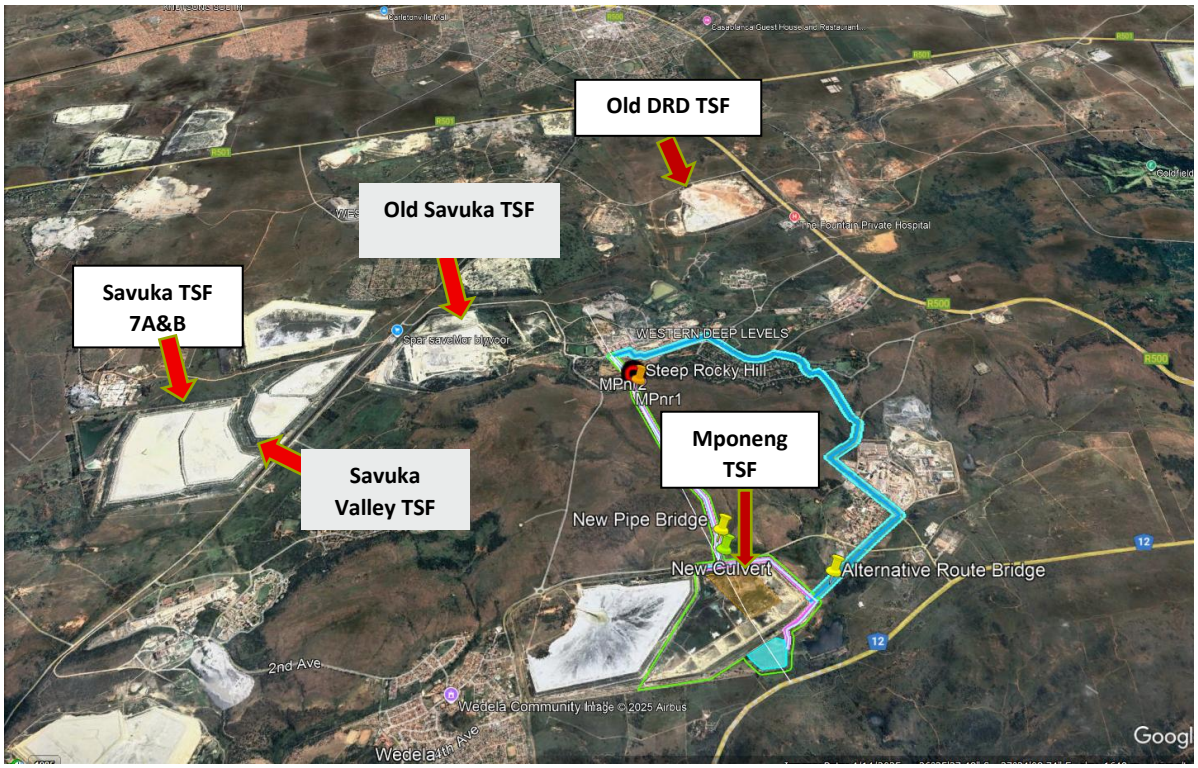


Figure 74: Location of alternative TSF sites

6.5 IWWMP ACTION PLAN

The IWWMP action plan for the Mponeng Lower Compartment TSF, as well as the applicable Section 21 water uses, is indicated in **Table 53**. This table outlines the impacts, objectives and mitigation measures that need to be implemented as well as the parties responsible for implementation of the measures.

The action plan is not however a static framework and should be updated and improved as new possible action items are identified and implemented.

Table 53: IWWMP action plan

Theme	Objectives	Management Plan	Responsibility
Groundwater	To prevent and reduce leaching and migration of radionuclides from the TSF during the post-closure phase.	• The management objective would be to first ensure that radiation exposure is below the regulatory compliance criteria (i.e., the dose constraint), and secondly to optimise the radiation protection by applying the ALARA principle. • The total effective dose from the ingestion of groundwater as a contribution from the TSF was hypothetically illustrated to be below the regulatory compliance criteria (i.e., dose limit), which means that from a compliance perspective, no additional management or mitigation measures are required. • From the optimisation of radiation protection perspective for the post-closure period, the following management/mitigation measures can be implemented if it is assumed that the facility remains at the surface: o Implementation of a passive groundwater remediation system downstream of the TSF to capture the contaminant plume. o Note that active remediation systems, such as cut-off trenches or a pump and treat system, might also be effective in the short to medium term. However, the timescales of concern are beyond what can be considered active institutional control periods.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the groundwater monitoring programme is adequate and in line with the WUL and that the contamination plume is mitigated according to approved mitigation measures and action plans as per the updated IWWMP and the EMPr.
Groundwater	To prevent and reduce groundwater contamination during the operational, decommissioning and rehabilitation, closure and post-closure phases.	• Phyto-remediation as preferred alternative to mitigation the contamination plume. This option will change the risk from High Negative to Low Negative during the operational phase. After closure the RWD will be decommissioned and rehabilitated whereafter the risk rating improves marginally. This option has the best rating and is the recommended long-term management option. • The existing monitoring network is comprehensive and sufficient to quantify the impact from the RWD and the	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the groundwater monitoring programme is adequate and in line with the WUL and that the mitigation measures as contained herein and within the approved EMPr is implemented.

Theme	Objectives	Management Plan	Responsibility

		TSF. The boreholes are generally close to the TSF, referred to as source boreholes. It is important to drill monitoring boreholes further from the contaminant sources to be able to quantify plume migration, as well as close to the property boundary or receptors. These boreholes are referred to as compliance boreholes. Four additional compliance borehole pairs (one shallow and one deep) are recommended. The aim of these boreholes is to monitor the effectiveness of the phyto-remediation. Borehole MB38, which is located inside the phyto-remediation has much better quality than the other monitoring boreholes. Further down-gradient boreholes will confirm that this is because of the phyto-remediation. It is also important to distinguish between the weathered and fractured formations.
		• The following is recommended in terms of monitoring:
		  ○ Groundwater levels.
		  ○ Groundwater quality.
		  ○ Data should be stored electronically in an acceptable database.
		  ○ On the completion of every sampling run a monitoring report should be written. Any changes in the groundwater levels and quality should be flagged and explained in the report.
		  ○ A compliance report can be submitted to DWS once a year, if required.
		• A comprehensive bi-annual analysis of the dedicated monitoring boreholes.
		• Groundwater levels should be monitored monthly in the dedicated groundwater monitoring boreholes.
		• Rainfall should be monitored daily.
		• Samples should be submitted to a SANAS accredited laboratory. The following recommended parameters to be analysed for include:	

Theme	Objectives	Management Plan	Responsibility
		○ pH. ○ Electrical Conductivity. ○ Total Dissolved Solids. ○ Total Alkalinity. • Anions and Cations (Ca, Mg, Na, K, NO3, NH_4, Cl, SO_4, F, Fe, Mn, Al, Cr).	
Surface Water	To prevent and reduce erosion of soils and sedimentation of surface water features.	The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed water uses: • Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements). • Monitor the TSFs to ensure areas of potential erosion are identified and managed appropriately. • Rehabilitation should include topsoil replacement, re-vegetation and maintenance/aftercare for disturbed areas insofar as it should be developed for disturbed areas. • Concurrent rehabilitation of the TSFs should ideally occur during the life of the TSFs. This would likely include cladding of TSFs side slopes and subsequent revegetation with final TSFs rehabilitation resulting in fully vegetated site. • Additional guidance on erosion control is available in: Landcom Soils and Construction, Volume 1, 4th edition from 2004 (otherwise known as the Blue Book).	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface monitoring programme, the stormwater management plan and the TSF monitoring programme is adequate and in line with the WUL and are implemented. They are also responsible to ensure that the approved rehabilitation plans and measures are implemented and to implement best practice in terms of erosion prevention practices as per the recommended guidelines.
Surface Water	To prevent and reduce pollutants entering the surface water environment (W2).	The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed project: • Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements). • Develop the TSFs using sound engineering to limit the likelihood of a failure. • Maintain and operate the TSFs/RWD to limit the potential for overfilling of the RWD that leads to a spill. • Monitor the TSFs to identify any potential failures/slumps.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface monitoring programme, the stability monitoring as well as the stormwater management plan is adequate and in line with the WUL and implemented.

Theme	Objectives	Management Plan	Responsibility
		• Keep activity within the managed dirty water footprint where possible. • Store hydrocarbons off-site where possible, or otherwise implement hydrocarbon storage with adequate bunding. • Handle hydrocarbons carefully to limit spillage. • Ensure vehicles are regularly serviced so that hydrocarbon leaks are limited. • Use drip trays for stationary vehicles or otherwise park over areas suited to their storage (e.g. with an oil interceptor) • Designate a single location for refuelling and maintenance where possible. • Keep a spill kit on site to deal with any hydrocarbon leaks. • Remove soil from the site which has been contaminated by hydrocarbon spillage. • Undertake surface water monitoring to enable change detection related to contaminants originating from the site.	
Surface Water	To prevent the decrease in run-off water (W3).	The below mitigation is expected to already be part of the existing TSFs management and also applies to the proposed project: • Limiting the time and area over which machinery operates will limit the compaction of soils on the site. • Divert clean water run-on away from the site.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface monitoring programme, the stability monitoring as well as the stormwater management plan is adequate and in line with the WUL and implemented.
Surface Water	To prevent or lower the Flood Risk (W4).	The below mitigation is expected to already be part of the existing TSFs management; • Ensure the existing stormwater management plan is sufficient (per GN704 and TSF-specific requirements). • Ensure that flood protection of the TSFs is sufficient to manage flood risk from both adjacent river systems (north and south) and stormwater run-on. • Develop the TSFs using sound engineering to limit the likelihood of a failure.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface monitoring programme, the stability monitoring as well as the stormwater management plan is adequate and in line with the WUL and implemented.

Theme	Objectives	Management Plan	Responsibility
		• Monitor the TSFs to identify any potential failures/slumps. *Monitoring* • Potential contaminants of concern that need to be monitored are expected to have already been identified based on the historical quarterly surface water quality monitoring that has been undertaken. The understanding of the mine's processes and the associated contaminants that might be released in the event of a failure in an aspect of the TSF's (e.g. toe paddock rupture or RWD overflow) is likewise expected to be clearly understood with monitoring reflecting this. • Quarterly monitoring reports should be produced to differentiate seasonal variations and general trends due to the mining activities, with a comparison of water samples to standards and guidelines set by the Department of Water and Sanitation (DWS) and an analysis of parameters over time so that trends can be established. • The recommended monitoring points are also provided in the specialist report and should be included in the monitoring programme	
Wetland Habitat	To prevent and or reduce the siltation of water resources.	• Update and implement the stormwater management plan. • Implement and maintain silt traps and sediment basins at strategic stormwater discharge points. • Establish and maintain vegetated buffer zones (using indigenous grass species) between the TSF and nearby wetlands, within 15 m from the TSF. • Regularly inspect and clear sediment traps and drains to ensure continued functionality. • Apply dust suppression measures (e.g., water spraying or biodegradable binders) on or vegetate exposed tailings to reduce wind-blown silt deposition where required.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan is adequate and in line with the WUL and implemented.

Theme	Objectives	Management Plan	Responsibility
Wetland Habitat	To prevent or reduce erosion of surface water resources.	• Install energy dissipation structures at stormwater outflows to reduce flow velocity, where required. • Stabilize slopes and embankments where required. • Implement a controlled release of stormwater through designed drainage channels to prevent concentrated flows from reaching wetland areas. • Conduct regular inspections of stormwater management infrastructure and repair erosion-prone areas immediately. • No machinery or vehicles should be allowed to parked in any wetlands. All activities to be restricted to authorized areas only.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan is adequate and in line with the WUL and implemented.
Wetland Habitat	To prevent or reduce the altering of the Hydrological Regime.	• Implement stormwater management, to be informed by the hydrological report. • Use permeable berms or check dams in water diversion channels to slow down and evenly distribute water flow. • Monitor groundwater levels.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan is adequate and in line with the WUL and implemented.
Wetland Habitat	To prevent the proliferation of Alien Invasive Vegetation.	• Remove alien vegetation manually or mechanically rather than using herbicides, to avoid contamination risks. This should be conducted annually. • Implement a maintenance program to ensure that previously cleared areas do not become re-infested with alien vegetation.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan, as well as the Alien Invasive Plants Management Plan is adequate and in line with the WUL and implemented.
Wetland Habitat	To prevent impaired water quality.	• Conduct routine water quality monitoring at key points downstream of the TSF to detect contamination early. • Conduct groundwater quality monitoring.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and groundwater, biomonitoring programmes, the stormwater management plan as well as the dust management plan is adequate and in line with the WUL and implemented.

Theme	Objectives	Management Plan	Responsibility
Wetland Habitat	To prevent further wetland disturbance and decrease in functionality.	• Establish a 15 m wetland buffer zone with clear demarcation to prevent accidental encroachment. This can include signage. • Restrict heavy vehicle access to designated and authorized roads. • Implement a long-term wetland monitoring program to track ecological changes and implement adaptive management strategies.	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the buffers are upheld, groundwater and surface water and biomonitoring programmes, the stormwater management plan as well as the dust management plan is adequate and in line with the WUL and implemented.
Wetland Habitat	To prevent the impact of lowering of the water table due to Phytoremediation for Groundwater Pollution on the wellbeing and functioning of the wetlands.	• Use indigenous plant species that are well-adapted to local conditions. This helps maintain the ecological balance and supports local biodiversity. • Monitor water levels by means of the current groundwater monitoring programme to detect any significant changes in the water table. The geohydrologist is to advise on the suitability of the programme, and to recommend any changes. • The geohydrologist is to also advise on 'allowable' changes to the groundwater levels, and to prescribe remedial actions if levels are exceeded. • Manage the density of phytoremediation plants to prevent excessive water uptake and potential lowering of the water table. This can be achieved by spacing plants appropriately and using mixed planting strategies. • Appoint a geohydrologist and ecologist/wetland[sv16.1] specialist, to implement mitigation measures/ oversee mitigation measures to ensure correct implementation, where required	Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan, as well as the Alien Invasive Plants Management Plan is adequate and in line with the WUL and implemented. They are also responsible to appoint a geohydrologist and ecologist/wetland specialist, to implement mitigation measures/ oversee mitigation measures to ensure correct implementation, where required.
Wetland Habitat	To ensure the general wellbeing and functioning of the wetlands.	• Strict adherence to the wetland buffers should be practiced, unless for activities that have been authorised; • Update and implement a stormwater management plan for the operational phase of the development. The plan must address the movement of water on site and include measures to reduce erosion and sedimentation of the	The Environmental Officer together with the Environmental Manager are responsible for ensuring that the surface and biomonitoring programmes, the stormwater management plan as well as the dust management plan, as well as the Alien Invasive Plants Management Plan is adequate and in line with the WUL and implemented. They

Theme	Objectives	Management Plan	Responsibility
		watercourses. Furthermore, the plan must ensure that only clean water is released into the environment; • Ensure that waste generated on site during the operational phase is appropriately contained, categorised and disposed of; and • Review and update the surface, groundwater and also aquatic biomonitoring programmes for the operation. In the event no monitoring programmes are available, these must be informed by the relevant specialists. It is recommended that an annual wetland monitoring programme be considered for the necessary authorisation, for this project.	are also responsible to appoint a geohydrologist and ecologist/wetland specialist, to implement mitigation measures/ oversee mitigation measures to ensure correct implementation, where required.

7 CONTROL AND MONITORING

Effective implementation of the IWWMP requires a robust system of environmental control and performance monitoring to track progress, ensure compliance with regulatory obligations, and support adaptive management over time. Control and monitoring measures are embedded across key operational areas and are aligned with Harmony Gold's Environmental Management System (EMS), WUL conditions, and internal audit frameworks. This section will discuss measures to be implemented for the monitoring and control where necessary to ensure that the project does not prove detrimental to the baseline hydrological environment.

7.1 MONITORING OF CHANGE IN BASELINE INFORMATION

Harmony has implemented a surface and groundwater monitoring programme across all of their West Wits operations as described in **Section 5.4**. The geohydrologists has made recommendations to adjust the groundwater monitoring network, refer to the Action Plan (Section 6.5) as well as the recommendations in **Section 5.4.2**. The annual reports are to be submitted to the authorities at the stipulated time interval in the IWUL. Harmony currently has a quarterly groundwater monitoring programme (and monthly surface water monitoring programme) in which monitoring is conducted and a data record is kept. The detailed environmental monitoring schedule are described in the WUL and the monitoring reports. The recommendations is detailed in this report, the social and environmental aspects that act as environmental indicators and are most common have been considered.

7.2 AUDIT AND REPORT ON PERFORMANCE MEASURES

The mine is committed to continual improvement and prevention of pollution. The applicant undertakes annual internal audits and biennial external EMPr compliance audits. Harmony will further undertake internal and external audits on compliance with the conditions of the WUL, once issued, and in line with the frequency required by the WUL (i.e., on an annual basis).

7.3 AUDIT AND REPORT ON RELEVANCE OF IWWMP ACTION PLAN

The WUL will require that the efficacy of the measures proposed as part of the action plan be reviewed and updated where required. As such, the IWWMP action plan will be reviewed and updated in line with the frequency required by the WUL (i.e., on an annual basis).

8 CONCLUSION

This Integrated Water and Waste Management Plan (IWWMP) presents a comprehensive overview of the water and waste-related systems, risks, and management strategies applicable to Harmony Gold's Mponeng Operations, including the associated infrastructure at Savuka and Tau Tona (where applicable). The plan has been informed by recent monitoring data, site inspections, historical reports, risk assessments, and compliance audits, and is aligned with the requirements of the National Water Act (Act 36 of 1998), the site's Water Use Licence (WUL), and best practice environmental guidelines. This section provides the concluding statements relating to the regulatory status of the activity, the motivation of the activity in terms of Section 27 of the NWA (**Appendix 7**) and the proposed WULA.

The alternative barrier system as assessed (along with the phytoremediation) has been demonstrated to have an equivalent performance to a Class C liner and is therefore considered adequate for the purposes of water resource protection.

8.1 REGULATORY STATUS OF ACTIVITY

The recommencement of deposition on Mponeng Lower Compartment is a listed activity in terms of environmental management legislation, and at the moment concurrent Environmental Authorisation and WUL application processes are underway. As part of the EA process, an integrated application for an EA as well as a waste management licence application is being applied for.

8.2 KEY COMMITMENTS

Harmony is committed to implementing and reviewing the IWWMP action plan included in this document based on any new information where required.

9 REFERENCES

Airshed Planning Professionals. 2026. Air Quality Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

AngloGold Ashanti. 2018. Operational Profile 2019 – Mponeng South Africa. Available online: https://www.aga-reports.com/19/download/AGA-OP19-mponeng.pdf (Accessed 3 September 2025).

AquiSim Consulting Pty Ltd. 2026. Radiological Impact Assessment to Recommence Depositioning at the Lower Mponeng Tailings Storage Facilities.

Brink, A. B. A. 1979. Engineering Geology of Southern Africa, Vol. 1 – The first 2 000 million years of geological time. Building Publications, Pretoria.

Council for Geoscience. 1998. 1:250 000 West Rand 2626 Geological series. Council For Geoscience, Pretoria.

Council for Scientific and Industrial Research. 2024. West Rand District Municipality: Climate Risk Profile Report. Climate and Disaster Resilience Fund & Santam

Department of Agriculture, Forestry and Fisheries. 2017. *National land capability evaluation raster data: Land capability data layer*, 2017. Pretoria

Department of Water Affairs and Forestry, 1998. National Water Act, Act 36 of 1998

Department of Water Affairs and Forestry, 1999, "Government Notice 704 (Government Gazette 20118 of June 1999)

Driver, A., Nel, J., Snaddon, K., Murray, K., Roux, D., Hill, L., Swartz, E., Manuel, J., & Funke, N. 2011. Implementation Manual for Freshwater Ecosystem Priority Areas.

Eco Elementum and Engineering (Pty) Ltd. 2025. Mponeng Lower Compartment Tailings Storage Facility Pre-Feasibility Study Report.

Gomelelo Environmental and Management Consulting. 2025. ANNUAL UPDATE OF THE INTEGRATED WATER AND WASTE MANAGEMENT PLAN (IWWMP) - GOLDEN CORE TRADE AND INVEST (PTY) LTD. – MPONENG OPERATIONS 2024 / 2025

Haldar, S. K. 2018. (2nd Edition) Mineral Exploration - Chapter 13 - Mineral Processing, p 259-290. Available online: https://www.sciencedirect.com/science/article/pii/B9780128140222000137 (accessed 01 September 2025).

Hydrologic Consulting. 2025. Baseline Hydrological Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

Krusemann, G.P.; De Ridder, N.A. 1991. Analysis and evaluation of pumping test data - ILRI Publications, No. 47, 2. Ed., 377 pages, Wageningen.

Land Type Survey Staff. 1972 - 2006. Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Merafong City Local Municipality Draft Integrated Development Plan 2025-2026. Available online: https://merafong.gov.za/wp-content/uploads/2025/04/Draft-IDP-Document-March-2025-2026.pdf (accessed 01 September 2025).

Mucina, L. & Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

MvB Consulting. 2025. Geohydrological Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

Parsons C. F., and Killick A. M. 1985. The Surface Geology of Part of the W.A.G.M. Property and Environs. J.C.I. Research Unit Report 200 (unpublished report).

Parsons, C. F. 1991. The Geology of the Gemsbokfontein Dolomitic Groundwater Compartment and Possible Effects of Dewatering. JCI Report No. 210.

Parsons R. 1995. A South African Aquifer System Management Classification. WRC Report No KV 77/95, Pretoria.

Schulze, R.E. and Lynch, S.E., 2006. “South African Atlas of Climatology and Agrohydrology”, WRC Report 1489/1/06,

Smith, B. 2006. The Farming Handbook. Netherlands & South Africa: University of KwaZulu-Natal Press & CTA

Soil Classification Working Group. 1991. Soil Classification: A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

Soil Classification Working Group. 2018. Soil Classification a Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

South African National Biodiversity Institute - South African National Biodiversity Institute, 2018, “Vegetation Map of South Africa, Lesotho and Swaziland 2018”

The Biodiversity Company. 2026. Aquatic Biodiversity and Wetlands Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

The Biodiversity Company. 2026. Soils and Agriculture Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

The Biodiversity Company. 2026. Terrestrial Ecology Assessment for the Harmony Mponeng Lower Compartment TSF, Gauteng.

Truswell, J.F. .1977. The geological evolution of South Africa.

Water Research Commission, Pretoria Water Research Commission 2002. “Design Rainfall Estimation in South Africa”. WRC Report No. K5/106